

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TENNANT COMPANY,
Petitioner,

v.

OXYGENATOR WATER TECHNOLOGIES, INC.,
Patent Owner.

IPR2021-00625
Patent RE45,415 E

Before KRISTINA M. KALAN, CHRISTOPHER M. KAISER, and
SHELDON M. MCGEE, *Administrative Patent Judges*.

KALAN, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision on Remand
Determining No Challenged Claims Unpatentable
Granting Patent Owner's Motion to Seal
35 U.S.C. §§ 144, 318

I. INTRODUCTION

We address this case on remand after a decision by the United States Court of Appeals for the Federal Circuit in *Tennant Co. v. Oxygenator Water Technologies, Inc.*, No. 2022-2304, 2024 WL 3507694 (Fed. Cir. July 23, 2024) (Paper 64, “*Tennant*”). For the reasons discussed herein, we determine that Tennant Company (“Petitioner”) has not shown, by a preponderance of the evidence, that any of the challenged claims are unpatentable.

A. *Procedural History*

Petitioner filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 13, 14, and 17–27 of U.S. Patent No. RE45,415 E (Ex. 1101, “the ’415 patent”). Oxygenator Water Technologies, Inc. (“Patent Owner” or “OWT”) filed a Preliminary Response to the Petition (Paper 8).

We instituted an *inter partes* review of claims 13, 14, and 17–27 of the ’415 patent on the grounds of unpatentability alleged in the Petition. Paper 9 (“Dec.”). After institution of trial, Patent Owner filed a Patent Owner Response. Paper 34 (sealed version), Paper 35 (public version) (“PO Resp.”). Petitioner filed a Reply. Paper 42 (“Reply”). Patent Owner filed a Sur-Reply. Paper 45 (“Sur-Reply”). Patent Owner filed a Motion to Seal. Paper 37. We held an oral hearing on May 20, 2022, and a transcript of the hearing is included in the record. Paper 52 (“Tr.”).

On August 17, 2022, we issued a Final Written Decision in this proceeding in accordance with 35 U.S.C. § 318(a) and 37 C.F.R. § 42.55. Paper 53 (“Final Dec.”). We concluded that Petitioner had not established by a preponderance of the evidence that claims 13, 14, and 17–27 of the

'415 patent were unpatentable as anticipated or obvious. Final Dec. 55–59. The Final Written Decision was appealed by Petitioner to the United States Court of Appeals for the Federal Circuit. *See* Paper 54.

The Federal Circuit vacated and remanded our anticipation determinations as to claims 13, 14, and 17–27. *Tennant*, 11.¹ The Federal Circuit further stated: “Because we vacate and remand to the Board to consider Tennant’s anticipation argument, we do not reach Tennant’s obviousness arguments (which depends on its contention that either Wikey or Davies produce nanobubbles).” *Id.* at 11.

On September 19, 2024, we authorized the parties to file supplemental briefing, stating also that the “parties are not authorized to present new factual assertions, provide additional exhibits, or raise new arguments beyond those directed to the issues raised in the remand.” Ex. 3001. Pursuant to this authorization, Petitioner filed an Opening Brief on Remand (Paper 61; “Pet. Br. Rem.”) in support of its contentions. Patent Owner filed a Lead Brief on Remand (Paper 62; “PO Br. Rem.”) in support of its contentions. Petitioner filed a Reply Brief on Remand (Paper 66; “Pet. Reply Br. Rem.”). Patent Owner filed a Responsive Brief on Remand (Paper 65; “PO Resp. Br. Rem.”).

On November 21, 2024, we also authorized the parties to file supplemental briefing without additional evidence. Ex. 3002. Pursuant to this authorization, Petitioner filed a Sur-Reply Brief on Remand (Paper 67;

¹ Although the *Tennant* introduction states that “we reverse and remand,” we follow the Conclusion of the opinion, which states “we vacate and remand.” *Compare Tennant*, 2 (“we reverse and remand”), with *id.* at 11 (“we vacate and remand”; “VACATED AND REMANDED”).

“Pet. Sur-Reply Rem.”). Patent Owner filed a Reply Brief on Remand (Paper 68; “PO Reply Br. Rem.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision on Remand is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has not shown unpatentability of any challenged claim by a preponderance of the evidence.

B. The '415 Patent

The '415 patent is a reissue of U.S. Patent No. 7,670,495 and is titled “Flow-Through Oxygenator.” Ex. 1101, codes (54), (64). The '415 patent “relates to the electrolytic generation of microbubbles of oxygen for increasing the oxygen content of flowing water,” and “also relates to the use of superoxygenated water to enhance the growth and yield of plants”; its flow-through model “is useful for oxygenating water for hydroponic plant culture, drip irrigation and waste water treatment.” *Id.* at 1:24–30.

The '415 patent explains that the “production of oxygen and hydrogen by the electrolysis of water is well known,” in which hydrogen gas and basic water are produced at the cathode during electrolysis, and oxygen gas and acidic water are produced at the anode. *Id.* at 2:5–6, 2:9–11, 2:21–23.

The '415 patent explains that pumps to supply oxygen have high power requirements and produce acidic and basic water, which can be detrimental to live animals. *Id.* at 2:47–50. In view of this, the '415 patent expresses a need for “quiet, portable, low voltage means to oxygenate water” and for oxygenator models suitable to be placed in-line in water distribution devices and for hydroponic culture. *Id.* at 2:52–54, 2:60–62.

The '415 patent describes “an oxygen emitter which is an electrolytic cell which generates very small microbubbles and nanobubbles of oxygen in an aqueous medium, which bubbles are too small to break the surface tension of the medium, resulting in a medium supersaturated with oxygen.” *Id.* at 2:66–3:3. Figure 1B of the '415 patent is reproduced below.

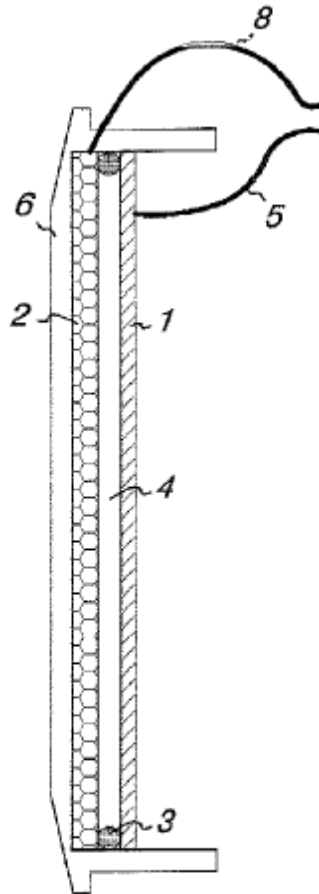


Fig. 1B

Figure 1B depicts oxygen emitter 6 that includes anode 1, cathode 2, and non-conducting spacer 3 having gap 4 for the passage of gas and the mixing of anodic and cathodic water. *Id.* at 3:46, 4:60–67, 5:2.

The '415 patent states that “to form microbubbles and nanobubbles, the anode and cathode are separated by a critical distance.” *Id.* at 3:13–14. The '415 patent defines “critical distance” as “the distance separating the anode and cathode at which evolved oxygen forms microbubbles and nanobubbles.” *Id.* at 4:1–3. The '415 patent describes the critical distance as ranging “from 0.005 inches to 0.140 inches” and that the “preferred critical distance is from 0.045 to 0.060 inches.” *Id.* at 3:14–16. With regard to Figure 1B’s embodiment, the '415 patent states:

The spacer thickness is critical as it sets the critical distance. It must be of sufficient thickness to prevent arcing of the current, but thin enough to separate the electrodes by no more than 0.140 inches. Above that thickness, the power needs are higher and the oxygen bubbles formed at higher voltage will coalesce and escape the fluid. Preferably, the spacer is from 0.005 to 0.075 inches thick. At the lower limits, the emitter tends to foul more quickly. Most preferably, the spacer is about 0.050 inches thick.

Id. at 5:4–13.

C. Illustrative Claim

Claim 13 is the sole independent claim of the challenged claims.

Claim 13 is representative and is reproduced below:

13. A method for producing an oxygenated aqueous composition comprising:
 - flowing water at a flow rate no greater than 12 gallons per minute through an electrolysis emitter comprising an electrical power source electrically connected to an anode electrode and a cathode electrode contained in a tubular housing,
 - causing electricity to flow from the power source to the electrodes, and,
 - producing the composition comprising a suspension comprising oxygen microbubbles and nanobubbles in the

water, the microbubbles and nanobubbles having a bubble diameter of less than 50 microns, wherein:
the anode electrode is separated at a critical distance from the cathode such that the critical distance is from 0.005 inches to 0.140 inches;
the power source produces a voltage no greater than about 28.3 volts and an amperage no greater than about 13 amps,
the tubular housing has an inlet and an outlet and a tubular flow axis from the inlet to the outlet;
the water flows in the inlet, out the outlet, is in fluid connection with the electrodes, and the water flowing into the inlet has a conductivity produced by the presence of dissolved solids such that the water supports plant or animal life.

Ex. 1101, 11:20–45.

D. Instituted Grounds of Unpatentability

We instituted *inter partes* review of claims 13, 14, and 17–27 of the '415 patent on the following grounds:

Ground	Reference(s)/Basis	35 U.S.C. § ²	Claim(s) Challenged
1	Wikey ³	102	13, 18–23, 25
2	Wikey, AFD ⁴	103	13, 18–23, 25

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. §§ 102 and 103 that became effective on March 16, 2013. Because the '415 patent issued from an application filed before March 16, 2013, we apply the pre-AIA version of §§ 102 and 103.

³ US 3,891,535, issued June 24, 1975 (Ex. 1112).

⁴ M. Hargrove & M. Hargrove, *Aquariums for Dummies*, IDG Books Worldwide, Inc. (1999) (Ex. 1114).

Ground	Reference(s)/Basis	35 U.S.C. § ²	Claim(s) Challenged
3	Wikey, AFD, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, ⁵ Han, ⁶ Glembotsky, ⁷ and Burns ⁸	103	13, 18–23, 25
4	Wikey, Clark ⁹	103	26, 27
5	Wikey, Clark, AFD	103	26, 27
6	Wikey, Clark, AFD, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns	103	26, 27
7	Davies ¹⁰	102	13, 14, 17–23, 25
8	Davies, Hough ¹¹	103	13, 14, 17–23, 25

⁵ H. Wendt & G. Kreysa, *Electrochemical Engineering: Science and Technology in Chemical and Other Industries*, Springer-Verlag Berlin Heidelberg, 81–127 (1999) (Ex. 1117).

⁶ M. Han et al., *Development of a New Method of Measuring Bubble Size*, Water Sci. and Tech.: Water Supply Vol. 2 No. 2, 77–83 (2002) (Ex. 1137).

⁷ V. Glembotsky et al., *Size of gas bubbles forming during electroflotation*, 5 Elektronnaia Obrabotka Materialov 66–68 (1973) (Ex. 1123). Petitioner provides a certified English translation of Glembotsky (Ex. 1124).

⁸ S. Burns et al., *Application of Digital Image Analysis for Size Distribution Measurement of Microbubbles*, Imaging Technologies: Techniques and Civil Engineering Applications Engineering Foundation (1997) (Ex. 1131).

⁹ US 4,039,439, issued Aug. 2, 1977 (Ex. 1106).

¹⁰ US 4,917,782, issued Apr. 17, 1990 (Ex. 1105).

¹¹ US 6,171,469 B1, issued Jan. 9, 2001 (Ex. 1141).

Ground	Reference(s)/Basis	35 U.S.C. §²	Claim(s) Challenged
9	Davies, Erickson ¹²	103	13, 14, 17–23, 25
10	Davies, Erickson, Hough	103	13, 14, 17–23, 25
11	Davies, Erickson, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns	103	13, 14, 17–23, 25
12	Davies, Erickson, Hough, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns	103	13, 14, 17–23, 25
13	Davies, Schoeberl ¹³	103	24
14	Davies, Schoeberl, Hough	103	24
15	Davies, Erickson, Schoeberl	103	24
16	Davies, Erickson, Schoeberl, Hough	103	24
17	Davies, Erickson, Schoeberl, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns	103	24
18	Davies, Erickson, Schoeberl, Hough, the general	103	24

¹² US 5,324,398, issued June 28, 1994 (Ex. 1107).

¹³ US 5,439,576, issued Aug. 8, 1995 (Ex. 1108).

Ground	Reference(s)/Basis	35 U.S.C. § ²	Claim(s) Challenged
	knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns		
19	Davies, Peters ^{14, 15}	103	26, 27
20	Davies, Peters, Hough	103	26, 27
21	Davies, Peters, Erickson	103	26, 27
22	Davies, Peters, Erickson, Hough	103	26, 27
23	Davies, Peters, Erickson, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns	103	26, 27
24	Davies, Peters, Erickson, Hough, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns	103	26, 27

¹⁴ US 3,984,303, issued Oct. 5, 1976 (Ex. 1109).

¹⁵ Petitioner cites Clark instead of Peters for Grounds 19–24 in the summary on pages 5–6 of the Petition. However, Petitioner cites Peters in its detailed challenges for Grounds 19–24 on pages 79–83 of the Petition. Therefore, as noted in the Institution Decision (Dec. 8 n.14), and without any clarification otherwise from the parties, we view Petitioner as relying on Peters in Grounds 19–24 instead of Clark.

Petitioner relies on the declaration testimony of Dr. Mario Tremblay.

Ex. 1103. Patent Owner relies on the declaration testimony of Dr. Ralph E. White. Ex. 2109; Ex. 2116 (private version); Ex. 2117 (public version).

In the Final Written Decision, we determined Petitioner had not met its burden of establishing, by a preponderance of the evidence, that the challenged claims were unpatentable.

II. ANALYSIS

A. *Legal Standards*

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). A “prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). If a prior art device in its normal and usual operation would necessarily perform the claimed method, then the method is arguably inherently anticipated by the prior art device. *In re King*, 801 F.2d 1324, 1326 (Fed. Cir. 1986). A “prior art reference may anticipate when the claim limitation or limitations not expressly found in that reference are nonetheless inherent in it.” *MEHL/Biophile Int’l Corp. v. Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person of

ordinary skill in the art at the time the invention was made. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). Obviousness is resolved based on underlying factual determinations, including: (1) the scope and content of the prior art; (2) differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness, i.e., secondary considerations.¹⁶ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Subsumed within the *Graham* factors is the requirement that, if all claim limitations are found in a number of prior art references, then the patent challenger must show that the skilled artisan would have had a reasonable expectation of success in combining the prior art references to achieve the claimed invention. *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007).

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). Petitioner must demonstrate unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d); *see also Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (2012) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)).

¹⁶ Patent Owner presents evidence and arguments about objective indicia of nonobviousness, namely, copying. PO Resp. 64–68. Because we determine that Petitioner has not demonstrated a sufficient basis for obviousness of the challenged claims, we need not reach Patent Owner’s evidence and arguments relating to objective indicia.

B. Level of Ordinary Skill in the Art

Petitioner asserts:

A person of ordinary skill in the art (POSITA) would have had a degree in chemistry, chemical engineering, or a similar discipline and at least two years of experience with electrolysis systems. Ex. 1103, ¶ 14. Alternatively, a POSITA could have equivalent experience in industry or research, such as designing, developing, testing, or implementing electrolysis systems. *Id.* Also, as noted in the '415 patent, a POSITA “can readily fabricate any of the emitters shown in FIG. 4 or 5 or can design other embodiments that will oxygenate flowing water.” Ex. 1101, 9:20–22.

Pet. 16.

Patent Owner states, for “purposes of this proceeding, PO does not challenge Petitioner’s proposed level of ordinary skill.” PO Resp. 53 n.6.

Neither party argues that the outcome of this case would differ based on our adoption of any particular definition of one of ordinary skill in the art. Accordingly, we adopt Petitioner’s definition, because it is consistent with the cited prior art. We further note that the prior art itself demonstrates the level of skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that “specific findings on the level of skill in the art . . . [are not required] ‘where the prior art itself reflects an appropriate level and a need for testimony is not shown’” (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))).

C. Claim Construction

We apply the claim construction standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b). Under *Phillips*, claim terms are afforded “their ordinary and

customary meaning.” *Phillips*, 415 F.3d at 1312. The “ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. Only terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

In the Petition, Petitioner refers us to definitions for certain terms in the ’415 patent’s “Definitions” section, namely, “critical distance,” “microbubble,” “nanobubble,” and “supersaturated.” Pet. 17–18 (quoting Ex. 1101, 4:1–6, 4:10–18). Otherwise, Petitioner does not propose express claim constructions in the Petition, although it addresses Patent Owner’s proposed constructions in its Reply, as discussed below. Reply 2–5.

Patent Owner represents that the parties agree that the construction of “nanobubble” should include the language “a bubble with a diameter less than that necessary to break the surface tension of the water.” PO Resp. 10–11. Patent Owner disputes Petitioner’s requested inclusion of additional language requiring that “[n]anobubbles remain suspended in the water, giving the water an opalescent or milky appearance.” *Id.* at 11.

Petitioner argues that the ’415 patent defines both “microbubble” and “nanobubble.” Reply 2 (quoting Ex. 1101, 4:10–15). The quoted portion of the ’415 patent is reproduced below:

“Microbubble” means a bubble with a diameter less than 50 microns.

“Nanobubble” means a bubble with a diameter less than that necessary to break the surface tension of water. Nanobubbles remain suspended in the water, giving the water an opalescent or milky appearance.

Ex. 1101, 4:10–15.

Petitioner notes that the '415 patent's definition of "microbubble" has a numerical bound but the definition of "nanobubble" does not. *Id.* at 3.¹⁷ Because patentee has acted as its own lexicographer, and because Patent Owner agrees that the definition provided in the specification is the preferred construction, we adopt the construction of "nanobubble" provided in the specification. *Cont'l Cirs. LLC v. Intel Corp.*, 915 F.3d 788, 796 (Fed. Cir. 2019) (citing *Phillips*, 415 F.3d at 1316) ("When the patentee acts as its own lexicographer, that definition governs."). Namely, we construe "nanobubble" as "a bubble with a diameter less than that necessary to break the surface tension of water." Ex. 1101, 4:12–13. We decline to add any additional language to our construction, as proposed by Petitioner, because the additional quoted sentence in the specification appears to describe an effect of nanobubbles on the appearance of water when nanobubbles are present, rather than define the nanobubbles themselves.

On this record, we determine that no other claim terms require express construction.

D. Summary of Relevant Prior Art

1. Wikey (Ex. 1112)

Wikey is titled "Aquarium Water Treatment Apparatus." Ex. 1112, code (54). Wikey's Figure 1 is reproduced below.

¹⁷ While not set forth as part of an explicit claim construction, Petitioner's declarant elsewhere opines that nanobubbles have a diameter of roughly 100 nanometers (0.1 microns). Ex. 2172, 69:11–25; Sur-Reply 2.

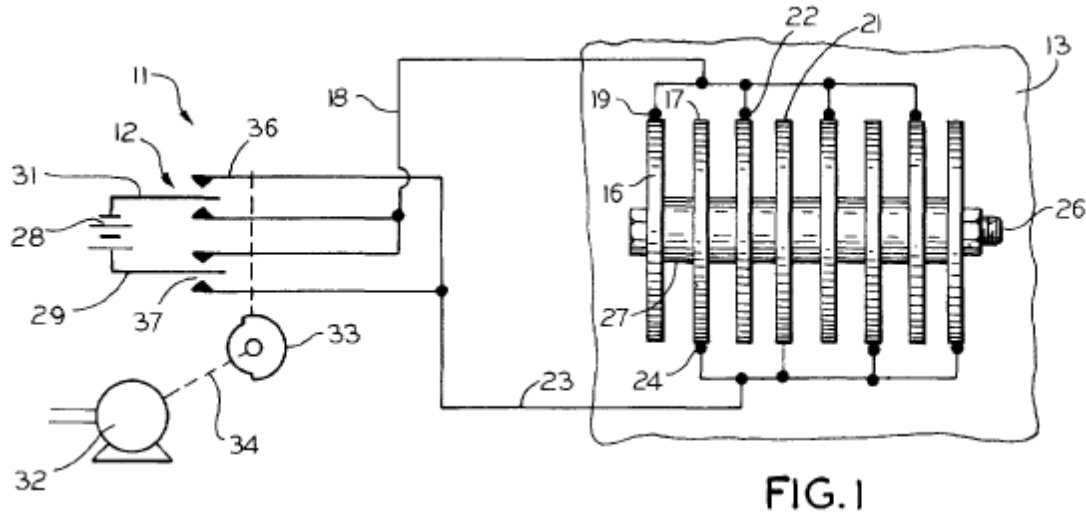


Figure 1 depicts water treatment apparatus 11 “for aerating and treating water in fish tanks, aquariums and the like.” *Id.* at 1:60–61, 1:66–2:1. Power supply 12, which can be a DC source, feeds power to electrode units 13 that are under water. *Id.* at 2:1–4, 2:23–24. Electrode units 13 include electrodes 16 and 17 that are oppositely polarized plates. *Id.* at 2:4–11. The plates are mounted on insulated rod 26 and separated from each other by insulated washers 27. *Id.* at 2:18–20. Apparatus 11 also includes a means for periodically changing the polarity of the electrodes, such as motor 32 that drives cam 33 and switches 36, 37. *Id.* at 2:26–33.

Wikey discloses that in “a preferred embodiment of the invention, the plates are maintained at a distance of 1/64 inch apart by the insulators and a 6 volt D.C. source is utilized.” *Id.* at 2:39–41. Wikey further teaches that the amperage between the plates depends on plate size and the conductivity of water but nonetheless, “the relative amperage of the preferred embodiment is in the order of ½ amp.” *Id.* at 2:42–46. Wikey states that, with a “platinum coated titanium plate, the bubbles of gas including oxygen are extremely small.” *Id.* at 2:49–51.

Wikey's Figure 3 is reproduced below.

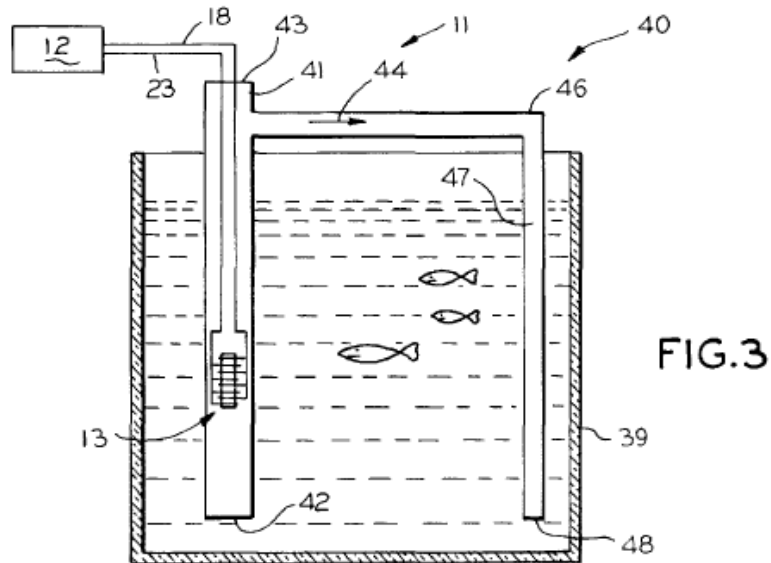


Figure 3 shows a further refinement of apparatus 11. *Id.* at 1:64–65. A circulating device, such as vertical tube 41, surrounds electrolysis unit 13. *Id.* at 3:6–8. Bottom 42 of tube 41 “is open to enable the flow of water therein” and top 43 of tube 41 “is also open and extends above the normal level of water in the tank.” *Id.* at 3:10–13. Wikey teaches:

A pumping action in tube 41 is caused by the electrolysis action of apparatus 13. In fact, the level of the water in tube 41 increases until water is flowing in the direction shown by arrows 44 in the horizontal tube 46 and back down through second vertical tube 47. The water that flows through the three tubes is forced therethrough by the electrolysis action and because of the electrolysis action contains a plethora of oxygen bubbles. The hydrogen that is released in tube 41 escapes into the atmosphere at opening 43. The water containing the oxygen bubbles passes back down through tube 47 which is open at the bottom portion 48 thereof to enable aerated water to flow therethrough and supply oxygen to the lower levels of the tank.

Id. at 3:13–27.

2. *Davies (Ex. 1105)*

Davies is titled “Electrolytic Liquid Purification Process and Apparatus.” Ex. 1105, code (54). Davies “relates to a process and apparatus for electrolytically treating water and other liquids” and “for treating water to be used for drinking purposes or for human body contact.” *Id.* at 1:7–10.

Davies’s Figure 2 is reproduced below.

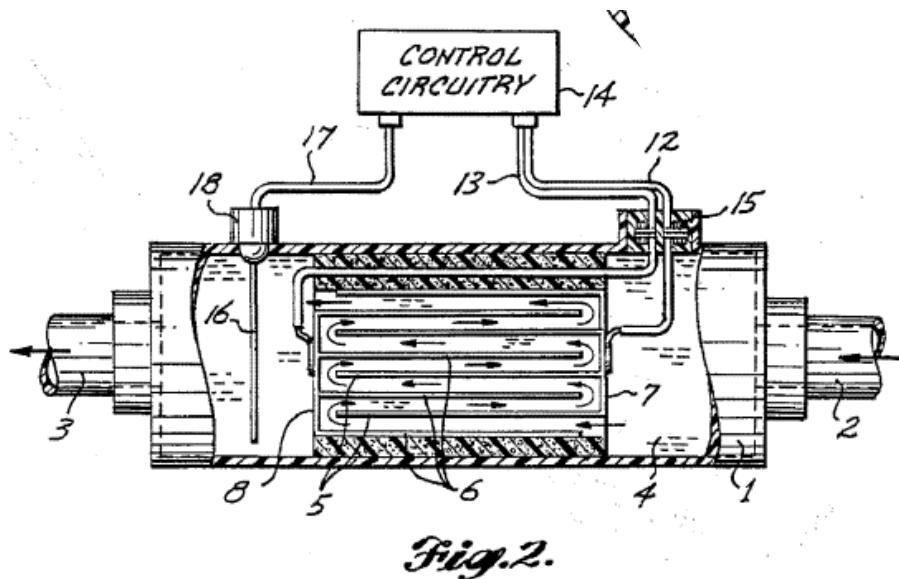


Figure 2 is a side view of a clarifying electrolytic cell. *Id.* at 1:66–2:1. The electrolytic cell includes cylindrical casing 1 connected to liquid supply pipe 2 and liquid discharge pipe 3. *Id.* at 2:60–63. Davies describes interior chamber 4 that includes “a stack of electrode plates including two components or plate sets disposed in interstratified or interleaved relationship” and describes that Figure 2 shows grouped anode plates 5 and grouped cathode plates 6 in an interleaved relationship. *Id.* at 2:63–68. Specifically, “anode plates 5 project in parallel, equally-spaced, cantilever fashion from an end connecting plate 7” and “cathode plates 6 project in

parallel, equally-spaced, cantilever fashion from an end connecting plate 8.”
Id. at 2:68–3:4.

Davies’s Figure 3 is reproduced below.

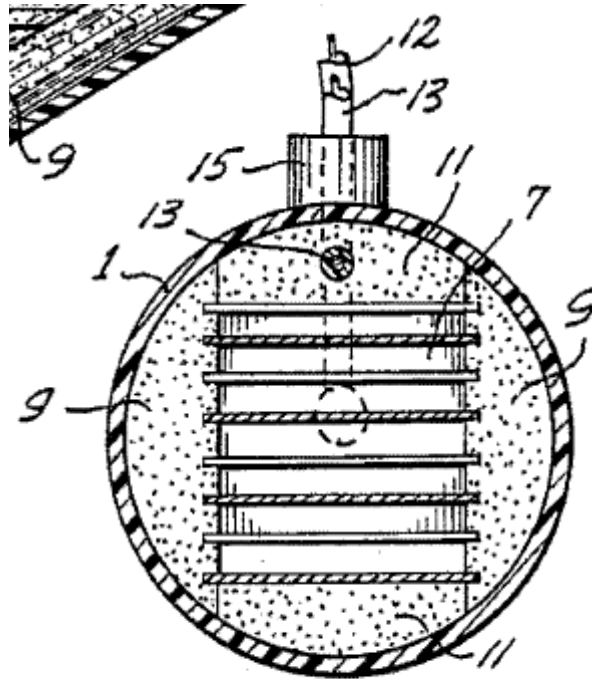


Fig. 3.

Davies describes the opposite edges of electrode plates 5, 6 being held by mounting blocks 9 located at opposite sides of the electrode stack to hold electrode plates 5, 6 “firmly in accurately spaced relationship.” *Id.* at 3:5–13. Spaces above and below the stack of plates 5, 6 are closed by filler blocks 11. *Id.* at 3:19–20.

Davies describes interleaving anode plates 5 and cathode plates 6 so a free end of each cantilevered plate is spaced from the adjacent end plate a distance that is approximately equal to the spacing between adjacent plates to form a series of return bends and provide a sinuous passage from the entrance end of the casing to the exit end through the plate stack. *Id.*

at 3:25–32. Davies teaches that for “most purposes the plate width should be in the range of 3 to 5 inches (7.62 to 12.7 cm) and the spacing between adjacent plates should be one-eighth to one-quarter of an inch (3.5 to 7 mm),” and that it is “desirable for the space between adjacent plates to be small so as to provide a short path for travel of electricity between the plates.” *Id.* at 3:43–49. Davies further teaches:

The time during which the liquid is subjected to the electric field between the anode and cathode plates can be regulated by selection of the length of the path between the liquid and the plates which is determined by the length of the plates, and by the velocity of the liquid flowing through the interplate passage. Preferably the length of the plates 5 and 6 is in the range of 5 inches to 10 inches (12.7 to 25.4 cm) and the velocity of the water may be 8 to 20 feet (2.4 to 6 m) per minute so that the water will be in contact with the plates for a period of 15 to 40 seconds.

Id. at 3:49–59.

Davies discloses that the cell can be powered by a 110 volt or a 220 volt alternating current source, which can be transformed to a low voltage, such as 12 volts or 24 volts. *Id.* at 4:26–30, 8:68–9:5. Davies also describes using direct current electricity, such as a 12-volt battery. *Id.* at 5:65–68. Davies describes installing the cell in a household water system via connection to the cold-water supply for a sink or a wash bowl. *Id.* at 4:66–5:1.

Davies’s Figure 11 is reproduced below.

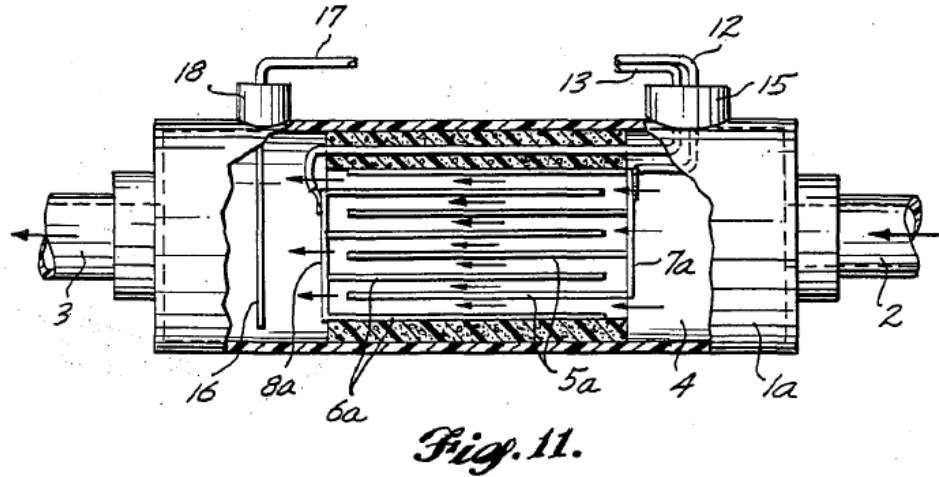


Figure 11 depicts an alternate type of clarifying electrolytic cell. *Id.* at 2:17–20. Davies teaches that anode plates 5a and cathode plates 6a “can be of the same size as the anode plates 5 and the cathode plates 6, as shown in FIGS. 1, 2, 3, and 4.” *Id.* at 6:43–47. However, anode plates 5a project in cantilever fashion from central connecting strap 7a, and cathode plates 6a project in cantilever fashion from connecting strap 8a. *Id.* at 6:47–52. Davies describes substantially straight parallel flow paths between plates 5a, 6a from inlet 2 to outlet 3. *Id.* at 6:63–68. Davies further describes using an electrolytic cell to maintain an aquarium’s liquid in clean condition. *Id.* at 7:36–40. Davies teaches that a filter is not necessary in such an arrangement due to recirculation of water in the aquarium by a pump through the cell. *Id.* at 7:41–43.

E. Federal Circuit Decision

In *Tennant*, the Federal Circuit discussed four arguments made by Petitioner on appeal in support of Petitioner’s assertion that Wikey and/or Davies discloses the nanobubble limitation. *Tennant*, 5–11.

First, Petitioner contended on appeal that Petitioner’s “testing of the devices from Wikey and Davies demonstrates anticipation.” *Id.* at 5. The Federal Circuit determined that “the Board did not err in concluding that the testing did not detect the presence of nanobubbles.” *Id.*

Second, Petitioner contended on appeal that “even if the testing did not directly detect nanobubbles, it demonstrated that the water was supersaturated, and that this was sufficient to show the presence of nanobubbles.” *Id.* The Federal Circuit noted that the “Board found that supersaturation does not show the presence of nanobubbles” and determined that the “Board’s decision is supported by substantial evidence.” *Id.* at 6.

Third, Petitioner contended on appeal that “both Wikey and Davies inherently produce microbubbles and nanobubbles because they both ‘describe[] an anode and a cathode spaced at the “critical distance.”’” *Id.* The Federal Circuit noted that the “Board found ‘that the ’415 patent itself does not necessarily equate a certain critical distance of electrodes with the formation of nanobubbles or microbubbles, to the exclusion of all other variables,’” and determined that the “Board’s finding is supported by substantial evidence.” *Id.* at 7.

Fourth, Petitioner contended on appeal that Wikey and Davies “met all of the limitations of independent claim 13 as they relate to the parameters of the device—i.e., the voltage used, the amperage used, the shape of the housing the inlet, the outlet, the fluid flow, and even the ‘critical distance.’” *Id.* Petitioner further contended that “when all claimed parameters are present—as in Wikey—microbubbles and nanobubbles are inherently formed.” *Id.* at 7–8 (citing *In re King*, 801 F.2d at 1326). The Federal Circuit stated that Petitioner “made this same argument to the Board in its

IPR petition” and that Petitioner’s expert testified to the same. *Id.* at 8 (citing J.A. 121–22, 24–25 (Final Decision’s summary of Petitioner’s argument on reply having to do with “critical distance”), 112, 528, 559). The Federal Circuit stated that “the Board did not address this argument, finding only that Wikey’s and Davies’ disclosure of the ‘critical distance’ was insufficient to inherently disclose production of nanobubbles.” *Id.* at 8–9.

The Federal Circuit relies on “the prosecution history where OWT represented that microbubbles and nanobubbles were inherently produced when the claim parameters of the ’415 patent were followed,” pointing in particular to “[n]ew claim 55, which, as amended, became claim 13 in the [’415] patent.” *Tennant*, 9. “New claim 55,” reproduced in part in *Tennant*, provided that “the combination of the critical distance, the voltage, amperage and the water conductivity results in the formation of a suspension comprising oxygen nanobubbles in the water.” *Id.* (quoting Ex. 1102, 190). This quoted language from new claim 55, as noted, “was ultimately deleted from claim 13.” *Id.* at 9 n.2 (citing Ex. 1102, 167, 140–141, 136–153). Invoking principles of judicial estoppel, the Federal Circuit concludes that “if the physical parameters of the claim were followed, it would automatically produce nanobubbles,” and that Patent Owner “cannot make one argument when seeking issuance of its patent and the opposite argument in defending the patent in post-grant review and to this court.” *Id.* at 10–11 (quoting cases on judicial estoppel).

In conclusion, the Federal Circuit stated: “Because the Board failed to address Tennant’s argument that Wikey and Davies disclosed all the

parameters of the '415 [patent] and therefore inherently produce microbubbles and nanobubbles, we vacate and remand.” *Id.* at 11.

F. Parties’ Arguments after Remand

1. Petitioner’s Arguments (Petitioner’s Opening Brief on Remand—Patent Owner’s Responsive Brief on Remand—Petitioner’s Sur-Reply Brief on Remand)

a) Petitioner’s Opening Brief on Remand

Petitioner argues that the Board must evaluate Petitioner’s “argument that independent claim 13 is anticipated because the prior-art devices of Wikey and Davies independently teach each claimed parameter and therefore inherently anticipate the claimed microbubbles and nanobubbles limitation.” Pet. Br. Rem. 1. Petitioner presents arguments that each of Wikey and Davis discloses “all physical parameters of claim 13,” namely: “Fluid flow rate”; “Electrical power source and flow”; “Critical distance”; “Voltage”; “Housing shape, inlet, and outlet”; and “Water flow/Conductivity.” *Id.* at 2–4. Accordingly, Petitioner argues, the “prior-art devices inherently disclose claim 13’s microbubbles and nanobubbles,” which Petitioner argues “OWT has already conceded” in prosecution. *Id.* at 5 (citing *Tennant*, *4 (quoting Ex. 1102, 198)).

Petitioner further argues that Patent Owner “cannot argue against *Tennant*’s position because the Federal Circuit held that OWT is judicially estopped from doing so.” *Id.* at 1, 5 (citing *Tennant*, *4 (quoting Ex. 1102, 198)). Petitioner again relies on *In re King*, 801 F.2d at 1326, and presents claim 13 anticipation arguments based on Wikey, Davies, and the '415 patent. *Id.* at 5–8.

Petitioner presents additional arguments that the Board should “hold claims 14 and 17–27 unpatentable as anticipated and/or obvious.” *Id.* at 1, 8–15.

b) Patent Owner’s Responsive Brief on Remand

Patent Owner responds that Petitioner “failed to support its broader inherency argument,” i.e., the argument that “any method employing electrolysis parameters anywhere within the ranges of claim 13 will inherently produce nanobubbles.” PO Resp. Br. Rem. 1. Patent Owner maintains that it “never ‘conceded’ during prosecution that nanobubbles were inherently produced by the other parameters of claim 13,” and that Petitioner “cites no evidence that establishes just meeting the parameter ranges recited in claim 13 will be *sufficient* to produce nanobubbles.” *Id.* at 1–2.

Patent Owner also argues that Petitioner’s “evidence fails to show inherency” because the evidence cited by Petitioner “relies only on the ‘critical distance’” (i.e., Ex. 1103 ¶¶ 35, 91, 106), says nothing about nanobubbles being inherently produced (i.e., Ex. 1103 ¶¶ 61, 128), or constitutes a statement by the Examiner to which Patent Owner did not acquiesce (i.e., Ex. 1102, 107). *Id.* at 2–3. Patent Owner maintains that the factual finding that “other unclaimed parameters *do* affect nanobubble creation” was adopted by the Board and not rejected or disturbed by the Federal Circuit. *Id.* at 4.

Patent Owner further argues that judicial estoppel “does not apply, and the Federal Circuit has not ‘held’ that it does.” *Id.* at 5. Patent Owner refers to its Lead Brief on Remand to argue that the statements identified by the Federal Circuit “do not support application of the ‘extreme remedy’ of

judicial estoppel,” because (1) they were not inconsistent with Patent Owner’s present position, and (2) Patent Owner “cannot be said to have ‘succeeded’ based on any such argument.” *Id.* at 6. Finally, Patent Owner argues that Petitioner’s enablement arguments are “inapposite and wrong.” *Id.* at 6–7.

Patent Owner additionally argues that “Wikey and Davies do not even teach all the other parameters of claim 13,” that Petitioner’s “additional arguments regarding dependent claims are improper and should not be considered,” and that, even if considered, those additional arguments should fail. *Id.* at 7–10.

c) Petitioner’s Sur-Reply Brief on Remand

Petitioner reiterates that Patent Owner “is judicially estopped from arguing microbubbles and nanobubbles are not inherently produced when the physical parameters of claim 13 are met.” Pet. Sur-Reply Rem. 1. Petitioner maintains that the “Federal Circuit decided judicial estoppel.” *Id.* at 2. First, according to Petitioner, it is irrelevant that “judicial estoppel was not adequately briefed and argued to the Board,” as Patent Owner argued, because “an appellate court may dispose of a case on judicial estoppel grounds even if the issue was not raised in the first instance or by the parties on appeal.” *Id.* at 2–3. Next, according to Petitioner, “the Federal Circuit’s mandate on remand did not ask the Board to make a determination on judicial estoppel—that issue is resolved.” *Id.* at 4.

Petitioner also argues that the Board may properly consider the dependent claims on remand and should find all unpatentable. *Id.* at 4–5.

2. *Patent Owner's Arguments (Patent Owner's Lead Brief on Remand—Petitioner's Reply Brief on Remand—Patent Owner's Reply Brief on Remand)*

a) *Patent Owner's Lead Brief on Remand*

Patent Owner argues that Petitioner's argument on appeal (as opposed to its argument in the Petition), i.e., the argument that “any electrolysis method falling within each of the parameter ranges recited in claim 13” inherently makes nanobubbles, is a “broader inherency argument.” PO Br. Rem. 1. Patent Owner argues that this broader inherency argument is “technologically unsupported and unpersuasive,” and that “judicial estoppel does not apply.” *Id.* at 2.

First, Patent Owner argues that Petitioner failed to support its broader inherency argument with persuasive evidence. *Id.* Patent Owner critiques Petitioner's reliance on Paragraphs 35, 61, 68, 91, 106, 134, and 157 of the Tremblay declaration as insufficient to support the broader inherency argument, because these paragraphs discuss only “critical distance” or “testing” to support arguments that were already rejected by the Board, which rejection the Federal Circuit affirmed. *Id.* at 3–4 (discussing Ex. 1103 ¶¶ 35, 61, 68, 91, 106, 134, 157).

Next, Patent Owner argues that the evidence contradicts a finding that nanobubbles are necessarily produced whenever the parameters of claim 13 are satisfied. *Id.* at 4. For one, Patent Owner argues, “both experts and the examiner all agree that there are *many* factors that influence the size of bubbles created during electrolysis, many of which are not recited in claim 13.” *Id.* at 4–5. Moreover, Patent Owner argues, claim 13 “does not define a single, precise embodiment,” and its parameters are given as ranges, so

“whether all combinations will actually produce nanobubbles is never stated in the patent.” *Id.* at 5–6.

Regarding judicial estoppel, Patent Owner argues that Petitioner waived reliance on the prosecution history, and “cannot backfill with arguments or evidence that are not in the Petition.” *Id.* at 6 (referring to Ex. 1102, 196, 198). Patent Owner further argues that judicial estoppel does not apply, enumerating factors set forth in *New Hampshire v. Maine*, 532 U.S. 742, 749–751 (2001): (1) a party’s later position must be “clearly” or “entirely” inconsistent with its earlier position; (2) whether the party has succeeded in persuading a tribunal to accept the party’s earlier position; and (3) whether the party would derive an unfair advantage if not estopped. Patent Owner argues that its statements during prosecution were not inconsistent with its “position that the Petition has failed to support its broader inherency argument.” PO Br. Rem. 8.

Patent Owner draws a distinction between “what is ***needed*** to produce nanobubbles and what is ***sufficient*** to produce nanobubbles,” positing that “the relevant question for the broader inherency argument is whether the list of parameters recited by claim 13 is ***always sufficient*** to produce the claimed nanobubbles, regardless of what exact combination of values within those parameters are employed and regardless of what unclaimed features or other parameters are present.” *Id.* at 8–9. According to Patent Owner, the “file history comments identified by the Federal Circuit were discussing parameters needed for nanobubble creation,” but “never addressed whether *all* needed parameters were recited in claim 13 or whether *every combination* of values were inevitably ***sufficient*** to create nanobubbles.” *Id.* at 9. Patent Owner provides additional reasoning that the language quoted

by the Federal Circuit is not inconsistent with Patent Owner’s position. *Id.* at 9–11.

Patent Owner further argues that “the claims that were pending when these comments (the ones cited in the Federal Circuit opinion) were made were *different* than claim 13 as issued.” *Id.* at 11. Patent Owner disagrees with the Federal Circuit’s observation (in a footnote discussing deletion of language from new claim 55 before it issued as claim 13) that “there was no suggestion that the change was substantive,” arguing that “the language was deleted for good reason—because if construed as requiring these four parameters to be the sufficient cause of nanobubbles, it was inconsistent with dependent claims adding additional factors that cause nanobubbles.” *Id.* at 12 (citing *Tennant*, 9 n.2).

Patent Owner also argues that the Examiner did not accept that nanobubbles were inherent, and therefore Patent Owner could not have benefited from any such arguments. *Id.* at 13. “The examiner singled out claim 55 for allowance, not because nanobubbles are the inherent result of the claimed parameters, but because producing nanobubbles was an affirmatively-recited method step of that claim.” *Id.* at 14–15. Thus, Patent Owner argues, “Patent Owner cannot be said to have benefited” because the Examiner “ultimately did not adopt the position that the claimed parameters ‘automatically’ produce nanobubbles.” *Id.* at 15.

b) *Petitioner’s Reply Brief on Remand*

Petitioner replies that Patent Owner’s “attempts to recast the Federal Circuit’s clear language as merely ‘concerns’ that judicial estoppel ‘might’ apply are simply without merit,” and the Board should reject Patent Owner’s arguments that judicial estoppel does not apply. Pet. Reply Br. Rem. 1. If

the Board addresses Patent Owner's arguments, Petitioner argues, it "should find the Federal Circuit correctly determined that [Patent Owner's] argument during prosecution is inconsistent with the one it is making now." *Id.*

Because the Examiner required Patent Owner to "better define its invention to avoid the prior art by positively reciting microbubbles and nanobubbles," Patent Owner did so by reciting "'the conditions needed to produce' those microbubbles and nanobubbles, and, as a result, the Examiner allowed the claims." *Id.* at 2 (citing Ex. 1102, 196, 198).

Petitioner maintains that judicial estoppel precludes Patent Owner from arguing that microbubbles and nanobubbles are not inherent in the prior art, because Patent Owner argued the opposite when seeking issuance of the '415 patent. *Id.* at 3. Petitioner relies on the Federal Circuit's finding that Patent Owner "represented that microbubbles and nanobubbles were inherently produced when the *claim parameters* of the '415 patent were followed." *Id.* (citing *Tennant*, 4) (emphasis by Petitioner).

Regarding the three-part test for judicial estoppel, Petitioner first argues that (1) Patent Owner's "argument to the Board is clearly inconsistent with the prosecution history," stating that Patent Owner amended "its claim to describe the physical parameters—critical distance for separation of the electrodes, maximum voltage, maximum amperage, and desired conductivity—that necessarily produce microbubbles and nanobubbles." *Id.* at 4–5. Petitioner argues that although the "combination of" language was "ultimately deleted from claim 13," the "Federal Circuit correctly observed that this change was not substantive." *Id.* at 5, 5 n.2.

Second, Petitioner argues (2) that Patent Owner "obtained a favorable outcome by arguing the claimed parameters inherently produce

microbubbles and nanobubbles,” namely, “issuance of the ’415 Patent.” *Id.* at 7. Regarding Patent Owner’s argument that “judicial estoppel was improperly raised on appeal,” Petitioner argues that a “court may raise and decide judicial estoppel *sua sponte* precisely because the doctrine is designed to protect judicial integrity.” *Id.* at 8.

Third, Petitioner argues that it “cites ample evidence the claimed physical parameters inherently produce microbubbles and nanobubbles.” *Id.* at 9 (citing *Tennant*, 3–4; Pet. 30–34, 62–64).

c) Patent Owner’s Reply Brief on Remand

Patent Owner argues that judicial estoppel does not apply, because “none of the elements of the test for judicial estoppel is met.” PO Reply Br. Rem. 1.

First, Patent Owner argues that it did not “successfully obtain claim 13 *because of the statements*” Petitioner now points to but, rather, because “the Examiner considered the claimed step of ‘producing . . . nanobubbles’ to be a positive limitation of the method, not because other elements of the claim inherently resulted in nanobubbles.” *Id.* Patent Owner also disagrees that the Federal Circuit’s decision is “dispositive” on the issue of judicial estoppel, arguing that the Federal Circuit’s remand is for the Board to address Petitioner’s argument that “because Wikey and Davies disclosed values or ranges of parameters that fall within or overlap with those of claim 13, they inherently anticipated the affirmatively-claimed step of ‘producing . . . nanobubbles.’” *Id.* Patent Owner also returns to its *necessary* vs. *sufficient* position, stating that it “did not argue (and [Petitioner] has not shown) that any combination of parameters falling within the claims is inherently *sufficient* for nanobubbles.” *Id.* at 2. Patent Owner disagrees that

it ever stated what Petitioner alleges (much less obtained a favorable outcome) but, rather, argues that the “prosecution history shows the Examiner understood the step of producing micro- and nano-bubbles was not inherent to any structure being recited.” *Id.* at 3.

Patent Owner also argues that Petitioner waived reliance on the prosecution history, noting that when “addressing Element 13(c),” Petitioner “never cited the evidence it now seeks to rely on (*e.g.*, Ex. 1102, 196, 198),” instead “pointing to *other parts* of the Petition and by including a misleading parenthetical.” *Id.* at 4–5 (citing Paper 66, 9 n.3 (citing “Pet. at 22, 37–38, 68”)).

Finally, Patent Owner argues that Petitioner has not met its burden of proof to show “that any combination of parameters falling within the other parameters of claim 13 will *necessarily* result in” the affirmatively claimed step of “producing . . . oxygen microbubbles and nanobubbles.” *Id.* at 5.

With the *Tennant* decision and the parties’ arguments in mind, we discuss the issues on remand below.

G. Asserted Anticipation of Claims 13, 18–23, and 25 by Wikey (Ground 1)

1. Arguments

Petitioner argues that Wikey anticipates claims 13, 18–23, and 25. Pet. 19–38; Reply 5–12. Patent Owner argues that Wikey does not anticipate. PO Resp. 18–32; Sur-Reply 1–15.

With respect to claim 13, Petitioner asserts that every element of claim 13 is found in Wikey, as follows:

[pre] A method for producing an oxygenated aqueous composition comprising (Pet. 22; *id.* at 19–29 (summarizing Wikey’s method of

producing “a suspension comprising microbubbles and nanobubbles in the water”));¹⁸

[13a] flowing water at a flow rate no greater than 12 gallons per minute through an electrolysis emitter (Pet. 30 (relying on Ex. 1112, 3:10–11; Ex. 1103 ¶¶ 32, 61, 68, 69));

[13b] comprising an electrical power source electrically connected to an anode electrode and a cathode electrode contained in a tubular housing, causing electricity to flow from the power source to the electrodes, and (Pet. 30–31 (relying on Ex. 1112, 2:22–24, 2:1–11, 3:1–8, Fig. 3; Ex. 1103 ¶¶ 29–30));

[13c] producing the composition comprising a suspension comprising oxygen microbubbles and nanobubbles in the water, the microbubbles and nanobubbles having a bubble diameter of less than 50 microns (Pet. 31–32 (relying on Ex. 1112, 2:39–41, 2:47–52, 3:18–21; Ex. 1103 ¶¶ 34–35, 61, 68));

[13d] wherein: the anode electrode is separated at a critical distance from the cathode such that the critical distance is from 0.005 inches to 0.140 inches (Pet. 32 (relying on Ex. 1112, 2:39–41; Ex. 1103 ¶ 34));

[13e] the power source produces a voltage no greater than about 28.3 volts and an amperage no greater than about 13 amps, (Pet. 32 (relying on Ex. 1112, 1:40–43, 2:39–41, 2:44–46));

[13f] the tubular housing has an inlet and an outlet and a tubular flow axis from the inlet to the outlet (Pet. 33 (relying on Ex. 1112, 3:10–18, Fig. 3));

¹⁸ We express no opinion on whether the preamble is limiting.

[13g] the water flows in the inlet, out the outlet, is in fluid connection with the electrodes (Pet. 33 (relying on Ex. 1112, 2:42–44; Ex. 1103 ¶ 31));

[13h] and the water flowing into the inlet has a conductivity produced by the presence of dissolved solids such that the water supports plant or animal life (Pet. 33–34 (relying on Ex. 1112, 3:38–39; Ex. 1103 ¶ 36)).

Petitioner presents additional arguments that Wikey anticipates claims 18–23 and 25. Pet. 34–38.

2. *Analysis*

As noted in our Institution Decision, Wikey appears to disclose each limitation of claim 13 except “microbubbles and nanobubbles having a bubble diameter of less than 50 microns.” Dec. 24–25; Pet. 30–34. Petitioner argues that Wikey’s apparatus “forms a ‘plethora of oxygen bubbles’ that are ‘extremely small.’” Pet. 31 (citing Ex. 1112, 2:47–52, 3:18–21). Petitioner also argues that the ’415 patent “admits that the claimed critical distance creates microbubbles and nanobubbles” and the “Wikey emitter has the same configuration as claim 13 and therefore produces the same result.” *Id.* at 31–32 (citing Ex. 1101, Abstract; Ex. 1103 ¶¶ 35, 61, 68). Petitioner reconstructed the Wikey apparatus using information provided in Wikey as to physical characteristics, i.e. “electrode spacing of 0.016 inches and a voltage of 6 volts,” and amperage “depending on the size of the electrode plates and the conductivity of the water” that can be “in the order of ½ amp.” *Id.* at 21–22; Ex. 1112, 2:39–46; Ex. 1103 ¶¶ 33, 49, 56, 61, 68. Petitioner also relied on Wikey’s guidance on electrode plate size in relation to amperage and conductivity of the water, namely, “8 circular electrode plates having a 2-inch diameter” in its reconstructed apparatus. Ex. 1103 ¶ 42.

Although we indicated in our Institution Decision that Petitioner need not test every possible iteration and parameter of a reference to make a successful inherent anticipation case (Dec. 25 (citing *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1376 (Fed. Cir. 2005))), Petitioner nevertheless must demonstrate either express or inherent anticipation.

In our Final Written Decision, we indicated that Petitioner has accounted for most of the limitations of claim 13 in Wikey, but disclosure of microbubbles and nanobubbles was lacking. Final Dec. 40. We found, and we maintain, that Petitioner’s arguments for the express creation of microbubbles and nanobubbles, on the record developed during trial, were not persuasive, as discussed below. *Id.* We further evaluate, as instructed in *Tennant*, Petitioner’s arguments for the inherent creation of microbubbles and nanobubbles.

a. Express Creation of Microbubbles and Nanobubbles

Patent Owner argues that Wikey does not expressly teach the creation of microbubbles or nanobubbles, and is not directed to the formation of microbubbles or nanobubbles. PO Resp. 19. We agree with Patent Owner that Wikey does not expressly disclose microbubbles or nanobubbles, and that the Petition “does not even contend that Wikey expressly discloses that its device creates microbubbles or nanobubbles.” *Id.* (citing Pet. 31–32); *compare* Tr. 14:14–23 (Petitioner stating “Wikey does explicitly disclose the presence of the nanobubbles and microbubbles”), *with id.* at 35:8–17 (Patent Owner characterizing this as “a new argument on appeal” (citing Pet. 31)).

b. Inherent Creation of Microbubbles or Nanobubbles

Patent Owner argues that Petitioner has “failed to prove that Wikey inherently yields microbubbles or nanobubbles,” taking issue with

Petitioner's two main arguments regarding this limitation, which are based on (i) a statement in the abstract of the '415 patent about "critical distance" and (ii) testing of an alleged reproduction of the Wikey reference. PO Resp. 19–20.

i. Abstract's "Critical Distance"

Patent Owner argues that microbubbles and nanobubbles are not inherently created by the electrode gap, i.e., critical distance, disclosed by Wikey. PO Resp. 19–22. More particularly, Patent Owner takes issue with Petitioner's reliance on the '415 patent abstract, which provides that when "the anode and cathode are separated by a critical distance, very small microbubbles and nanobubbles of oxygen are generated." *Id.* at 20; Ex. 1101, code (57). This statement, according to Patent Owner, does not mean that the "electrode gap is the only thing that is relevant to creation of microbubbles and nanobubbles"; instead, one of ordinary skill in the art "would understand while reading it that many things other than spacing of the electrodes are going to have an effect on the bubble size created using devices described in the patent." *Id.* at 21 (citing Ex. 2172, 24:6–31:5; Ex. 2116 ¶¶ 41–43; quoting Ex. 2172, 30:20–31:5 (Dr. Tremblay's testimony)). Patent Owner argues that the '415 patent defines "critical distance" as a "functional distance" that can range from 0.005 inches to 0.140 inches, and that distance is one of a number of interdependent variables in the electrolysis process. *Id.* at 21–22; *see also* Ex. 1102, 169, 196 (prosecution history); Ex. 2116 ¶¶ 45–48.

Petitioner replies that "Petitioner met its *prima facie* burden of showing that Wikey inherently created the claimed 'microbubbles' and 'nanobubbles.'" Reply 6 (citing Dec. 22–25). Petitioner also replies that

claim 13 specifies voltage, current, and flow rate limits that, combined with the critical distance, create microbubbles and nanobubbles, and that Wikey teaches values for each of these variables falling within the claimed ranges. *Id.* at 7. Petitioner also replies that Wikey teaches creating small bubbles of oxygen that do not break the surface tension of the water. *Id.* (citing Ex. 1112, 2:49–5, 13:21–27).

Patent Owner criticizes as improper Petitioner’s argument that the “Board’s decision to institute shifted the burden to Patent Owner to prove Wikey . . . did not inherently create nanobubbles.” Sur-Reply 3 (citing *Fan Duel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1341–42 (Fed. Cir. 2020)). Ultimately, Patent Owner argues, Petitioner did not make a *prima facie* showing that the prior art references create nanobubbles. *Id.* at 5.

We disagree that our Institution Decision established a *prima facie* case that Petitioner met its burden at the Final Written Decision stage. An affirmative decision on institution is a determination that Petitioner has shown, on the record existing at that stage in the proceeding, that Petitioner has a reasonable likelihood of prevailing on its arguments as to at least one challenged claim. Dec. 40; 35 U.S.C. § 314(a). To prevail in an instituted *inter partes* review, however, 35 U.S.C. § 316(e) requires Petitioner to meet “the burden of proving a proposition of unpatentability by a preponderance of the evidence.” See *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (“[T]here is a significant difference between a petitioner’s burden to establish a ‘reasonable likelihood of success’ at institution, and actually proving invalidity by a preponderance of the evidence at trial The Board’s findings in its Final Written Decision were thus not inconsistent with those in its Institution Decision; they were made under a qualitatively

different standard.”). To state that our Institution Decision established a *prima facie* case that Petitioner was correct would be erroneous, as such a position conflates different burdens imposed upon Petitioner and, in doing so, would have us improperly give Petitioner an advantage in the actual trial culminating in a final written decision. *Fan Duel*, 966 F.3d at 1341–42.

We agree with Patent Owner that the ’415 patent itself does not necessarily equate a certain critical distance of electrodes with the formation of nanobubbles or microbubbles, to the exclusion of all other variables. PO Resp. 19–22. As acknowledged by Dr. Tremblay, one of ordinary skill in the art would have understood that many other factors align to create an apparatus, such as the one in the ’415 patent, that generates microbubbles and nanobubbles. Ex. 2172, 30:20–31:5. Although Petitioner’s citation to the ’415 patent abstract is not incorrect (Pet. 31–32), we interpret this portion of the specification in context to conclude that Patent Owner does not “admit” inherency of microbubbles or nanobubbles by this statement.

ii. Testing

Patent Owner argues that Petitioner “never even assessed whether Wikey creates nanobubbles,” and Petitioner’s testing “did not provide any evidence indicating that nanobubbles were produced” by the alleged reproduction of Wikey’s apparatus. PO Resp. 22–27. According to Patent Owner, “Petitioner’s expert testified that [nanobubbles] have a diameter on the order of 0.1 microns” (Sur-Reply 2) but his declaration “states only that testing identified bubbles of 9 microns or larger, and never states that testing identified nanobubbles.” PO Resp. 23–24 (citing Ex. 2172, 69:11–70:4 (Dr. Tremblay stating that the size of a bubble that doesn’t break the surface tension of water is “[r]oughly 100 nanometers”); Ex. 1103 ¶¶ 61, 64–68,

125–127, 131–133, 148–150, 154–156); Sur-Reply 3; *see also* Ex. 2117 ¶ 71 (Patent Owner’s expert testifying that a bubble “having a diameter less than that necessary to break the surface tension of water” is much smaller than 1 micron (citing Ex. 2193)). Patent Owner contends that Petitioner has demonstrated its ability to test for the presence of nanobubbles, citing Petitioner’s own promotional material in which it provided nanobubble-sized testing to its customers (PO Resp. 24–25 (citing Ex. 2195; Ex. 2172, 68:7–69:6; Ex. 2116 ¶¶ 69–78); Sur-Reply 2–3 (citing Ex. 2195; Ex. 2177, 128:19–129:10)), but that for this proceeding Petitioner “chose instead to use equipment with resolution down to only 5 microns,” i.e., equipment not sensitive enough to detect nanobubbles. Sur-Reply 3 (citing Ex. 2172, 69:7–10, 70:1–4, 114:13–117:17, 129:18–25).

Petitioner replies that its tests were conducted appropriately using the same testing and evidence Patent Owner presented in the specification to support the claims. Reply 8 (citing Ex. 1101, 5:50–52). Petitioner also argues that the ’415 patent states in Table III that the apparatus causes water to become “milky, indicating supersaturation” (Ex. 1101, 9:38–50), and also that nanobubbles “remain suspended in the water, giving the water an opalescent or milky appearance” (Ex. 1101, 4:14–15). Reply 9. Thus, Petitioner argues, the patent’s lexicography “equates ‘miliness’ with both nanobubbles and supersaturation,” implying that the miliness indicates both the presence of nanobubbles and supersaturation. *Id.*

Patent Owner responds that Petitioner erroneously relies on Example 2, which “specifically states it did not measure nanobubbles.” Sur-Reply 5 (citing Ex. 1101, 5:62–6:2). Patent Owner also responds that Table III of the ’415 patent does not prove the existence of nanobubbles; the

specification only says “milkeness is indicative of supersaturation,” but does not suggest the converse, i.e., that dissolved oxygen content over 100% proves that the water is milky or contains nanobubbles. *Id.* at 6–7 (quoting Ex. 2172, 76:9–14 (Dr. Tremblay agreeing that dissolved oxygen does not indicate bubbles in the water or say anything about the size of the bubbles); citing Ex. 2172, 77:23–78:21). Patent Owner also challenges Petitioner’s argument that “the specification admits that as long as the other parameters of claim 13 and 18 are met nanobubble creation is inherent” is incorrect because neither “of those claims existed when the specification was filed, so the specification did not suggest those parameters inherently created microbubbles and nanobubbles.” Sur-Reply 7–8.

On this complete record, we find that Petitioner’s testing does not sufficiently demonstrate that Wikey inherently discloses nanobubbles. Pet. 22–29. Petitioner apparently had the ability to test for the presence of nanobubbles when using its Wikey-based apparatus, but did not do so. Sur-Reply 2–3. Patent Owner points out that nanobubbles, which Petitioner’s expert indicated were on the order of 0.1 microns, are detectable using available technology that Petitioner knew of and had used in the past. *Id.* However, Petitioner’s expert acknowledged that he did not do any testing that would determine whether nanobubbles were formed. *Id.* at 7 (citing Ex. 2172, 70:1–4).

Petitioner’s reliance on milkeness and supersaturation to demonstrate the presence of nanobubbles is also unsupported. Petitioner argues that milky appearance equals supersaturation (Reply 9 (citing Ex. 1101, 9:38–50)), and also that milky appearance equals nanobubbles (*id.* (citing Ex. 1101, 4:14–15)); the inference Petitioner apparently wants us to draw is

that supersaturation equals nanobubbles. Patent Owner, however, persuasively argues that dissolved oxygen content over 100% does not prove the water is milky. PO Resp. 25–26; Sur-Reply 6–7; *see also* Tr. 13:24–26 (Petitioner’s counsel agreeing that “you can have supersaturation without milkiness”). Patent Owner also demonstrates that supersaturation does not necessarily mean that nanobubbles are present. PO Resp. 26; Sur-Reply 7; Ex. 2172, 76:9–14, 77:23–78:21. Thus, Petitioner’s argument based on supersaturation equaling nanobubbles because milkiness equals both breaks down because milkiness does not necessarily equal either.

Accordingly, we determine that Petitioner’s arguments and testing fail to show that Wikey inherently discloses nanobubbles.

iii. Wikey Parameters and Petitioner’s Experiment

Patent Owner also argues that Petitioner’s device and parameters “are not disclosed by Wikey,” and that this shortcoming impacts the results in such a way that Petitioner cannot show that Wikey yields microbubbles, let alone nanobubbles. PO Resp. 27. More particularly, Patent Owner argues that in Petitioner’s purported reproduction of the Wikey device, Petitioner changed the orientation of the electrodes disclosed by Wikey from horizontal to vertical, which poses a problem because vertical orientation of electrodes allows bubbles to rise more uniformly with less collision, whereas horizontal orientation of electrodes likely causes more collision of bubbles and slower travel of bubbles, and, therefore, formation of larger bubbles. *Id.* at 27–28. Thus, according to Patent Owner, “horizontally disposed plates can be expected to create larger bubbles than vertically disposed plates,” and Petitioner’s test results using its reproduction of the Wikey device “failed to show what size bubbles Wikey inherently creates.” *Id.* at 28. Patent Owner

also argues that Petitioner used an incorrect electrode size and current, and Petitioner’s “multiple times wider” electrodes and “ten times higher” amperage both “impact bubble size” and “fail to show that the formation of micro- and nanobubbles is inherent to Wikey.” *Id.* at 28–30.

Petitioner replies that, despite Patent Owner’s notion that rotating the electrodes could cause the bubbles to coalesce into larger bubbles, “[m]ere speculation cannot rebut Petitioner’s *prima facie* showing that the bubbles produced by the Wikey device inherently include ‘microbubbles’ and ‘nanobubbles.’” Reply 10. Petitioner also argues that one of ordinary skill in the art would not expect Wikey’s “schematic” Figure 2 and 3 illustrations to require a particular orientation of electrodes, or a particular size of electrodes. *Id.* at 10–11.

Patent Owner argues that it is not “mere speculation” that the orientation of the electrodes would affect bubble size, as demonstrated by Clark (Ex. 1106, 8:53–63), which “teaches that the electrode arrangement affects bubble size by changing how bubbles collide with each other.” Sur-Reply 12 (citing PO Resp. 27–28; Ex. 2172, 29:14–22 (Dr. Tremblay testifying that orientation of electrodes can affect bubble size)).

Having reviewed the evidence and argument about this aspect of Petitioner’s reproduction of Wikey, we are unpersuaded that Petitioner’s reproduction follows Wikey’s template. Wikey depicts its electrodes in operation as oriented in a particular fashion, namely, horizontally. Ex. 1112, Figs. 2–3. Patent Owner demonstrates that the orientation of the electrodes plays a role in the creation of bubbles. PO Resp. 27–28; Sur-Reply 10–13. Petitioner’s declarant agreed that electrodes with a different orientation, such as the vertical orientation tested by Petitioner, could alter the outcome

regarding the creation of nanobubbles. Ex. 2172, 29:14–22. Without demonstrating that its reproduction follows the guidance of Wikey, Petitioner cannot successfully argue that the results achieved by its reproduction demonstrate that the production of nanobubbles in Wikey is “inherent.”

For the foregoing reasons, we determined in our Final Written Decision that Petitioner had not sufficiently shown that Wikey discloses the microbubbles and nanobubbles limitation of claim 13, either expressly or inherently and, as such, had not sufficiently shown that claim 13 is anticipated by Wikey. Below, in accordance with the Federal Circuit’s mandate, we revisit whether Wikey inherently produces nanobubbles and microbubbles.

iv. Tennant Opinion

In *Tennant*, the Federal Circuit stated: “Because the Board failed to address Tennant’s argument that Wikey and Davies disclosed all the parameters of the ’415 and therefore inherently produce microbubbles and nanobubbles, we vacate and remand.” *Tennant*, 11.

As noted by the Federal Circuit, Petitioner on appeal contended that Wikey “met all of the limitations of independent claim 13 as they relate to the parameters of the device—i.e., the voltage used, the amperage used, the shape of the housing the inlet, the outlet, the fluid flow, and even the ‘critical distance.’” *Id.* at 7. Petitioner further contended on appeal that “when all claimed parameters are present—as in Wikey—microbubbles and nanobubbles are inherently formed.” *Id.* at 7–8 (citing *In re King*, 801 F.2d at 1326). The Federal Circuit stated that Petitioner “made this same argument to the Board in its IPR petition” (*id.* at 8 (citing J.A. 121–22, 24–

25 (Final Decision’s summary of Petitioner’s argument on reply having to do with “critical distance”)), 112) and that Petitioner’s expert testified to the same (citing J.A. 528, 559). The Federal Circuit stated that “the Board did not address this argument, finding only that Wikey’s and Davies’ disclosure of the ‘critical distance’ was insufficient to inherently disclose production of nanobubbles.” *Id.* at 8–9.

The Federal Circuit relies on “the prosecution history where OWT represented that microbubbles and nanobubbles were inherently produced when the claimed parameters of the ’415 patent were followed,” pointing in particular to “[n]ew claim 55, which, as amended, became claim 13 in the [’415] patent.” *Tennant*, 9. New claim 55, discussed in *Tennant*, provided in part that “the combination of the critical distance, the voltage, amperage and the water conductivity results in the formation of a suspension comprising oxygen nanobubbles in the water.” *Id.* (quoting Ex. 1102, 190). *Tennant* notes that this quoted language from claim 55 was ultimately deleted before issuing as claim 13, “but there was no suggestion that the change was substantive.” *Id.* at 9 n.2 (citing Ex. 1102, 167, 140–141, 136–153). According to *Tennant*, Patent Owner’s contention on appeal that “parameters other than those found in the claim limitations affect[] the production of microbubbles and nanobubbles” “appears to contradict [Patent Owner’s] representations made during prosecution of the ’415 patent.” *Id.* at 7 n.1.

As set forth in this footnote (*Tennant*, 7 n.1), the Federal Circuit expressed concern with Patent Owner’s representations during prosecution appearing to be inconsistent with Patent Owner’s representations on appeal. As noted, however, new claim 55 was amended several times before issuing

as claim 13. *Tennant*, 9; Ex. 1102, 43–44, 141. As-issued claim 13, and intervening amended claims 55, each contain limitations different than those in the originally presented “new” claim 55 (“New Claim 55”), which recites:

55. (New) A method for producing an oxygenated aqueous composition comprising:
 flowing water through an electrolysis emitter system comprising:
 a power source, an anode electrode and a cathode electrode[]
 contained in a tubular housing, wherein:
 the anode electrode is separated at a critical distance from the cathode electrode by a nonconductive spacer maintaining the separation of the electrodes such that the critical distance is from 0.005 inches to 0.140 inches;
 the power source is in electrical communication with the electrodes, produces a voltage of a maximum of about 28.3 volts and a maximum amperage of about 13 amps,
 the tubular housing has an inlet and an outlet and a tubular flow axis from the inlet to the outlet;
 the water flows in the inlet, out the outlet, is in fluid connection with the electrodes, has a conductivity produced by a maximum of about 2000 ppm total dissolved solids;
 the combination of the critical distance, the voltage, amperage and the water conductivity results in the formation of a suspension comprising oxygen nanobubbles in the water, the nanobubbles having a bubble diameter of less than 0.0006 inches and the nanobubbles being incapable of breaking the surface tension of the water so that the suspension remains at least in part for a period of up to several hours.

Ex. 1102, 190 (underlining indicating that the entire claim is new). In connection with the “new claim[]” proposed, Patent Owner argued during prosecution that “the water and microbubbles/nanobubbles of oxygen suspended in the water are positively recited features of a system, a method and a suspension.” *Id.* at 196. Patent Owner relied on this newly proposed

language in New Claim 55 to argue, in addition, that “the voltage, amperage, the separation of the electrode spacing, and the total solids in the water signifying viscosity and conductivity of the water, which can be summed by the phrase tap water, are positively recited features of this system. These features achieve the suspension of nanobubbles in water.” *Id.*

Significantly, however, Patent Owner introduced further amendments to New Claim 55 during prosecution as reproduced below (“Currently Amended Claim 55”) (underlining indicating additions; strikethroughs and bracketing indicating deletions):

55. (Currently Amended) A method for producing an oxygenated aqueous composition comprising:

flowing water at a maximum flow rate of 12 gallons per minute through an electrolysis emitter ~~system~~ comprising an electrical power source electrically connected to an anode electrode and a cathode electrode contained in a tubular housing,

causing electricity to flow from the power source to the electrodes, and,

producing the composition comprising a suspension comprising oxygen microbubbles and nanobubbles in the water, the microbubbles and nanobubbles having a bubble diameter of less than 50 microns and the microbubbles and nanobubbles being incapable of breaking the surface tension of the water, wherein:

the anode electrode is separated at a critical distance from the cathode ~~electrode by a nonconductive spacer maintaining the separation of the electrodes~~ such that the critical distance is from 0.005 inches to 0.140 inches;

the power source is ~~in electrical communication with the electrodes,~~ produces a voltage of a maximum of about 28.3 volts and a maximum amperage of about 13 amps,

the tubular housing has an inlet and an outlet and a tubular flow axis from the inlet to the outlet;

the water flows in the inlet, out the outlet, is in fluid connection with the electrodes, has a conductivity produced by [a maximum of about 2000 ppm total] the presence of dissolved solids such that the water supports plant or animal life

~~the combination of the critical distance, the voltage, the amperage and water conductivity results in the formation of a suspension comprising oxygen nanobubbles in the water, the nanobubbles having a bubble diameter of less than 0.0006 inches and the nanobubbles being incapable of breaking the surface tension of the tap water so that the suspension remains at least in part for a period of up to several hours.~~

Ex. 1102, 140–141. In Patent Owner’s Amendment and Response dated May 13, 2014, Patent Owner presented a “Once Amended” version of Claim 55, which appears to be a clean version of the Currently Amended Claim 55 without strikethroughs and bracketing. *Id.* at 92, 93–94 (“Once Amended Claim 55”). Another “Currently Amended” version of Claim 55 was presented in a Supplemental Amendment and Response dated July 18, 2014 (“Second Currently Amended Claim 55”), deleting the limitation “and the microbubbles and nanobubbles being incapable of breaking the surface tension of the water” as well as adding phrases “concerning maxima” that “are understood to include all values up to the maxima.” *Id.* at 76–77, 79. Yet another “Currently Amended” version of Claim 55 was presented in a Second Supplemental Amendment and Response dated September 17, 2014 (“Third Currently Amended Claim 55”), clarifying the language of claim 55 by “correcting a typo” and “further characterizing the recited range of flow rate, amperage and voltage.” *Id.* at 65–66, 69.

In a Second Substitute Supplemental Amendment and Response “submitted in place of the Substitute Supplemental Amendment” on October 20, 2014, Patent Owner presented new claim 13. Ex. 1102, 42–44. The record does not appear to contain a version of claim 13 including bracketing, underlining, and strikethroughs showing the changes between claim 13 and any of the versions of claim 55; claim 13 was introduced as “New” in this Second Substitute Supplemental Amendment and Response. *Id.* at 42 (“this Second Substitute Supplemental Amendment does NOT present these claims with bracketing of cancelled words and underlining of new words relative to those same claims previously presented”). Patent Owner characterized claim 13 as follows:

In regard to the text of claim 13 and new claims 24-27, Applicant states the following.

Applicant has adopted certain language of main claim 13 to further characterize the recited range of flow rate, amperage and voltage. The limitations relating to maximums of flow rate, amperage, and voltage have been clarified using the words “no greater than.” A device used in the method need not be capable of operating at the maximum but rather may be operated at a value less than or equal to the recited values. The phrase “the water flowing into the inlet” has been adopted to indicate that the water flowing into the inlet meets the conductivity recitation.

Id. at 46–47.

The sections of claim 55 reproduced in *Tennant* were from New Claim 55. *Tennant*, 9 (quoting Ex. 1102, 196). *Tennant* focuses its discussion on New Claim 55 and Patent Owner’s arguments made in connection therewith. *Id.* at 9–10 (citing Ex. 1102, 196, 198).

We note and discuss, below, the several changes in claim 55 between the “New” version and the “Currently Amended” version (and ultimately, after Once Amended Claim 55, Second Currently Amended Claim 55, and Third Currently Amended Claim 55, the as-issued claim 13). *Compare* Ex. 1102, 190, *with* Ex. 1102, 140–141, 43.

First, Currently Amended Claim 55 (and claim 13) deletes the language discussed in *Tennant*. *Tennant*, 9; Ex. 1102, 141. As Patent Owner points out, “the claims that were pending when these comments (the ones cited in [*Tennant*]) were made, were ***different*** than claim 13 as issued.” PO Br. Rem. 11. We agree that New Claim 55 “was materially amended prior to becoming claim 13.” *Id.* (citing Ex. 1102, 140–141, 76, 65–66). “Significantly, the list of parameters changed. Some were removed and different ones were added.” *Id.* Patent Owner further notes that a “material difference between claim 13 and the claim pending when the comments were made is that [New Claim 55] included the language ‘*the combination of the critical distance, the voltage, amperage and the water conductivity results in the formation of a suspension comprising oxygen nanobubbles in the water...*’ Ex. 1102, 190 (emphasis added).” *Id.* at 12. “This language was subsequently deleted prior to issuing as claim 13. Ex. 1102, 141.” *Id.* These changes—notably, the deletion of the language relied on in *Tennant*—render discussion of that language no longer on all fours with the language and comments associated with Currently Amended Claim 55, the further-amended versions of claim 55, and as-issued claim 13. In connection with the allowance of Currently Amended Claim 55, the Examiner’s comments merely state that Currently Amended Claim 55 “would be allowable if applicant’s reply complies with all formal requirements.” Ex. 1102, 110. In

the “Allowable Subject Matter” section of the Notice of Allowability for Currently Amended Claim 55, the Examiner states:

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not disclose the method step of placing the emitting device in the fluid to be treated. The prior art discloses flowing the fluid through the device using a pipe system.

The prior art does not suggest nor fairly disclose wherein the housing has a side arm positioned at an angle relative to the tubular flow axis and the electrodes are located in the side arm.

Id. Following the introduction of claim 13 (Ex. 1102, 43), the Examiner stated in the “Allowable Subject Matter” section of the Notice of Allowability for claim 13:

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not disclose nor fairly suggest the method for producing oxygenated aqueous composition comprising the combination of the critical distance between the cathode and anode of .0005-0.140, the voltage maximum of about 28.3 volts, and 13 or less amperage with a maximum of 12 gallons per minute such that it results in the formation of a suspension comprising oxygen microbubbles and nanobubbles in the water, the nanobubbles having a bubble diameter of less than 50 microns.

Id. at 25. The Examiner’s statements regarding allowance of Currently Amended Claim 55 and claim 13 do not appear to import any findings from the New Claim 55 analysis and, given the changes between Currently Amended Claim 55 and claim 13 on the one hand, and New Claim 55 on the other hand, we do not read the Examiner’s comments about New Claim 55 as necessarily applicable to the limitations of Currently Amended Claim 55 or claim 13.

Second, the “2000 ppm” limitation, present in New Claim 55, no longer exists in Currently Amended Claim 55, the other amended versions of claim 55, or as-issued claim 13. Patent Owner argues that “when the remarks quoted [in *Tennant*] were made, the list of parameters in [New Claim 55] included a limitation that the water at the inlet has ‘a maximum of about 2000 ppm total dissolved solids.’” PO Br. Rem. 11 (citing Ex. 1102, 190; Ex. 2157 ¶¶ 32, 37–38 (electrolyte composition affects electrolysis); Ex. 2116 ¶¶ 34–36; Ex. 2172, 30:5–16). Patent Owner’s deletion of the “2000 ppm” limitation (i.e., removal of the bracketed phrase from “conductivity produced by [a maximum of about 2000 ppm total] dissolved solids”) omits one of the pillars of the immediately subsequent, relied-upon language “the combination of the critical distance, the voltage, amperage **and water conductivity** results in the formation of a suspension comprising oxygen nanobubbles in the water” (emphasis added). The “2000 ppm” limitation that was deleted during prosecution was, ultimately, replaced with a *broader* limitation allowing for “a conductivity produced by the presence of dissolved solids such that the water supports plant or animal life.” Ex. 1102, 43.¹⁹ The Petition itself recognizes the relationship between the concentration of dissolved solids in water and its conductivity. Pet. 20 n.3 (“It was well known . . . that water that contains more dissolved solids is more conductive.”). And as alleged by Patent Owner and supported by credible testimony: “It is undisputed that the level of dissolved solids

¹⁹ Record evidence in this proceeding establishes that dissolved solids can exceed 2000 ppm and still “support plant or animal life.” See Ex. 2157 ¶ 41 (“Many animals begin to have negative health effects at approximately 3000 ppm total dissolved solids.”).

(electrolytes) is material to the formation of bubbles.” PO Br. Rem. 11–12 (citing Ex. 2157 ¶¶ 32, 37–38; Ex. 2116 ¶¶ 34–36; Ex. 2172, 30:5–16).

Because as-issued claim 13 allows for a broader range of water conductivities than those that would be realized with the maximum of 2000 ppm dissolved solids recited in New Claim 55, Patent Owner’s comments pertaining to New Claim 55 can no longer be applied with full force and effect to Currently Amended Claim 55, the intervening versions of claim 55, or as-issued claim 13.

Third, Currently Amended Claim 55 adds the limitation “flowing water at a maximum flow rate of 12 gallons per minute.” Ex. 1102, 140. As noted by Patent Owner, New Claim 55 “as it existed at the time of the comments during prosecution did not include a ‘flow rate’ limitation—this limitation was later added prior to claim 13 issuing. *Compare* Ex-1102, 190 *with* Ex-1102, 140–141.” PO Br. Rem. 12. The specific flow rate in Currently Amended Claim 55, as an enumerated limitation expressed in terms of gallons per minute, is not present in New Claim 55. However, because Currently Amended Claim 55 introduced a specific flow rate while simultaneously deleting the language “the combination of the critical distance, the voltage, amperage and the water conductivity results in the formation of a suspension comprising oxygen nanobubbles in the water,” arguments based on the language from New Claim 55 cannot necessarily apply to Currently Amended Claim 55 (or the intervening versions of claim 55, or as-issued claim 13). In a similar vein, Currently Amended Claim 55 removed language providing for a “nonconductive spacer maintaining the separation of the electrodes.” Ex. 1102, 141. In the prosecution history, Patent Owner indicated that the “separation of the electrodes within a certain

range is a factor for production of the micro bubbles and nano bubbles. While use of a nonconductive spacer is one way to achieve this separation, the separation can be achieved in other routine ways,” and Patent Owner moved the “nonconductive spacer” limitation into dependent claims. *Id.* at 150–151. The removal of such a limitation also changes the overall claim language and does not permit automatically porting over arguments presented in relation to New Claim 55 to Currently Amended Claim 55, other versions of claim 55, or as-issued claim 13. Without further clarity in the record regarding the possible effects of this “spacer” change on the language having to do with nanobubbles, it is not clear that we can apply arguments from New Claim 55 to Currently Amended Claim 55, to other versions of claim 55, or to as-issued claim 13.

The net effect of these multiple changes throughout the evolution of the claim language from introduction to issuance is that the subject matter of issued claim 13, and also Currently Amended Claim 55 and other versions of claim 55, differs considerably from the New Claim 55 originally proposed by Patent Owner. These differences, identified above, cabin Patent Owner’s relied-upon statements during prosecution to the claim language and limitations associated with New Claim 55, and these limited statements cannot necessarily be carried over to Currently Amended Claim 55, other versions of claim 55, or as-issued claim 13.

Accordingly, although we are mindful of the potential judicial estoppel effect of statements made by a patent owner during prosecution, the circumstances of the evolution of New Claim 55 through to as-issued claim 13 leads us to the conclusion that judicial estoppel does not apply here. Judicial estoppel “prevents a party from prevailing in one phase of a

case on an argument and then relying on a contradictory argument to prevail in another phase.” *New Hampshire*, 532 U.S. at 749. The factors to consider in determining whether judicial estoppel applies are: (1) a party’s later position must be “clearly inconsistent” with its earlier position; (2) whether the party has succeeded in persuading a tribunal to accept the party’s earlier position; and (3) whether the party would derive an unfair advantage if not estopped. *Id.* at 750–51.

Regarding the first factor, Patent Owner argues that its position during prosecution was not “clearly” or “entirely,” or even at all, inconsistent with its position during trial. PO Br. Rem 8. As noted above, New Claim 55 “was materially amended prior to becoming claim 13,” and notably, the language of New Claim 55 to which *Tennant* points “was subsequently deleted prior to issuing as claim 13.” *Id.* at 11–12. We agree that the multiple, significant amendments along the path from proposal of New Claim 55 to issuance of claim 13 provide “yet another reason why the remarks made earlier in prosecution are not inconsistent (and certainly not ‘clearly’ or ‘entirely’ inconsistent) with Patent Owner’s current position as to claim 13 as issued.” *Id.* at 13.

Regarding the second factor, Patent Owner argues that the Examiner’s “reasons for allowance demonstrate that the examiner ***did not*** find that nanobubbles were inherently produced by any emitter operating within the parameter ranges recited in claim 13.” *Id.* at 13–14 (citing Ex. 1102, 25). Patent Owner points to various positions adopted by the Examiner during prosecution, indicating that the Examiner “ultimately did not adopt the position that the claimed parameters ‘automatically’ produce nanobubbles.” *Id.* at 13–15 (citing Ex. 1102, 106–107, 217, 222, 169). Patent Owner

argues that, because it “cannot be said to have benefited,” this is a “further reason why judicial estoppel does not apply.” *Id.* at 15. We agree that the changes from New Claim 55 through to issued claim 13 do not support a finding that Patent Owner benefitted from the comments made early in the prosecution, particularly because claim 13 omits the language about which those comments were made and contains numerous changes from the earlier iteration to which those comments applied.

Regarding the third factor, we are not persuaded that Patent Owner would derive an unfair advantage if not estopped. We note that Patent Owner’s arguments with respect to New Claim 55 did not, ultimately, result in issuance of New Claim 55. Rather, claim 13 issued after multiple additional changes that altered its scope considerably from that of New Claim 55, on which the cited arguments were predicated. Accordingly, we discern no unfair advantage to Patent Owner here.

Thus, although judicial estoppel in general prohibits Patent Owner from turning its back on earlier successful statements in prosecution, that is not the case here. Patent Owner is not contradicting its statements in connection with New Claim 55; rather, Patent Owner’s multiple amendments to New Claim 55 mean that the landscape of the claim language changed before issuing as claim 13 and, with it, the nature of Patent Owner’s representations as to the earlier claim language that ultimately did not end up in as-issued claim 13.

The mandate from the Federal Circuit instructed us to evaluate Petitioner’s inherency argument. *Tennant*, 11. Accordingly, and in view of our determinations as to Patent Owner’s representations during prosecution, we are not persuaded that the ’415 patent admits the inherency of

microbubbles or nanobubbles when operating under the parameters of issued claim 13. Because the '415 patent does not admit the inherency of microbubbles or nanobubbles when operating under the parameters of issued claim 13, Petitioner would have to show the inherency of Wikey's microbubbles and nanobubbles in some other manner than merely demonstrating that Wikey meets every other limitation of claim 13. Petitioner has not done so.

Accordingly, and in line with our previous determination that “Wikey appears to disclose each limitation of claim 13 except ‘microbubbles and nanobubbles having a bubble diameter of less than 50 microns’” (Final Dec. 20), we determine that Petitioner has not demonstrated that Wikey inherently discloses microbubbles or nanobubbles. Accordingly, Petitioner has not demonstrated that Wikey discloses every limitation of claim 13.

v. Dependent Claims

Every dependent claim challenged under Petitioner's Ground 1 includes the microbubbles and nanobubbles limitation of claim 13, and, accordingly, Petitioner does not make its case as to these dependent claims. None of Petitioner's arguments as to anticipation of the dependent claims by Wikey rectifies the microbubble and nanobubble deficiency. We analyze the parties' separate arguments for the dependent claims, below.

Regarding claim 18, which requires that “the water has a temperature no greater than about ambient temperature at the inlet and the water temperature is a factor for formation of the suspension,” Petitioner argues that “water temperature is a factor in Wikey.” Pet. 34. Patent Owner argues that Wikey does not teach a method that uses water temperature as a factor in forming the suspension. PO Resp. 30–31. Petitioner replies that “Wikey

uses the ‘ambient temperature’ of the water the same way the ’415 patent does – it performs electrolysis in unheated water that has fish swimming in it.” Reply 11. Patent Owner responds that this claim does not require that water temperature be “measured,” but does require that water temperature be “used,” and that Wikey is silent regarding “use” of water temperature. Sur-Reply 14. For this claim, Petitioner has still failed to show that microbubbles or nanobubbles are present, and Petitioner’s argument that Wikey “performs electrolysis in unheated water” fails to explain how Wikey meets the claim 18 limitation that “water temperature is a factor for formation of the suspension.”

Regarding claim 21, Petitioner argues that because “Wikey produces microbubbles and nanobubbles,” it “produces a suspension comprising microbubbles and nanobubbles that supersaturate the water.” Pet. 36–37. Patent Owner argues that Wikey does not teach that the bubbles supersaturate the water. PO Resp. 31–32. Petitioner replies that “it is inherent that continuing to run the Wikey apparatus will result in a sufficient accumulation of bubbles to ‘supersaturate’ the water” because the ’415 patent teaches that the claimed microbubbles and nanobubbles remain in suspension for long periods of time. Reply 12 (citing Ex. 1101, Abstract, 4:27–38; Ex. 1103 ¶ 35). Patent Owner responds that this is a new argument, and that there is “no evidence that Wikey’s apparatus inherently works fast enough, or long enough, to supersaturate Wikey’s aquariums.” Sur-Reply 15. We agree that new arguments on reply are not appropriate, and Petitioner has not demonstrated sufficiently that Wikey inherently creates microbubbles or nanobubbles, let alone that Wikey’s device would

run fast enough or long enough to supersaturate the water with microbubbles or nanobubbles.

Regarding claim 25, Petitioner argues that “Wikey’s microbubbles and nanobubbles are incapable of breaking the surface tension of the water, as admitted” during prosecution of the ’415 patent and in the ’415 patent itself. Pet. 38. Patent Owner argues that Wikey does not teach the creation of bubbles that are substantially incapable of breaking the surface tension of the water. PO Resp. 32. More particularly, Patent Owner argues that Petitioner did not test for bubbles with this property, and that Petitioner’s bubbles appeared to disappear almost immediately. *Id.* (citing PO Resp. §§ IV.A, V.B.2.b.i, V.B.2.b.ii). Petitioner replies that Wikey teaches that “water containing the oxygen bubbles passes back down through the tube 47” which means the bubbles do not break the surface tension and leave the water. Reply 12 (citing Ex. 1112, 2:49–5, 13:21–27). This argument is linked to our analysis of whether Wikey discloses microbubbles and nanobubbles, above, which we determine it does not. We also agree with Patent Owner that a lack of testing for this property, together with results that apparently disprove the existence of this property, undermine Petitioner’s arguments regarding this claim.

On the complete record now before us, we determine that Petitioner has not sufficiently shown that Wikey discloses all the limitations of the claims challenged under Ground 1 (i.e., claims 13, 18–23, 25) and thus has not established by a preponderance of the evidence that claims 13, 18–23, and 25 are unpatentable as anticipated by Wikey.

*H. Asserted Obviousness Based on Wikey and Other References
(Grounds 2–6)*

Petitioner asserts the following obviousness challenges based on Wikey:

- Ground 2: claims 13, 18–23, and 25 over Wikey and AFD (Pet. 39–40);
- Ground 3: claims 13, 18–23, and 25 over Wikey and AFD and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 40–44);
- Ground 4: claims 26 and 27 over Wikey and Clark (Pet. 44–46);
- Ground 5: claims 26 and 27 over Wikey, Clark, and AFD (Pet. 47); and
- Ground 6: claims 26 and 27 over Wikey, Clark, and AFD and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 47).

For Ground 2, Petitioner contends that one of ordinary skill in the art would have been motivated to combine Wikey and AFD because they both relate to “aerating or increasing the oxygen content of water in an aquarium to support plant and animal life” and, based on their “disclosure of similar structures and components to achieve similar goals,” one of ordinary skill in the art would have “understood that the teachings of AFD are applicable to Wikey.” Pet. 39–40. For Ground 3, Petitioner relies on Wendt, Han, Glembotsky, and Burns to illustrate the principle that “water electrolysis

produces oxygen bubbles smaller than 50 microns that have the claimed properties.” *Id.* at 43. For Ground 4, Petitioner argues that one of ordinary skill in the art would have been “motivated, and found it obvious, to combine” Wikey and Clark, because they both address the same field and disclose similar structures. *Id.* at 45–46. Petitioner refers back to its rationales for Grounds 2 and 4 for Ground 5, and its rationale for Grounds 3 and 5 in Ground 6. *Id.* at 47.

Patent Owner argues that “Petitioner’s obviousness arguments all fail because Petitioner does not articulate any motivations in support of the proposed obviousness combinations,” and more particularly, “Petitioner does not identify any reason a POSA would have been motivated to modify the prior art to produce microbubbles or nanobubbles.” PO Resp. 53. Patent Owner also argues that Petitioner fails to explain why or how one of ordinary skill in the art would modify Wikey, and “does not even attempt to suggest a POSA would have had a reasonable expectation that the modification would have achieved that objective.” *Id.* at 55. Patent Owner argues that the Reply presents new arguments, and:

Even with Petitioner’s new arguments, Petitioner’s obviousness grounds remain deficient for at least four general reasons. First, the Petition did not identify any motivation to make the identified combination. Second, the Petition did not explain how the secondary references would be combined with the primary reference. Third, the petition did not explain why a POSA would have had a reasonable expectation of success in making the relevant combination. Finally, many of the Petitioner’s alleged combinations do not even attempt to resolve the primary references’ failure to meet certain claim elements.

Sur-Reply 22–23.

As we noted in our Institution Decision, we were skeptical that Petitioner’s reason to combine arguments were sufficient on the record at that point in the proceeding, under the reasonable likelihood standard. Dec. 27–28. On the complete record, and after remand, we find that Petitioner’s arguments are still insufficient to establish obviousness under the heightened preponderance of the evidence standard for a final written decision. *See TriVascular*, 812 F.3d at 1068. It is still unclear, based on Petitioner’s proffered reasoning, which portions of the cited secondary references would be combined with Wikey, how they would be combined with Wikey, and whether one of ordinary skill in the art would have had a reasonable expectation of success combining them with Wikey. This applies to each of the claims identified in each of Grounds 2–6. Moreover, all of the obviousness combinations proposed by Petitioner in Grounds 2–6 inherit the microbubbles and nanobubbles problem of Ground 1. Pet. 39–47.

These concerns are not resolved by the Reply, in which the arguments appear to be new (*see, e.g.*, Reply 13–14 (citing Ex. 1103 ¶¶ 70–71, 182); *see also Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1330–31 (Fed. Cir. 2019)), or insufficient in the same manner the Petition’s obviousness arguments were insufficient (*see, e.g.*, Reply 14–15 (citing Ex. 1103 ¶¶ 36, 73–76, 182–186)). Additionally, even if we were to evaluate Petitioner’s Reply argument on the merits, we agree with Patent Owner’s positions, as explained further below. *See* PO Resp. 53–59; Sur-Reply 22–27.

In Ground 2, for example, Patent Owner argues that the Petition “does not suggest AFD would motivate a POSA to add a pump or any other means to create flow outside of the flow already created by Wikey’s electrolysis

module.” PO Resp. 55. In its Reply, Petitioner reiterates that Wikey and AFD are in the same field, and AFD “teaches the use of a filtration system to help aerate the water by producing flow and bubbles.” Reply 13. Also in its Reply, Petitioner provides additional reasons to combine, i.e., “a POSITA would have understood that combining a pump or filter with Wikey would yield additional water flow and filtration” and “[c]ombining the Wikey emitter with a conventional pump or mechanical filter of AFD to boost and regulate flow would allow a smaller pump, which would be quieter, more efficient, and ensure the desired aeration/filtration.” *Id.* at 13–14. Petitioner states that this combination “uses Wikey for its intended purpose and goals, demonstrating a clear expectation of success.” *Id.* at 14. Patent Owner responds that the “Board should ignore this brand new argument” because “the Petition did not make this argument.” Sur-Reply 25. We agree with Patent Owner. The arguments made on Reply were not properly presented in the first instance in the Petition. Pet. 39–40. Our concerns about the arguments in the Petition are not resolved by the Reply’s either new or insufficient arguments. Reply 13–14. Additionally, even if we were to evaluate Petitioner’s Reply argument on the merits, we agree with Patent Owner that, contrary to Petitioner’s Reply argument that the combined system could use a “smaller pump,” Wikey states that it seeks to avoid traditional pumps and “provide an aerating and circulating pump with no moving parts.” Sur-Reply 26 (citing Ex. 1112, 1:37–40; Ex. 2116 ¶ 120).

In Ground 3, Petitioner relies on Wendt, Han, Glembotsky, and Burns (together, the “Treatises”) to illustrate the principle that “water electrolysis produces oxygen bubbles smaller than 50 microns that have the claimed properties.” Pet. 43. Patent Owner argues that in this combination, even “as

to bubble size, Petitioner fails to identify any motivation to modify Wikey in view of the additional art” and “does not explain what changes the references would have motivated a POSA to make.” PO Resp. 56.

Petitioner replies that the Treatises are “cited to show how a POSITA would have understood Wikey,” namely, that “water electrolysis systems produce ‘microbubbles’ and ‘nanobubbles’ smaller than 50 microns,” and to show that “it would have been obvious to use Wikey’s apparatus to produce the claimed ‘microbubbles’ and ‘nanobubbles.’” Reply 15–16. Patent Owner reiterates that “Petitioner did not suggest modifying Wikey based on the Treatises to add the step of producing oxygen microbubbles and nanobubbles.” Sur-Reply 26. We agree, and for similar reasons to those identified in connection with Ground 2, above, find Petitioner’s arguments on reply to be either new or insufficient in the same manner as the arguments in the Petition. Even if we were to consider the merits of the Reply argument, the Reply fails to provide a reason why one of ordinary skill in the art would modify Wikey based on the Treatises to add the step of producing microbubbles and nanobubbles. It is not enough that a skilled artisan could have done so; it is necessary that they would have been motivated to do so, and that is lacking here. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (“[O]bviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.”).

In Ground 4, Patent Owner argues that (1) Petitioner does not explain why a POSITA would be motivated to modify Wikey; (2) Clark teaches away from the formation of nanobubbles and is designed to produce bubbles

that are no less than 100 microns; (3) Petitioner never considers how exchanging the Wikey electrodes with Clark's peripheral electrodes would affect Wikey's outcome; and (4) both references are from the 1970s. PO Resp. 57–60. Petitioner argues on Reply that one of ordinary skill in the art “would have found it helpful to look to the teachings of Wikey and Clark in combination to understand how to deliver increased oxygen to fish,” and “would have been motivated to replace Wikey's flat electrodes with Clark's electrode arrangement, which Clark teaches creates smaller, more uniform bubbles.” Reply 14–15. For similar reasons to those identified in connection with Grounds 2 and 3, above, we find Petitioner's arguments on reply to be either new or insufficient in the same manner as the arguments in the Petition. Even if we were to consider the merits of the Reply argument, it fails to provide a persuasive reason why one of ordinary skill in the art would modify Wikey's electrodes based on Clark's electrodes.

Ground 5 shares the same issues as Grounds 2 and 4, and Ground 6 shares the same issues as Grounds 3 and 5. Pet. 47. In sum, Petitioner does not persuade us, by a preponderance of the evidence, that claims 13, 18–23, and 25–27 of the '415 patent would have been obvious on any of the bases articulated in Grounds 2–6.

I. Asserted Anticipation of Claims 13, 14, 17–23, and 25 by Davies (Ground 7)

1. Arguments

Petitioner argues that claims 13, 14, 17–23, and 25 are anticipated by Davies. Pet. 47–69, Reply 16–22. Patent Owner argues that Davies does not anticipate. PO Resp. 32–52, Sur-Reply 1–8, 15–22.

With respect to claim 13, Petitioner asserts that every element of claim 13 is found in Davies, as follows:

[pre] A method for producing an oxygenated aqueous composition comprising (Pet. 47–61);

[13a] flowing water at a flow rate no greater than 12 gallons per minute through an electrolysis emitter (Pet. 62 (relying on Ex. 1105, 5:33–36));

[13b] comprising an electrical power source electrically connected to an anode electrode and a cathode electrode contained in a tubular housing, causing electricity to flow from the power source to the electrodes, and (Pet. 62 (relying on Ex. 1105, 2:58–68, 4:5–10, 4:26–30));

[13c] producing the composition comprising a suspension comprising oxygen microbubbles and nanobubbles in the water, the microbubbles and nanobubbles having a bubble diameter of less than 50 microns (Pet. 62–63 (relying on Ex. 1102, 107; Ex. 1103 ¶¶ 91, 106, 111–157));

[13d] wherein: the anode electrode is separated at a critical distance from the cathode such that the critical distance is from 0.005 inches to 0.140 inches (Pet. 63 (relying on Ex. 1105, 3:43–48; Ex. 1103 ¶¶ 84, 100));

[13e] the power source produces a voltage no greater than about 28.3 volts and an amperage no greater than about 13 amps (Pet. 63 (relying on Ex. 1105, 5:65–68, 9:59–65; Ex. 1103 ¶¶ 124, 127, 130, 132, 147, 150, 153, 156));

[13f] the tubular housing has an inlet and an outlet and a tubular flow axis from the inlet to the outlet (Pet. 64 (relying on Ex. 1105, 2:60–63, Fig. 11; Ex. 1103 ¶ 87));

[13g] the water flows in the inlet, out the outlet, is in fluid connection with the electrodes (Pet. 64 (relying on Ex. 1105, Figs. 2, 11; Ex. 1103 ¶¶ 87, 102));

[13h] and the water flowing into the inlet has a conductivity produced by the presence of dissolved solids such that the water supports plant or animal life (Pet. 64–65 (relying on Ex. 1105, 5:7–11, 5:22–27; Ex. 1103 ¶¶ 89, 104)).

To show how Davies allegedly discloses every limitation of claim 13, Petitioner relied on reconstruction and testing of (1) a serpentine embodiment and (2) a straight-through embodiment as those were purportedly disclosed by Davies. Pet. 47–69.

Petitioner also argues that Davies anticipates claims 14, 17–23, and 25. Pet. 65–69.

2. *Analysis*

As we noted in our Institution Decision, Davies does not appear to explicitly disclose the “microbubbles and nanobubbles having a bubble diameter of less than 50 microns” limitation of claim 13. Dec. 35–36; Pet. 62–63. Petitioner argues that the ’415 patent “admits that the claimed critical distance creates microbubbles and nanobubbles” and because “Davies has the same configuration, Davies is ‘capable of providing the same results.’” Pet. 62 (citing Ex. 1101, Abstract; Ex. 1103 ¶¶ 91, 106).

Patent Owner argues that Davies has a “serpentine” embodiment and a “straight through” embodiment. PO Resp. 32–33. In the serpentine embodiment, Patent Owner argues that Davies does not: (a) disclose the claimed electrode gap between 0.005 and 0.140 inches; (b) teach an amperage no greater than about 13 amps; (c) expressly teach microbubbles

and nanobubbles; and (d) inherently yield microbubbles and nanobubbles. *Id.* at 33–46. In the straight-through embodiment, Patent Owner argues that Davies does not: (a) teach a flow rate of less than 12 gallons per minute; (b) disclose the claimed electrode gap between 0.005 and 0.140 inches, an amperage no greater than about 13 amps, or creating microbubbles and nanobubbles; (c) inherently yield microbubbles and nanobubbles; and (d) factor water temperature into the process. *Id.* at 46–49.

Regarding microbubbles and nanobubbles, Patent Owner argues that “Petitioner does not even argue that Davies teaches the creation of microbubbles or nanobubbles,” but “instead relies on inherency to meet this claim element.” PO Resp. 38. Regarding the serpentine embodiment, Patent Owner argues that (i) the creation of microbubbles and nanobubbles would frustrate Davis’s purpose; (ii) as argued in connection with Ground 1, the ’415 patent does not “admit” that microbubbles and nanobubbles are invariably produced; (iii) also as argued in connection with Ground 1, Petitioner did not test for nanobubbles; (iv) Petitioner’s testing “chose a combination of values to arrive at a device and operation that is never described by Davies,” without providing any rationales for selecting those variables; and (v) Petitioner’s testing failed to provide a control that disclosed how many bubbles were in the water before the water entered the reproduced device, so there is “no reason to conclude” the “serpentine embodiment created any bubbles at all”; it is possible the bubbles were “simply present in the water before it ever went into the apparatus,” or “the result of the water splashing from the apparatus.” *Id.* at 39–46. Patent Owner also argues that the straight-through embodiment does not inherently create microbubbles and nanobubbles for the same reasons as the serpentine

embodiment, and that Petitioner used the wrong flow rate for the straight-through embodiment, which “error in flow rate would have had a significant effect on the production of bubbles.” *Id.* at 47–49 (citing Ex. 2172, 108:15–21 (Dr. Tremblay acknowledging that the reduced flow rate used in the straight-through embodiment was inconsistent with the teachings of Davies)).

Petitioner replies that (i) microbubbles and nanobubbles are inherent “regardless of whether Davies was ‘focused’ on them”; (ii) its Ground 1 arguments regarding admissions apply; (iii) its Ground 1 arguments regarding testing apply; (iv) its earlier arguments regarding ranges for electrode dimensions apply, in that the physical size of electrodes is a predictable art; and (v) there is no discussion of a “control” photograph in the ’415 patent specification. Reply 18–19.

Patent Owner responds that, despite the Response outlining “reasons why Davies—which is not designed to make bubbles at all—does not inherently create microbubbles, much less nanobubbles,” Petitioner’s Reply “did not resolve these issues.” Sur-Reply 18–19. Patent Owner first argues that even if Dr. White acknowledged that Davies’s electrolysis would create oxygen and hydrogen, this does not mean it would create bubbles rather than dissolved oxygen, let alone microbubbles or nanobubbles. *Id.* at 19 (citing Ex. 1147, 194:16–197:22, 50:17–51:3). Second, Patent Owner argues that Petitioner’s argument about the predictability of the physical size of electrodes is irrelevant to anticipation. *Id.* at 19–20 (citing *Galderma Labs., L.P. v. Teva Pharms. USA, Inc.*, 799 Fed. Appx. 838, 846 (Fed. Cir. 2020) for the proposition that inherency was not shown because the expert admitted that variations in formula parameters can affect the results). Third,

Patent Owner argues that Petitioner’s argument about the ’415 patent lacking a control is inapposite, because Petitioner must compare the prior art to the claims, not the specification. *Id.* at 20.

On this complete record, we find that Davies does not inherently disclose microbubbles or nanobubbles as required by independent claim 13. As discussed above in connection with Ground 1, we are not persuaded that the ’415 patent “admits” to production of microbubbles and nanobubbles when the electrodes are separated by a critical distance. *See supra* Section II.G.2. As such, Petitioner’s arguments regarding the separation distance of Davies’s electrodes are insufficient to show that Davies discloses production of microbubbles or nanobubbles. *See, e.g.*, Pet. 63. Also as discussed above in connection with Ground 1 and the inherent anticipation argument before us on remand, we determined that the ’415 patent does not admit the inherency of microbubbles or nanobubbles when operating under the parameters of issued claim 13. *See supra* Section II.G.2. Additionally, although Petitioner argues that the “Board has already concluded that Wikey and Davies independently teach each physical parameter of claim 13” (Pet. Br. Rem. 1–2 (citing Inst. Dec. 40–41 as to Davies)), this does not correctly characterize our determination as to Davies. Unlike in the Wikey-based anticipation ground, in which we found that “Wikey appears to disclose each limitation of claim 13 except ‘microbubbles and nanobubbles having a bubble diameter of less than 50 microns’” (Final Dec. 22 (citing Inst. Dec. 24–25)), in the Davies-based anticipation ground discussion, we simply noted that “Davies does not appear to explicitly disclose the ‘microbubbles and nanobubbles having a bubble diameter of less than 50 microns’ limitation,” without concluding that Davies disclosed each limitation of

claim 13. Final Dec. 40–41. We note, also, that Petitioner argued on appeal that “when all claimed parameters are present—as in Wikey—microbubbles and nanobubbles are inherently formed,” but this statement did not extend this particular argument to Davies. *Tennant*, 7–8. This, along with the remainder of our Final Decision findings with respect to Davies, indicated that not only were nanobubbles not disclosed by Davies, but other features of claim 13 were also potentially inadequately disclosed in Davies; ultimately, Petitioner’s arguments do not lead to Petitioner prevailing on its Davies-based anticipation ground. *Id.* at 40–44.

Having reviewed the record with respect to the amperage limitation of claim 13, we find it unclear whether Davies discloses the claimed amperage required by claim 13, i.e., no greater than about 13 amps, in either the serpentine or the straight-through embodiment. PO Resp. 36–38. As noted by Patent Owner, Davies does not provide any teachings about the amperages at which its devices should be operated. *Id.* at 36. Although we determined the inference of amperage to be sufficient for institution (Inst. Dec. 35), on this full record, Petitioner’s testing does not demonstrate inherent anticipation of the 13 amp limitation. PO Resp. 36–38. The majority of Petitioner’s Davies reproductions, not disclosed in the Petition, involved currents above 13 amps. *Id.* (citing Ex. 2172, 91:4–94:20 (showing currents above 13 amps); Ex. 2179, 9, 17 (showing currents of 20.7 to 34 amps)); *see also* Sur-Reply 17–18. We agree with Patent Owner that this confirms that Davies does not *inherently* have an amperage no greater than about 13 amps. *Transclean Corp. v. Bridgewood Servs.*, 290 F.3d 1364, 1373 (Fed. Cir. 2002). Inherency “may not be established by probabilities or possibilities,” and the “mere fact that a certain thing *may* result from a given

set of circumstances is not sufficient.” *Cont’l Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268–1269 (Fed. Cir. 1991) (the “evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference”); *MEHL/Biophile*, 192 F.3d at 1365. Because the 13 amp limitation is not necessarily present in Davies, Petitioner fails to meet this aspect of the anticipation inquiry.

Moreover, having reviewed the record with respect to the selection of particular values from among the various ranges in Davies, we find it unlikely that Petitioner’s picking and choosing of values from among Davies’s various ranges constitutes anticipation for either the serpentine or the straight-through embodiment. PO Resp. 41–45. To anticipate, a prior art reference must disclose more than “multiple, distinct teachings that the artisan might somehow combine to achieve the claimed invention.” *Net MoneyIN*, 545 F.3d at 1371; *see also In re Arkley*, 455 F.2d 586, 587 (CCPA 1972) (“The [prior art] reference must clearly and unequivocally disclose the claimed [invention] or direct those skilled in the art to the [invention] without *any* need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference.”). Given the “picking-and-choosing” activity in Petitioner’s reproductions, we are persuaded that Petitioner and Dr. Tremblay impermissibly combined various or undisclosed parameters in presenting their argument that Davies anticipates claim 13.

Also, as noted in the Final Decision, we are not persuaded that the straight-through embodiment experiments were conducted at the appropriate flow rate, for the reasons given by Patent Owner. PO Resp. 48–49; Sur-Reply 20–21. Thus, because Davies does not expressly disclose any flow

rate for the straight-through embodiment, and the parties' declarants agree that "Davies suggests a higher flow rate for the straight-through embodiment than the serpentine embodiment" (Sur-Reply 21 (citing Ex. 2116 ¶¶ 65–66)), this "prevents the straight-through embodiment from anticipating claim 13." *Id.*

Thus, in addition to determining that inherency does not apply, we also determine that other parameters of claim 13 are not shown to be present or anticipated by Davies. Moreover, as we stated in our Final Written Decision regarding testing the device constructed according the parameters set forth in Davies, Petitioner apparently had the ability to test directly for nanobubbles in both the serpentine and straight-through Davies-based testing devices, but did not do so. *See supra* Section II.E.2.b.ii; Sur-Reply 2–3. Patent Owner points out that nanobubbles, which Petitioner's expert indicated were on the order of 0.1 microns, are detectable using available technology that Petitioner knew of and had used in the past. Sur-Reply 2–3. However, Petitioner's expert acknowledged that he did not do any testing that would determine whether nanobubbles were formed. Sur-Reply 7 (citing Ex. 2172, 70:1–4). We agree with Patent Owner that the lack of a control disclosing how many bubbles were in the water before it entered the Davies reproductions makes it "impossible to know whether any of the detected particles by either device were created by the 'reproduction' or exited beforehand." PO Resp. 45.

Every dependent claim challenged under Petitioner's Ground 7 includes the microbubbles and nanobubbles limitation of claim 13, and, accordingly, Petitioner does not make its case as to these dependent claims. *RCA Corp. v. Applied Digital Data Sys., Inc.*, 730 F.2d 1440, 1446 (Fed.

Cir. 1984) (holding that, if prior art does not anticipate an independent claim, it cannot anticipate an associated dependent claim). None of Petitioner's arguments as to anticipation of the dependent claims by Davies rectifies the deficiencies identified above. We analyze the parties' separate arguments for the dependent claims, below.

Regarding claim 18, Petitioner argues that as "with any electrolytic water treatment process, water temperature is a factor in the electrolytic process of Davies." Pet. 66. Patent Owner argues that "Davies does not otherwise teach any steps to account for or modify the operation based on water temperature," apart from disclosing that the straight-through embodiment is used in pools and hot tubs. PO Resp. 49. Petitioner replies that Davies uses the "ambient temperature" of the water in "the same way the '415 patent does – it treats unheated water that has fish swimming in it." Reply 20. Patent Owner argues that "Petitioner's argument on this claim fails for the same reason as it did for Wikey." Sur-Reply 21. For this claim, Petitioner has still failed to show that microbubbles or nanobubbles are present, and Petitioner's argument that Davies "treats unheated water" fails to explain how Davies meets the claim 18 limitation that "water temperature is a factor for formation of the suspension."

Regarding claim 21, Petitioner argues that because "Davies produces microbubbles and nanobubbles," it "produces a suspension comprising microbubbles and nanobubbles that supersaturate the water." Pet. 68. Patent Owner refers to its Wikey/Ground 1 arguments that Petitioner has failed to show that the Davies necessarily supersaturates the water. PO Resp. 49. Petitioner replies that "supersaturation is an inherent result of producing 'microbubbles' and 'nanobubbles' for an extended period of time

because they remain suspended in the water” and testing indicates that the Davies embodiments made the water milky. Reply 20–21 (citing Ex. 1101, Abstract, 4:27–38; Ex. 1103 ¶ 35). Patent Owner responds that the “milky” argument is new and should be ignored and is based entirely on attorney argument about two images. Sur-Reply 21–22. We agree that Petitioner’s ‘milky’ argument is an inappropriate new argument on reply, and we determine that Petitioner’s Reply is unclear about how to interpret the images absent additional testimony.

Regarding claim 22, Petitioner argues that “Davies’ microbubbles and nanobubbles have a diameter less than 0.0006 inches, as admitted” during prosecution of the ’415 patent and in the ’415 patent itself. Pet. 68–69. Patent Owner argues that neither embodiment of Davies teaches bubbles having a diameter less than 0.0006 inches (~15 microns), referring to its earlier arguments that Davies does not create bubbles less than 50 microns. PO Resp. 50–52. Petitioner replies that this dimension is an “inherent result” of an electrolysis emitter with the preferred parameters, and that Petitioner’s testing “confirms that this limitation is met in the prior art at least to the same extent the ’415 patent discloses it.” Reply 21–22. This argument is linked to our analysis of whether Davies discloses microbubbles or nanobubbles, above, which we determine it does not, as well as our determination that Davies’s device does not have all the parameters that might produce microbubbles or nanobubbles.

Regarding claim 25, Petitioner argues that “Davies’ microbubbles and nanobubbles are incapable of breaking the surface tension of the water, as admitted” during prosecution of the ’415 patent and in the ’415 patent itself. Pet. 69. Patent Owner argues that Petitioner has not shown that the bubbles

created by Davies are substantially incapable of breaking the surface tension of the water, referring to its earlier arguments that Petitioner did not test for bubbles with this property, and that Petitioner's bubbles appeared to disappear almost immediately. PO Resp. 52 (citing PO Resp. §§ V.B.5, V.B.2.b.ii). Petitioner replies that this element "is inherently present in the prior art." Reply 22 (citing Ex. 2179, 9, 17). This argument is linked to our analysis of whether Davies discloses that microbubbles or nanobubbles are necessarily formed, above, which we determine it does not, as well as our determination that Davies's device does not have all the parameters that might produce microbubbles or nanobubbles. We also agree with Patent Owner that a lack of testing for this property, together with results that apparently disprove the existence of this property, undermine Petitioner's arguments regarding this claim.

Thus, for the foregoing reasons, Petitioner does not persuade us, by a preponderance of the evidence, that claims 13, 14, and 17–23, and 25 of the '415 patent are unpatentable as anticipated by Davies.

J. Asserted Obviousness Based on Davies and Other References (Grounds 8–24)

Petitioner asserts the following obviousness challenges based on Davies:

- Ground 8: claims 13, 14, 17–23, and 25 over Davies and Hough (Pet. 70–71);
- Ground 9: claims 13, 14, 17–23, and 25 over Davies and Erickson (Pet. 72–74);
- Ground 10: claims 13, 14, 17–23, and 25 over Davies, Erickson, and Hough (Pet. 74);

- Ground 11: claims 13, 14, 17–23, and 25 over Davies and Erickson and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 74–75);
- Ground 12: claims 13, 14, 17–23, and 25 over Davies, Erickson, and Hough and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 75);
- Ground 13: claim 24 over Davies and Schoeberl (Pet. 75–77);
- Ground 14: claim 24 over Davies, Schoeberl, and Hough (Pet. 77–78);
- Ground 15: claim 24 over Davies, Erickson, and Schoeberl (Pet. 78);
- Ground 16: claim 24 over Davies, Erickson, Schoeberl, and Hough (Pet. 78);
- Ground 17: claim 24 over Davies, Erickson, and Schoeberl and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 78–79);
- Ground 18: claim 24 over Davies, Erickson, Schoeberl, and Hough and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 79);

- Ground 19: claims 26 and 27 over Davies and Peters (Pet. 79–81);
- Ground 20: claims 26 and 27 over Davies, Peters, and Hough (Pet. 82);
- Ground 21: claims 26 and 27 over Davies, Peters, and Erickson (Pet. 82);
- Ground 22: claims 26 and 27 over Davies, Peters, Erickson, and Hough (Pet. 82);
- Ground 23: claims 26 and 27 over Davies, Peters, and Erickson and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 83); and
- Ground 24: claims 26 and 27 over Davies, Peters, Erickson, and Hough and in view of the general knowledge, experience, and common sense of one of ordinary skill in the art, as reflected in Wendt, Han, Glembotsky, and Burns (Pet. 83).

For Ground 8, Petitioner argues that one of ordinary skill in the art would have been motivated to combine Davies and Hough because they both “address the same field” and, based on their “disclosure of similar structures and components to achieve similar goals,” one of ordinary skill in the art would have “been motivated, and found it obvious, to combine them.”

Pet. 71. For Ground 9, Petitioner argues that one of ordinary skill in the art would have been motivated to combine Davies and Erickson because they both “address the same field” and, based on their “disclosure of similar structures and components to achieve similar goals,” one of ordinary skill in

the art would have “understood that the systems are easily compatible, and would have found it obvious to combine them.” *Id.* at 73. For Ground 10, Petitioner relies on its Ground 8 and Ground 9 arguments. *Id.* at 74. For Ground 11, Petitioner relies on Wendt, Han, Glembotsky, and Burns to illustrate the principle that “water electrolysis produces those small oxygen bubbles” having “a size less than 50 microns.” *Id.* at 74–75. For Ground 12, Petitioner relies on its Ground 10 and Ground 11 arguments. *Id.* at 75. For Ground 13, Petitioner argues that “Davies and Schoeberl both disclose electrolysis cells for sterilizing water” and that one of ordinary skill in the art would have been “motivated, and found it obvious, to combine them” because they disclose “similar structures and components.” *Id.* at 76. Petitioner adds that it would have been obvious to provide the preferred electrode separation of Schoeberl to the flat sheet electrodes of Davies “to achieve an advantageous laminar flow between the electrodes.” *Id.* at 77. For Grounds 14 and 15, Petitioner refers back to its rationale for Ground 13; for Grounds 16 and 17, Petitioner refers back to its rationale for Ground 15; for Ground 18, Petitioner refers back to its rationale for Ground 16. *Id.* at 77–79. For Ground 19, Petitioner argues that one of ordinary skill in the art would have been motivated to combine Davies and Peters because they both “address the same field” and one of ordinary skill in the art would have “found it obvious to replace the flat sheet electrodes of Davies with concentric tubular electrodes like those taught by Peters.” *Id.* at 80–81. For Grounds 20 and 21, Petitioner refers back to its rationale for Ground 19. *Id.* at 82. For Grounds 22 and 23, Petitioner refers back to its rationale for Ground 21. *Id.* at 82–83. For Ground 24, Petitioner refers back to its rationale for Ground 22. *Id.* at 83.

Patent Owner argues generally that “Petitioner’s obviousness arguments all fail because Petitioner does not articulate any motivations in support of the proposed obviousness combinations,” and more particularly, “Petitioner does not identify any reason a POSA would have been motivated to modify the prior art to produce microbubbles or nanobubbles.” PO Resp. 53. Patent Owner also argues that Petitioner fails to explain why or how one of ordinary skill in the art would modify Davies, and “does not even attempt to suggest a POSA would have had a reasonable expectation that the modification would have achieved that objective.” *Id.* at 55. As noted above, Patent Owner argues that the Reply presents new arguments, and:

Even with Petitioner’s new arguments, Petitioner’s obviousness grounds remain deficient for at least four general reasons. First, the Petition did not identify any motivation to make the identified combination. Second, the Petition did not explain how the secondary references would be combined with the primary reference. Third, the petition did not explain why a POSA would have had a reasonable expectation of success in making the relevant combination. Finally, many of the Petitioner’s alleged combinations do not even attempt to resolve the primary references’ failure to meet certain claim elements.

Sur-Reply 22–23.

As we noted in our Institution Decision, we were skeptical that Petitioner’s reason to combine arguments were sufficient on the record at that point in the proceeding. Dec. 39. On the complete record, we find that Petitioner’s arguments are insufficient to establish obviousness under the heightened standard for a final written decision. *See TriVascular*, 812 F.3d at 1068. It is still unclear, based on Petitioner’s proffered reasoning, which portions of the cited secondary references would be combined with Davies,

how they would be combined with Davies, and whether one of ordinary skill in the art would have had a reasonable expectation of success combining them with Davies. This pertains to each of the claims identified in each of Grounds 8–24. Moreover, all of the obviousness combinations proposed by Petitioner in Grounds 8–24 inherit the microbubbles and nanobubbles problem of Ground 7.

These concerns are not resolved by the Reply, in which the arguments appear to be new (Reply 22–25; *see also Henny Penny*, 938 F.3d at 1330–31), or insufficient in the same manner the Petition’s obviousness arguments were insufficient (*see, e.g.*, Reply 23 (citing Ex. 1103 ¶¶ 80–100, 193)). Additionally, even if we were to evaluate Petitioner’s Reply arguments on the merits, we agree with Patent Owner’s positions, as explained further below. *See* PO Resp. 53–55, 59–64; Sur-Reply 22–25, 27–28.

In Ground 8, according to Patent Owner, Petitioner “does not even argue that Hough resolves the issues with Davies’ disclosure,” provides only conclusory arguments for the combination, and does not explain “what Hough would motivate a POSA to change about the design of Davies.” PO Resp. 59–60. Petitioner replies that it “cites Hough to show what a POSITA would have understood about Davies’s teachings, not to physically modify Davies.” Reply 22. Because “Petitioner did not cite Hough to ‘physically modify Davies,’” Patent Owner responds, the combination fails “at least because it doesn’t remedy any of the issues identified with respect to Ground 7.” Sur-Reply 27. We agree with Patent Owner that Ground 8 does not remedy the issues with Ground 7. Additionally, despite Petitioner’s argument that it cited Hough merely to show what a POSITA would have understood about Davies’s teachings, this is contrary to Petitioner’s original

statement that “a POSITA would have been motivated, and found it obvious to, combine” Davies and Hough “based on their disclosure of similar structures and components to achieve similar goals.” Pet. 71.

In Ground 9, Patent Owner argues that Petitioner fails to identify any motivation to combine, because (1) simply being directed to removing impurities from water does not give rise to a motivation to modify Davies; (2) Erickson suggests a voltage that barely overlaps with the highest voltage permitted by the claims; and (3) Petitioner fails to argue that Erickson resolves most of the deficiencies of Davies in Ground 7. PO Resp. 60–61, 61–62 (referring to Petitioner’s Ground 9 argument for Grounds 10–12). Petitioner does not respond directly to Patent Owner’s arguments for Grounds 9–12. Sur-Reply 27; *see generally* Reply. We agree with Patent Owner that Grounds 9–12 do not remedy the issues with Ground 7.

In Ground 13, Patent Owner argues that Petitioner fails to “identify any motivation” for the combination of Davies and Schoeberl, fails to explain why the distance between Schoeberl’s electrodes would help clarify water, and fails to account for Schoeberl’s focus on a “reduction in the formation of undesired gas bubbles.” PO Resp. 62–63 (citing Ex. 1108, 1:44–49); *see also id.* (arguing that Grounds 14–18, which cite Grounds 8, 9, 11, and 13, do not resolve the deficiencies in those grounds). Petitioner replies that Schoeberl’s electrode gap “would have motivated a POSITA to try the Schoeberl electrode gap in the Davies device, with a reasonable likelihood of success.” Reply 23 (citing Ex. 1103 ¶ 193). Patent Owner responds that Petitioner’s Reply did not dispute any of Patent Owner’s arguments. Sur-Reply 27. We do not see where the arguments made in the Reply regarding Ground 13 were properly presented in the first instance in

the Petition. Pet. 75–77. Our concerns about the arguments in the Petition are not resolved by the Reply’s either new or insufficient arguments.

Reply 23. Additionally, even if we were to evaluate Petitioner’s Reply argument on the merits, there is insufficient articulation of a reason to combine Davies with Schoeberl, or of reasonable expectation of success.

Sur-Reply 27.

In Ground 19, Patent Owner argues that Petitioner “does not argue Peters resolves Davies’ failures to meet the elements of claim 13 discussed in response to Ground 7” and that neither of these two references “are directed to creating oxygen bubbles in water.” PO Resp. 64. Patent Owner also argues that “Petitioner also does not explain why or how a POSA would modify the disclosure of Davies to use the electrode configuration of Peters while still maintaining the allegedly relevant disclosures from Davies.” *Id.*; *see also id.* (arguing that Grounds 20–24, which cite Grounds 8, 9, 11, and 19, do not resolve the deficiencies in those grounds). Petitioner replies that one of ordinary skill in the art would have “considered the general teachings regarding electrode designs of Peters to be applicable to an electrolysis cell for treating water such as the Davies cell” and the “express teachings of Peters thus would have motivated a POSITA to replace Davies’ electrodes with concentric tubular electrodes like those taught by Peters, with a reasonable likelihood of success.” Reply 24–25. Patent Owner responds that Peters “does not address any of Davies’s deficiencies with respect to claim 13” and “the Petition failed to address how or why a POSA would modify Davies to use the configuration of Peters while still maintaining the relevant disclosures from Davies.” Sur-Reply 28. We agree with Patent Owner that Grounds 19–24 do not remedy the issues with

Davies and claim 13. Additionally, although Petitioner presents arguments on reply that appear to recharacterize its Petition arguments, we find Petitioner's arguments on reply to be either new or insufficient in the same manner as the arguments in the Petition.

In sum, Petitioner does not persuade us that it has established, by a preponderance of the evidence, that claims 13, 14, and 17–27 of the '415 patent would have been obvious on any of the bases articulated in Grounds 8–24.

III. MOTION TO SEAL

Patent Owner moves to seal Exhibits 2116 (which is an unredacted version of Exhibit 2117), 2129, 2151–2156, 2176, 2177, 2179, 2182–2185, and “an unredacted version of its Patent Owner Response.” Paper 37. Patent Owner represents that these documents “include information Petitioner designated as confidential or filed under seal in the co-pending district court action. Pursuant to the amended protective order in that matter, Patent Owner was therefore required to move to seal these documents.” *Id.*

We previously entered the Protective Order proposed by the parties (Ex. 2113), which differed from the Board's standard protective order. Paper 20. We find Patent Owner's Motion to Seal persuasive. Accordingly, we grant Patent Owner's Motion to Seal.

IV. CONCLUSION

For the reasons discussed above, we determine Petitioner does not meet its burden of establishing, by a preponderance of the evidence, that the challenged claims are unpatentable, as summarized in the following table:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
13, 18–23, 25	102	Wikey		13, 18–23, 25
13, 18–23, 25	103	Wikey, AFD		13, 18–23, 25
13, 18–23, 25	103	Wikey, AFD, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, Burns		13, 18–23, 25
26, 27	103	Wikey, Clark		26, 27
26, 27	103	Wikey, Clark, AFD		26, 27

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
26, 27	103	Wikey, Clark, AFD, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, Burns		26, 27
13, 14, 17–23, 25	102	Davies		13, 14, 17–23, 25
13, 14, 17–23, 25	103	Davies, Hough		13, 14, 17–23, 25
13, 14, 17–23, 25	103	Davies, Erickson		13, 14, 17–23, 25
13, 14, 17–23, 25	103	Davies, Erickson, Hough		13, 14, 17–23, 25
13, 14, 17–23, 25	103	Davies, Erickson, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, Burns		13, 14, 17–23, 25

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
13, 14, 17– 23, 25	103	Davies, Erickson, Hough, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, Burns		13, 14, 17–23, 25
24	103	Davies, Schoeberl		24
24	103	Davies, Schoeberl, Hough		24
24	103	Davies, Erickson, Schoeberl		24
24	103	Davies, Erickson, Schoeberl, Hough		24

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
24	103	Davies, Erickson, Schoeberl, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns		24
24	103	Davies, Erickson, Schoeberl, Hough, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns		24
26, 27	103	Davies, Peters		26, 27
26, 27	103	Davies, Peters, Hough		26, 27
26, 27	103	Davies, Peters, Erickson		26, 27

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
26, 27	103	Davies, Peters, Erickson, Hough		26, 27
26, 27	103	Davies, Peters, Erickson, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns		26, 27
26, 27	103	Davies, Peters, Erickson, Hough, the general knowledge, experience, and common sense of a POSITA, as reflected in Wendt, Han, Glembotsky, and Burns		26, 27
Overall Outcome				13, 14, 17–27

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner does not establish, by a preponderance of the evidence, that claims 13, 14, and 17–27 of U.S. Patent No. RE45,415 E are unpatentable;

ORDERED that Patent Owner’s Motion to Seal is *granted*; and

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

IPR2021-00625
Patent RE45,415 E

FOR PETITIONER:

Robert Oakes
Martina Hufnal
FREDRIKSON & BYRON, P.A.
oakes@fr.com
hufnal@fr.com

FOR PATENT OWNER:

Derek Vandenburg
Aaron Pederson
Nathan Louwagie
CARLSON, CASPERS, VANDENBURGH, & LINDQUIST, P.A.
dvandenburg@carlsoncaspers.com
apederson@carlsoncaspers.com
nlouwagie@carlsoncaspers.com