

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SYRINIX, INC.,
Petitioner,

v.

BLACOH FLUID CONTROL, INC.,
Patent Owner.

Case IPR2018-00415
Patent 7,357,034 B1

Before SCOTT C. MOORE, CHRISTA P. ZADO, and
FREDERICK C. LANEY, *Administrative Patent Judges*.

LANEY, *Administrative Patent Judge*.

FINAL WRITTEN DECISION

Determining Claims 1–3, 5, 6, and 18
Unpatentable in *Inter Partes* Review
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

Granting-In-Part Patent Owner's Motion to Amend
35 U.S.C. § 316(d) and 37 C.F.R. § 42.121

Granting Patent Owner's Motion to Seal
37 C.F.R. §§ 42.14 and 42.54

I. INTRODUCTION

A. *Background*

Syrinix, Inc. (“Petitioner”) filed a Petition (Paper 1; “Pet.”) to institute an *inter partes* review of claims 1–18 of U.S. Patent No. 7,357,034 B1 (Ex. 1001; “the ’034 patent”) supported by a Declaration of Paul Lander, Ph.D., (Ex. 1002). Blacoh Fluid Control, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 6; “Prelim. Resp.”). Upon consideration of the Petition, the Preliminary Response, and the evidence cited by the parties, we determined that Petitioner established a reasonable likelihood that it would prevail with respect to at least one of the claims challenged in the Petition and instituted review to determine the patentability of the challenged claims on all grounds raised in the Petition. Paper 7, 1 (“Dec. Inst.”).

After institution, Patent Owner filed a Response to the Petition (Paper 20, “PO Resp.”) supported by Declarations of Dan Cenatempo (Ex. 2015), Loren Worthington (Ex. 2016), and Frank Smith (Ex. 2017). In addition, Patent Owner filed a Contingent Motion to Amend, seeking to replace claims 1–4, 7, 9, 17, and 18 with substitute claims 19–26 (Paper 18, “PO MTA”). Petitioner filed a Reply to Patent Owner’s Response (Paper 23, “Pet. Reply”) and an Opposition to the Motion to Amend (Paper 22, “Pet. Opp. MTA”), both supported by a second Declaration of Paul Lander (Ex. 1016). Patent Owner filed a Reply in support of its Motion to Amend (Paper 26, “PO Reply MTA”) and a Sur-Reply in support of its Response to the Petition (Paper 25, PO Sur-Reply Resp.”). Patent Owner also deposed Dr. Lander, and submitted the deposition transcript as evidence. Ex. 2018. Finally, Petitioner filed a Sur-Reply in support of its Petition responding to Patent Owner’s Sur-Reply (Paper 27, “Pet. Sur-Reply”).

An oral hearing was held on January 15, 2019, and the hearing transcript is included in the record. See Paper 31 (“Tr.”). We have jurisdiction under 35 U.S.C. § 6(b). This is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons set forth below, Petitioner has shown by a preponderance of evidence that claims 1–3, 5, and 18 of the ’034 patent are unpatentable. Petitioner has not shown claims 4 and 6–17 of the ’034 patent are unpatentable. Because Patent Owner’s Motion to Amend is contingent upon a finding of unpatentability with respect to the original claims, we reach proposed claims 19–21 and 26, which Patent Owner presents as substitutes for original claims 1–3 and 18. However, we do not reach proposed claims 22–25, which were offered as substitutes for claims 4, 7, 9, and 17.

B. Related Matters

Petitioner indicates that the ’034 patent is the subject of a lawsuit between Petitioner and Patent Owner in the U.S. District Court for the Northern District of California (Ex. 1007, *Blacoh Fluid Controls, Inc. v. Syrinix, Inc.*, No. 5:17-cv-04007-NC). Pet. 7. Additionally, the ’034 patent indicates that it is a divisional of the application that issued as U.S. Patent No. 7,219,553 B1 (“the ’553 patent”) (Ex. 1001, 1:3–6), which the parties indicate is also a subject of the above lawsuit and IPR2018-00414. *Id.* at 5–6.

C. References and Materials Relied Upon

Petitioner relies on the following references and materials in support of the asserted grounds of unpatentability:

References and Materials	Exhibit No.
U.S. Patent No. 4,908,775 (iss. Mar. 13, 1990) ("Palusamy")	1009
U.S. Patent No. 5,987,990 (iss. Nov. 23, 1999) ("Worthington")	1010
WO 01/51386 A1 (pub. July 19, 2001) ("ZIP")	1011
U.S. Patent No. 4,161,782 (iss. July 17, 1979) ("McCracken")	1012
U.S. Patent No. 5,708,195 (iss. Jan. 13, 1998) ("Kurusu")	1013
Declarations of Paul Lander	1002, 1016

D. Instituted Grounds of Unpatentability

We instituted review on the following asserted grounds of unpatentability:

Ground	Challenged Claim	Statutory Basis¹	Reference(s)
1	1–3, 5, 9, 10, and 18	35 U.S.C. § 102	Palusamy
2	4, 6–8, 11–15, and 17	35 U.S.C. § 103	Palusamy and Worthington
3	16	35 U.S.C. § 103	Palusamy and ZIP
4	1, 3, 5, and 18	35 U.S.C. § 103	Palusamy and McCracken
5	9 and 10	35 U.S.C. § 103	Palusamy
6	11	35 U.S.C. § 103	Palusamy, Worthington, and Kurisu

¹ Because the patent application resulting in the '034 patent was filed before the effective date of the Leahy Smith America Invents Act ("AIA"), we refer to the pre-AIA versions of 35 U.S.C. §§ 102 and 103.

II. ANALYSIS

A. Overview of the '034 Patent

The '034 patent relates to a dynamic transient pressure detection system, which detects and records variations in pressure inside an operating fluid chamber. Ex. 1001, Abstract. The '034 patent discloses in the Background of the Invention that “measurement of pressure in pipelines . . . is very important to many industrial applications,” and “[i]rregular pressures can cause catastrophic effects to mechanical systems and result in large losses of time and money.” *Id.* at 1:12–16. According to the '034 patent disclosure, pipelines are designed to withstand both normal operating pressures and transient pressures. *Id.* at 1:18–20. “Pressure transients occur whenever there is a change in the flow rate in a pipeline and can be significantly higher and/or lower than normal operating pressures.” *Id.* at 1:20–23. “Causes of transient pressures include opening or closing a valve, starting or stopping a pump, or operation of an air relief valve.” *Id.* at 1:23–25.

The '034 patent alleges prior systems were deficient because the measurement systems continuously measure and record pressure at predetermined, *fixed* intervals. *Id.* at 2:28–46. These systems are generally set to sample the pressure sensor(s) at intervals of once per day, once per hour, or once per minute. *Id.* at 2:39–41. The problem with a fixed interval system, the '034 patent explains, is that a transient pressure may occur between the times the pressure samples are taken and, therefore, would have no record of its occurrence. *Id.* at 2:28–46. For example, “some of the most severe transients will have a duration of less than one second, and will not be

accurately measured by set-interval data recording systems.” *Id.* at 2:41–44. An object of the invention is to improve the detection and accuracy of recording transient pressures in pipelines and other operating fluid chambers. *Id.* at 2:47–49.

The ’034 patent discloses a system and method that detects transient pressures and locates the source of the transient pressures to provide information that may be used to avoid such transients during future operations. Ex. 1001, 2:53–59. To accomplish this objective, the system includes a dynamic pressure sensor placed within an operating fluid chamber, which continuously measures the pressure and time of the fluid pressure without operator interface. *Id.* at 2:60–66. Signals indicating the pressure within the fluid chamber are transferred through a transmission system to a receiver, which a signal processor converts if needed and records as data. *Id.* at 3:1–9. In addition, using a clock or timer, each signal is associated with timing data to establish a chronological order of each measurement signal detected, and may further included associated positioning information for locating the event. *Id.* “A data management program then analyzes the collected data and displays results.” *Id.* at 3:9–11.

In operation, the signal processor receives and records data samples at a predetermined sampling rate. *Id.* at 3:12–14. This sampling rate “can vary widely depending on the use and are set by an operator using the principles of physics and digital data processing; however, multiple samples per second are normally taken by the system.” *Id.* at 4:5–8. At the set intervals, data samples are provided to a receiver and a signal processor analyzes the information to determine whether there is a transient pressure in the

operating fluid chamber. *Id.* at 3:21–29. To accurately identify transient pressures of concern, the desired transient pressure parameters must be defined for the system, which may, for example, be an absolute threshold of pressure change or a statistical departure from the steady state pressure. *Id.* at 3:36–42.

Depending on whether pressure data exceeds the set transient pressure threshold, the signal processor controls the data rate sampling and/or data recording rates. Ex. 1001, 3:30–32. “The operator can adjust the data sample recording frequencies as needed for a particular application.” *Id.* at 3:44–46. Generally, the steady state pressure data is stored periodically at a different, slower sampling rate than transient pressure data. *Id.* at 3:42–44. “If the user desires, data samples in steady pressure conditions may be recorded at rates including, but not limited to, once per day.” *Id.* at 4:12–14. On the other hand, data pressure signals indicating a pressure greater than the set transient pressure threshold are stored at a higher sampling rate, which may be, but is not limited to, thousands of samples per second. *Id.* at 4:5–10. Thus, when the sensors indicate a pressure measurement that, when compared to the steady state pressure, is outside the set pressure threshold, the system records more pressure data for the transient pressure event to give operators more information.

The system continues to sample and/or record the pressure sensor data at the higher frequency until the pressure returns to a steady state value. *Id.* at 3:30–33. Contemporaneously, the times of detection and/or position of the sensor are recorded and sent with the pressure data. *Id.* at 3:59–63. And all of the data is received and analyzed by a data management program, and the results are displayed to the user. *Id.* at 3:9–11.

B. Representative Claim of the '034 Patent

The '034 patent has three independent claims, which are challenged claims 1, 9, and 18. Claims 1 and 9 are representative of the claimed subject matter and are reproduced below.

1. A method for detecting dynamic transient pressures comprising:

installing a dynamic pressure sensor in an operating fluid chamber,

measuring fluid pressures in the operating fluid chamber,

transmitting data sample information from the dynamic pressure sensor to a receiver and signal processor,

recording data sample information at a predetermined interval,

analyzing data samples with the signal processor,

identifying transient pressures in the operating fluid chamber,

increasing data sampling rates and/or data recording rates during transient detection until pressures reach steady state,

storing transient pressure data in internal memory, and analyzing and displaying collected data alone or with other kinds of data from other sources, using a data management program.

9. A method of detecting pressure transients in operating fluid chambers comprising:

defining pressure threshold in a chamber,

installing at least one pressure sensor in the chamber,

sensing pressure in the chamber with the sensor,

transmitting pressure data from the sensor to a receiver,

temporarily storing the pressure data in a buffer at a first, higher sampling rate,
periodically permanently storing the pressure data at a second, lower rate,
comparing the pressure data with the defined pressure threshold,
upon receiving the pressure data at values outside of the threshold:
permanently recording the pressure data in the buffer, increasing the second rate to match the first rate, permanently storing the pressure data at the first, higher rate, and
analyzing the pressure data recorded at the first, higher rate.

C. Level of Ordinary Skill in the Art

The level of ordinary skill in the art to which the '034 patent pertains is relevant to claim construction, anticipation, and obviousness. Petitioner asserts that the class of people having ordinary skill in the art would either have an undergraduate engineering degree and “at least two years of prior experience with pipeline measurement and fluid flow characterization techniques” or “a post-graduate degree in signal processing concepts.” Pet. 14 (citing Ex. 1002 ¶¶ 26–28, 30). Such a person, according to Petitioner, “would be familiar with prior art teachings of detection systems and methods for various causes of transient conditions, such as a water hammer, a flow disturbance along a fluid flow path, or a leak or diversion along a fluid flow path.” *Id.* (citing Ex. 1002 ¶ 29).

Patent Owner does not set forth a specific formulation regarding the level of ordinary skill in the art, or object to Petitioner’s contentions regarding who would qualify as one of ordinary skill in the art. Furthermore, Patent Owner does not suggest Petitioner’s proposal for the

level of ordinary skill would lead to an incorrect understanding of how a skilled artisan would understand either the '034 patent or the prior art.

In our Institution Decision, we declined to adopt a specific formulation regarding the level of ordinary skill in the art, and instead found the cited references to be representative of the level of ordinary skill in the art. Inst. Dec. 9–10 (citing *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the level of ordinary skill in the art may be evidenced by the cited references themselves)). The parties have not expressed any disagreement with this finding, nor have they suggested a more definitive characterization of the level of ordinary skill in the art is necessary to resolve a disputed issue. Accordingly, for purposes of this Decision we again treat the cited references as being representative of the level of skill in the art. However, the factual findings and legal conclusions set forth herein would have been the same had we instead applied Petitioner's proposed formulation regarding the level of ordinary skill in the art.

D. Claim Construction

In *inter partes* reviews filed before November 13, 2018, the Board interprets claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent in which they appear. See 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016); *Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board*, 83 Fed. Reg. 51,340 (Oct. 11, 2018). Consistent with the rule of broadest reasonable interpretation, claim terms are generally given their plain and ordinary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. See *In re Translogic Tech.*,

Inc., 504 F.3d 1249, 1257 (Fed. Cir. 2007). Only those terms in controversy need to be construed and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (explaining that only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy)).

Petitioner proposes constructions for the following terms and phrases: “[r]ecord(s),” “store(s),” “predetermined interval,” “[p]redetermined periodic interval,” “clock,” “buffer,” and “at.” Pet. 17–18, 70–71, and 75. Patent Owner does not raise any specific, substantive objection to Petitioner’s proposed constructions. None of the issues raised in this case depend on the precise meaning of the above claim limitations, however. Thus, we do not express constructions of these terms. *See Nidec Motor Corp.*, 868 F.3d at 1017.

Patent Owner proposes constructions for the following phrases: “dynamic transient pressures” (claim 1); “transient pressures” (claims 1 and 18); and “pressure transients” (claim 9), which are addressed collectively as the “transient phrases.” PO Resp. 17–37. Patent Owner contends claims are to be accorded their broadest reasonable interpretation in light of the specification, but argues that the patentee can disavow the full scope of the claim in the specification or during prosecution. *Id.* at 17. The parties have substantive disagreements regarding the “transient phrases.” We address these disputed terms below.

1. *The “transient phrases”*

Patent Owner contends that the intrinsic evidence from the '034 patent supports interpreting the “transient phrases” as “a pressure fluctuation, including fluctuations lasting less than one second.” PO Resp. 18. Patent Owner argues that the deficiency with Petitioner’s unpatentability contentions is that the prior art does not detect/identify transient pressures because “[t]ransient pressures, which include pressure fluctuations lasting less than one second, would go completely undetected.” *Id.* at 40.

Petitioner contends Patent Owner’s construction of the “transient phrases” improperly deviates from its plain meaning by incorporating “a specific identifier of pressure fluctuations ‘lasting less than one second.’” Pet. Reply 1. Petitioner proposes that the plain meaning of “dynamic transient pressure” is “constantly changing pressure values of a short duration.” *Id.*

Petitioner’s and Patent Owner’s proposed construction indicate that the parties agree a skilled artisan would understand, in the context of the '034 patent, that the “transient phrases” refer to a temporary variation in pressure from the normal operating pressure. We agree also. This apparent common ground is consistent with the specification of the '034 patent, which states that “[p]ressure transients occur whenever there is a change in the flow rate in a pipeline and can be significantly higher and/or lower than normal operating pressures.” Ex. 1001, 1:20–23. The parties disagree, however, on whether the “transient phrases” require the ability to detect pressure fluctuations lasting less than one second, as well as other fluctuations lasting more than one second. *See e.g.*, P.O. Resp. 40 (arguing that Palusamy does not identify/detect transient pressures because

“[t]ransient pressures, which include pressure fluctuations lasting less than one second (under a proper construction), would go completely undetected”); Reply 4 (arguing Patent Owner arbitrarily selects “less than one second,” even though the specification of the ’034 patent “nowhere states that pressure fluctuations lasting less than ‘one second’ need to be detected”). The claim construction dispute that we must address, therefore, boils down to whether the “transient phrase” limitations require the claimed systems to have a configuration that can detect pressure fluctuations lasting less than one second.

We begin addressing this issue where we left off in the Institution Decision. *See* Dec. Inst. 10–17. Addressing similar contentions made in the Preliminary Response, the Institution Decision considered whether the specification of the ’034 patent, and its file history, provide context that would lead a skilled artisan to understand “transient pressure” to require a configuration that can at least detect pressure fluctuations lasting less than one second. *Id.* After considering the intrinsic record and Patent Owner’s arguments, we “reject[ed] Patent Owner’s assertion that the claimed invention, as a whole, is limited to a configuration that detects/monitors pressure fluctuations lasting less than one second.” *Id.* at 17. Notably, our Institution Decision did not suggest that detecting pressure fluctuations lasting less than one second would fall *outside* the scope of the claims. Rather, we determined that the “transient phrases” do not limit the scope of the claimed invention to a configuration that can at least detect pressure fluctuations lasting less than one second. At the hearing for this matter, Petitioner represented that it “actually prefer[s]” the construction we

advanced in the Institution Decision and that it “would like that to be adopted.” Tr. 15:8–11.

Many of the arguments in Patent Owner’s Response are substantially similar to those made in its Preliminary Response (*compare* Prelim. Resp. 9–18 with PO Resp. 18–34) and we remain convinced that the “transient phrases” do not limit the scope of the claimed methods to having a configuration capable of detecting pressure fluctuations lasting less than one second for the same reasons we provide in the Institution Decision. *See* Dec. Inst. 10–17. Our conclusion in this regard is consistent with the Federal Circuit’s holding that when a claim uses generally descriptive words to define a limitation, it is ordinarily improper to construe it to have a numerical range that may appear in the written description. *See Conoco, Inc. v. Energy & Envtl. Int’l, L.C.*, 460 F.3d 1349, 1357–58 (Fed. Cir. 2006) (“[W]hen a claim term is expressed in general descriptive words, we will not ordinarily limit the term to a numerical range that may appear in the written description or in other claims.”) (quoting *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998)).

Patent Owner argues that our determination in the Institution Decision that “transient is not limited to pressure fluctuations lasting less than one second, but rather includes temporary pressure variations that ‘occur whenever there is a change in the flow rate in a pipeline,’” appears to support its position. PO Resp. 34–35 (citing Dec. Inst. 17). Patent Owner “agrees that ‘transient’ is not limited to pressure fluctuations lasting less than one second,” but asserts it “must include ‘pressure fluctuations lasting less than one second.’” *Id.* at 34. Patent Owner also “agrees that ‘transient’ includes ‘temporary pressure variations that occur whenever there is a

change in the flow rate in a pipeline,” but only “to the extent ‘whenever’ means detecting transients every time they occur.” *Id.* Patent Owner argues that our determination that a skilled artisan would understand “transient” to include temporary pressure variations that occur whenever there is a change in the flow rate in a pipeline “requires identifying/detecting temporary pressure variations whenever (i.e., every time) they occur.” *Id.* at 34.

Therefore, the issue before us regarding the “transient phrase” limitations is whether the intrinsic record of the ’034 patent would be understood by a person of ordinary skill in the art to *require* a configuration that detects pressure fluctuations lasting at least less than one second. After studying the intrinsic record, we previously found, and now find once again, that it does not include a lexicographic definition, disclaimer, or other language that would have been understood by a skilled artisan to impart such a meaning to the “transient phrases.” *See* Dec. Inst. 10–17.

This case is analogous to *In re Hiniker* wherein the specification taught operational advantages that were inherent in the claimed invention, but the claims failed to distinguish the invention based on the advantages described. 150 F.3d 1362, 1368 (Fed. Cir. 1998). In that case, the operational advantages related to providing “downward force via the attack angle of the point member.” The patent owner in that case argued that the claim phrase “said point member provides a downward force on said sweep when being pulled through the soil” should be interpreted to require the shovel attack angle to be such it caused reaction forces that are mainly downward, rather than backward. *Id.* The Federal Circuit explained that, because the claims did not quantify the downward force or otherwise recite structure that would so limit their coverage, importing these operational

characteristic would be improper. *Id.* “Although operational characteristics of an apparatus may be apparent from the specification, we will not read such characteristics into the claims when they cannot be fairly connected to the structure recited in the claims.” *Id.*

Here, Patent Owner attempts similarly to use the “transient phrases” to import an operational characteristic that the phrases themselves do not require because, while “dynamic transient pressures” and “transient pressures” include temporary pressure fluctuations lasting less than one second, these phrases also describe temporary pressure fluctuations lasting *more* than one second. *See e.g.*, Ex. 2004, 1:17–20 (“a transient event is rapid, unusual, short duration deviation from normal operation (*typically a few seconds*) which is large in magnitude”) (emphasis added); *see also*, PO Resp. 25–26 (stating column 1, lines 17–20, from Exhibit 2004, shows how a skilled artisan would have understood the transient phrases). As a result, our determination is that it would be improper to interpret the “transient phrases” to require detection of temporary pressure fluctuations lasting less than one second.

Patent Owner argues that “[i]f the claims are construed to encompass a system that detects slow pressure waves but not severe transients using a slow sample rate, that would defeat the fundamental premise of the patent and contradict the prosecution history.” PO Resp. 35. It is unclear, however, what Patent Owner means by the phrase “slow pressure waves.” Nevertheless, this argument is unpersuasive because we have not construed the claims “to encompass a system that detects slow pressure waves but not severe transients using a slow sample rate.”

To clarify our construction further, we agree with Patent Owner that the meaning of the “transient phrases,” in the context of the ’034 patent, does not encompass those pressure fluctuations caused solely by pipe leakage for the following reasons.

An applicant may narrow the meaning of a claim term by disclaiming or disavowing claim scope; however, such a “disclaimer or disavowal of claim scope must be clear and unmistakable, requiring ‘words or expressions of manifest exclusion or restriction’ in the intrinsic record.” *Unwired Planet, LLC v. Apple Inc.*, 829 F.3d 1353, 1358 (Fed. Cir. 2016) (quoting *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1327 (Fed. Cir. 2002)). During prosecution of the related ’553 patent, the applicant made the following clear representations:

Dynamic transient pressures are described through the specification and in Figure 1 and the original claims as the dangers to vessel or pipeline integrity which must identified. *That is not the same as leak detection* (Ex. 2005, 48) (emphasis added); and

Claim 1 distinguishes Applicant’s invention by providing a dynamic transient pressure detection system in a fluid chamber, while Kurisu looks *only for pipeline leaks*. Furthermore, claim 1 distinguishes applicant’s invention by detecting and monitoring any dynamic transient pressure in a fluid chamber, *rather than merely detecting ‘pressure waves’ caused by a leak as in Kurisu* (Ex. 2005, 48–49) (emphasis added).

We find the above remarks made during prosecution of the ’553 patent by the applicant to be an unmistakable disavowal of pressure fluctuations caused by a leak in a pipe from the scope of the “transient phrases.” Accordingly, we agree with Patent Owner that the applicant narrowed the

scope of the “transient phrases” to exclude transient pressures caused by pipeline leaks.

To summarize, after considering the evidence intrinsic to the ’034 patent, we determine that the broadest reasonable meaning of the “transient phrases” is not limited to temporary pressure fluctuations lasting less than one second. Accordingly, the “transient phrases” are claim limitations that do not restrict the claimed methods to detecting at least the subset of pressure fluctuations lasting less than one second. To add clarity, and address Patent Owner’s concern that we have swept into the meaning of the “transient phrases” subject matter expressly disclaimed, we determine further that the applicant clearly disavowed a meaning of the “transient phrases” that includes pressure fluctuations caused solely by leaks in a pipe.

E. Petitioner’s Challenges to Claims 1–18

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). It is incumbent upon Petitioner to identify, in the Petition, “in writing and with particularity each claim challenged, the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge to each claim.” 35 U.S.C. § 312(a)(3); *see also* *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (2016) (“It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’ 35 U.S.C. § 312(a)(3).”). Although the burden of production may shift, the burden of persuasion on the issue of patentability remains with

Petitioner always and never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). We analyze the challenges presented in the Petition in accordance with the above-stated principles.

As identified above, Petitioner alleges six separate grounds to establish the unpatentability of claims 1–18 of the '034 patent. For the following reasons, we find Petitioner has shown by a preponderance of evidence that claims 1–3, 5, and 18 are unpatentable, but that Petitioner has not shown claims 4 and 6–17 are unpatentable.

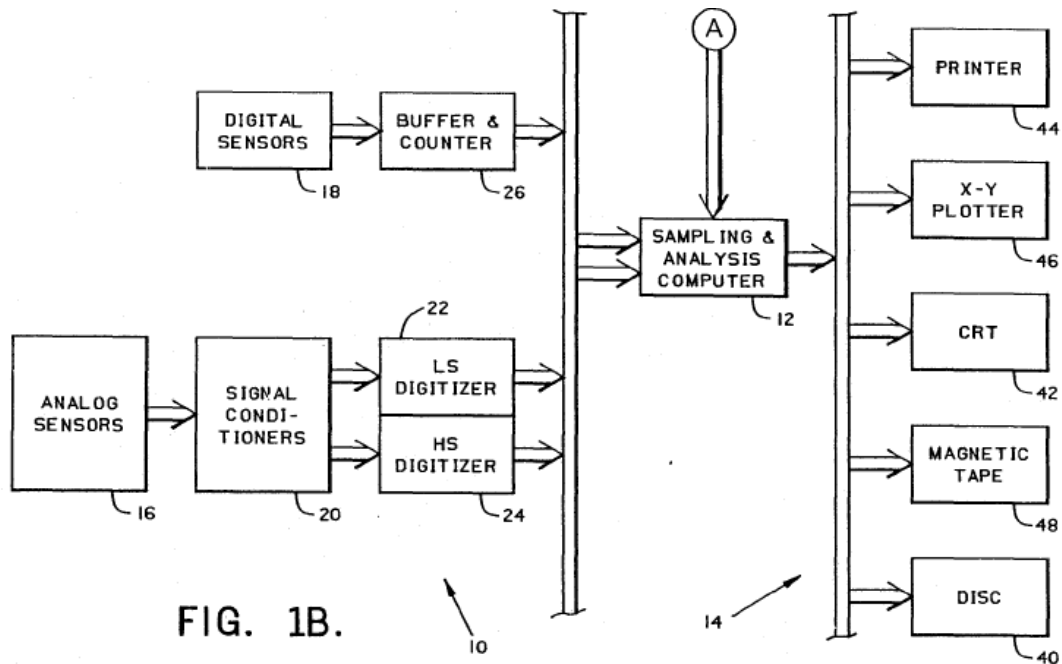
1. *Anticipation Of Claims 1–3, 5, 9, 10, and 18*
(Ground 1)

To anticipate a patent claim under 35 U.S.C. § 102, a single prior art reference must “describe every element of the claimed invention, either expressly or inherently,” to one of ordinary skill in the art. *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000). “[A] reference can anticipate a claim even if it does not expressly spell out all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would at once envisage the claimed arrangement or combination.” *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) (internal quotations omitted).

a. *Overview of Palusamy*

Palusamy is directed to an apparatus and method for monitoring and analyzing systems that provide engineers with information to evaluate fatigue accumulation on the system components, which are subjected to fluid flow, thermal and/or pressure transients. Ex. 1009, 1:8–17. Generally, this

system includes the structural components illustrated in Figure 1B, reproduced below. *Id.* at 3:23–40, Fig. 1B.



Above Figure 1B shows a block diagram of the hardware for the system Palusamy discloses. *Id.* at 2:37–39. “The hardware portion of the system consists of a signal input section 10, a sampling and analysis computer 12 and a set of output peripherals 14.” *Id.* at 3:25–27. Input section 10 includes sensors, which may be digital or analog, for providing measurement data regarding pressure, temperature or fluid flow occurring during operation of a plant. *Id.* at 3:31–33. “These sensors 16 and 18 sense the process signals and response parameters for the components and locations being monitored.” *Id.* at 3:34–36. The signals from the sensors are received and processed by the computer 12. *Id.* at 3:59–64.

The sampling and analysis computer 12 generally includes the functional components illustrated in Figure 1A, reproduced below. *Ex.* 1009, at 2:37–39, Fig. 1A.

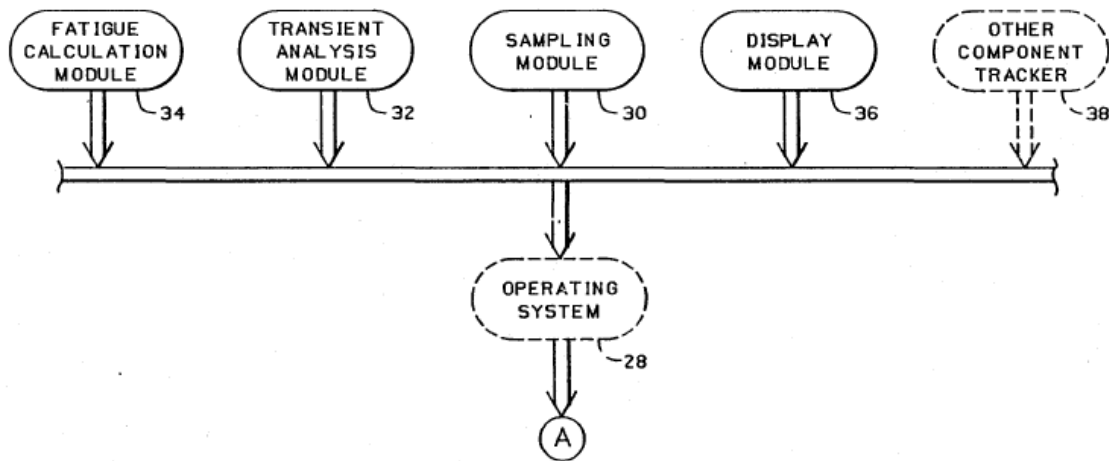


FIG. 1A.

The above figure shows operating system 28 for computer 12 has access to several software modules; most notably, a sampling module 30, a transient module 32, and display module 36. “The real time operating system 28 acts as the manager and causes loading of appropriate software modules 30–38.” *Id.* at 4:3–5.

Sampling module 30 causes sensors 16 and 18 to be sampled by the processor at a frequency of 4 or 5 samples in a 20 second time window during a steady state. *Id.* at 5:10–22, 5:54–57, 6:19–21, 6:55–57. Once all the samples are received by the processor, they are compared to a threshold value to determine whether a transient has occurred. *Id.* at 5:57–59. “The threshold values of the input database 60 are determined by engineering calculation and judgments made by the plant designers and would be values at which fluctuations will cause more than negligible fatigue.” *Id.* at 6:40–44.

If the monitored pressure sample signal exceeds the threshold value, transient recording starts and continues until a steady state is reestablished for a predetermined period. Ex. 1009, 5:61–64, 6:35–40, 7:1–5, 7:14–16. “Transient recording retains a great deal more data than steady state recording.” *Id.* at 7:5–6. Rather than receiving 4 or 5 samples over 20 seconds, when transient sampling is triggered, the processor receives 10 samples per second and 200 samples will be kept over the 20 second time window. *Id.* at 7:6–14.

“Both the steady state statistics and transients are stored in the transient and steady state time history database as, for example, a list of [pressures] and the times at which the [pressures] were recorded.” *Id.* at 5:65–68; *see also* 9:5–6. The information stored in the transient and steady state history database is used as input to the transient analysis module 32, which computes transient parameters that are provided to a fatigue calculation software module 34. *Id.* at 41–50. The computed information from module 34 is finally provided to the display software module 36, which displays the information in usable form to an operator. *Id.* at 50–63.

b. Analysis of Palusamy as Applied to the Claim 1

Claim 1 – Preamble
“1. A method for detecting dynamic transient pressures comprising:”

Petitioner contends that Palusamy discloses the preamble of claim 1 by describing a method and apparatus that “monitor[s] and analyz[es] fatigue accumulated by components and systems subjected to, among other things, pressure transients.” Pet. 23 (citing Ex. 1009, Abstract, 1:8–11, 3:31–34; Ex. 1002 ¶ 86). Palusamy explains that the disclosed system

“continuously monitors the sensors and records steady-state and transient phenomena.” *Id.* at 24 (citing Ex. 1009, Abstract, 3:31–34) (emphasis omitted). Although Patent Owner does not dispute directly whether this evidence shows Palusamy’s system detects transient pressures, Patent Owner contends more generally that the transient pressures the system does detect are not the claimed “transient pressures.” *See* PO Resp. 37–46.

Patent Owner contends that “[t]ransient pressures,’ which include pressure fluctuations lasting less than one second (under a proper construction), would go completely undetected in Palusamy’s system.” *Id.* at 40. Patent Owner argues that Palusamy’s analysis and sampling of 4 or 5 samples per 20 second window during steady state recording to determine whether there is a transient pressure makes the system incapable of detecting the most severe transients, which will have a duration of less than one second. *Id.* at 38–40. Notably, however, Patent Owner does not provide any evidence, or supported technical reasoning, that the system of Palusamy is capable of only detecting pressure fluctuations caused by a leak in a pipe.

Patent Owner’s arguments do not demonstrate a deficiency with Petitioner’s evidence because the alleged point of distinction is not commensurate with the scope of the claim. For the reasons discussed above in section II(D)(1), the claim “transient phrases” carry their plain meaning and do not impose a limitation that requires at least detecting pressure fluctuations lasting less than one second. Moreover, Patent Owner has not shown Palusamy’s system can only detect pressure fluctuations caused by a leak in a pipe.

After considering Petitioner’s cited evidence from Palusamy and the testimony of Mr. Landers, we find that Petitioner has shown persuasively

that Palusamy discloses a “method for detecting dynamic transient pressures,” as the preamble of claim 1 recites.

Claim 1 – element (1)

“installing a dynamic pressure sensor in an operating fluid chamber,”

Petitioner contends that Palusamy discloses element (1) of claim 1. Pet. 24. Petitioner asserts that this limitation is shown by Palusamy’s description of pressure sensors 16 and 18 and their placement at critical locations in a fluid pipe to detect pressure transients. *Id.* (citing Ex. 1009, 3:31–34, 6:1–7, Fig. 5). Petitioner supports its assertion further with citations to the Lander Declaration. *Id.* (citing Ex. 1002 ¶ 87). Patent Owner does not separately dispute that Palusamy discloses element (1) of claim 1. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “installing a dynamic pressure sensor in an operating fluid chamber,” as claim 1 recites.

Claim 1 – element (2)

“measuring fluid pressures in the operating fluid chamber,”

Petitioner contends that Palusamy discloses element (2) of claim 1. Pet. 24–25. Petitioner asserts that Palusamy shows this limitation through its description of the pressure sensors providing a processor measured pressure values. *Id.* at 25 (citing Ex. 1009, 5:32–41). Petitioner supports its contentions with citations to the Lander Declaration. *Id.* at 25 (citing Ex. 1002, ¶ 88). Patent Owner does not separately dispute that Palusamy discloses element (2) of claim 1. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “measuring fluid pressures in the operating fluid chamber,” as claim 1 recites.

Claim 1 – element (3)

“transmitting data sample information from the dynamic pressure sensor to a receiver and signal processor,”

Petitioner contends that Palusamy discloses element (3) of claim 1. Pet. 25–27. Petitioner asserts that Palusamy’s description of a system with a computer 12 that processes (e.g., signal conditioners, digitizers) signal samples received from pressure sensors 16 and 18. *Id.* at 25 (citing Ex. 1009, 3:23–64, 4:25–47, 5:18–20, Figs. 1A, 1B). Petitioner supports its contentions with citations to the Lander Declaration. *Id.* at 24 (citing Ex. 1002, ¶¶ 89–90). Patent Owner does not separately dispute that Palusamy discloses element (3) of claim 1. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “transmitting data sample information from the dynamic pressure sensor to a receiver and signal processor,” as claim 1 recites.

Claim 1 – element (4)

“recording data sample information at a predetermined interval,”
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Petitioner contends that Palusamy discloses element (4) of claim 1. Pet. 28. Petitioner contends Palusamy discloses this limitation by showing a system with a sampling module 30 that records 4 or 5 samples of the pressure sensor signals during a 20 second time window. *Id.* (citing

Ex. 1009, 6:19–21, 7:9–11, 18:16–18). Petitioner contend, “20 seconds is the ‘predetermined interval.’” *Id.* Petitioner supports its assertions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶¶ 91–98). Patent Owner does not separately dispute that Palusamy discloses element (4) of claim 1. *See* PO Resp. 37–46.

After considering Petitioner’s contentions, the evidence cited in support thereof, and column 5, lines 54–59, of Palusamy, we find Petitioner has shown persuasively that Palusamy discloses “recording data sample information at a predetermined interval,” as claim 1 recites.

Claim 1 – element (5)
“analyzing data samples with the signal processor,”

Petitioner contends that Palusamy discloses element (5) of claim 1. Pet. 28–30. Petitioner contends this element is disclosed by Palusamy’s description of computer 12 using a sampling module 30 that checks the sampled pressure sensor values against a threshold value to determine whether the data indicates the pressure in a pipe is a steady state or transient state condition. *Id.* (citing Ex. 1009, 5:22–26, 6:17–28, Fig. 3A).² Petitioner supports its contentions with citations to the Lander Declaration. *Id.* at 30 (citing Ex. 1002, ¶¶ 99–101). Patent Owner does not separately dispute that Palusamy discloses element (5) of claim 1. *See* PO Resp. 37–46.

² Petitioner refers also to Palusamy’s teachings of a “data integrity check 86” for this limitation. Pet. 29. We do not find this evidence persuasive or relevant because the data integrity check of Palusamy relates to an analysis of the sensor’s data to determine whether they “are working correctly,” rather than an analysis of the sensor data to determine the occurrence of a transient pressure. Ex. 1009, 5:22–53.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “analyzing data samples with the signal processor,” as claim 1 recites.

Claim 1 – element (6)
“identifying transient pressures in the operating fluid chamber,”

Petitioner contends that Palusamy discloses element (6) of claim 1 through its description of sampling module 30 that computer 12 uses to check the collected sampled pressure sensor values against “a threshold value” to determine whether the data indicates that the pressure in a pipe is in a steady state or transient state condition. Pet. 35 (citing Ex. 1009, 6:35–41). Palusamy states, “[i]f any monitored . . . pressure . . . signal in the entire plant exceeds the threshold values stored in the input database 60, transient recording starts . . . and continues until a steady state is reestablished for a predetermined period.” Ex. 1009, 6:35–41. Petitioner supports its contention further with citations to the Lander Declaration. Pet. 35 (citing Ex. 1002 ¶ 109).

Patent Owner argues that Petitioner’s evidence is deficient to show element (6). PO Resp. 37–46. Patent Owner asserts that Palusamy is “incapable of detecting fast transients” and “teaches a system that removes outliers by using a long sample window that averages low sample rate data.” PO Resp. 40. Patent Owner argues that Figure 6 of Palusamy illustrates that “Palusamy does not monitor rapid changes in pressure,” but is instead “limited to detecting whether a measured pressure average is greater than or less than a threshold magnitude of pressure, regardless of how long that change takes place.” PO Resp. 44–45 (emphasis omitted). According to

Patent Owner, Palusamy focuses simply on whether pressures cross a preset magnitude “without regard to the rate of change.” *Id.* at 45. Patent Owner argues that “Palusamy is just like other prior art that viewed the data spikes or impulses as noise.” *Id.* at 40.

Patent Owner’s arguments do not demonstrate a deficiency with Petitioner’s evidence, however, because the alleged points of distinction are not commensurate with the scope of the claim. For the reasons discussed above in section II(D)(1), the “transient phrases” do not import a limitation that requires the detection of transient pressures lasting less than one second. We are also not persuaded Palusamy’s detection of transients is divorced of any considerations of the pressure’s rate of change because Palusamy makes an evaluation every 20 seconds about whether the 4 or 5 collected data samples indicate the occurrence of a transient pressure. Ex. 1009, 5:54–64, 6:55–7:5. Although the temporal component of Palusamy’s transient detection may not be sufficient to detect transients lasting less than one second, we do not agree that Palusamy supports that its detection of temporary pressure changes is wholly independent of how long the transient lasts. In addition, as we noted in the Institution Decision (Inst. Dec. 26), Patent Owner offers no evidence that Palusamy’s method of detecting transients is similar to the distinguished prior art, which only detected pressure changes associated with pipe leakage. Palusamy indicates contrarily that the disclosed system is designed to detect transient pressures associated with “plant start-up,” “output demand changes,” and components functioning abnormally. Ex. 1009, 1:49–52.

After considering Petitioner’s cited evidence from Palusamy and the testimony of Mr. Landers, we find Petitioner has shown persuasively that

Palusamy discloses “identifying transient pressures in the operating fluid chamber,” as claim 1 recites.

Claim 1 – element (7)
“increasing data sampling rates and/or data recording rates during transient detection until pressures reach steady state,”

Petitioner contends that Palusamy discloses element (7) of claim 1. Pet. 31. Petitioner contends “Palusamy teaches increasing the data sampling rates and the data recording rates during transient detection.” *Id.* (citing Ex. 1009, Abstract, 7:5–16, 7:65–68). Petitioner supports its contentions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶ 103). Palusamy describes that sampling module 30 triggers computer 12, after detecting a transient condition, to increase the collection and recording of the pressure sensor samples from 4 or 5 samples per 20 second time window to collecting and recording all of the sensor samples (e.g., 200 sample per 20 second time window). Ex. 1009, 5:54–64, 7:1–14. Palusamy states, “[t]ransient data is recorded at a higher sampling rate, so that the parameters of the transients, such as the maximum value, can be determined for stress analysis.” *Id.* at 2:22–24. Patent Owner does not dispute that Palusamy discloses element (7) of claim 1. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “increasing data sampling rates and/or data recording rates during transient detection until pressures reach steady state,” as claim 1 recites.

Claim 1 – element (8)

“storing transient pressure data in internal memory, and analyzing and displaying collected data alone or with other kinds of data from other sources, using a data management program.”
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Petitioner contends that Palusamy discloses element (8) of claim 1. Pet. 31–33. Petitioner contends Palusamy’s descriptions of the operation of the sampling module 30, transient analysis module 32, fatigue calculation module 34, and display module 36 show a system that stores, analyzes and displays transient pressure data, as required by this limitation. *Id.* (citing Ex. 1009, 4:25–48, 4:41–63, 5:6–10, 5:22–27, 7:65–68, Figs. 1A, 1B, 3). Petitioner supports its contentions with citations to the Lander Declaration. *Id.* at 33 (citing Ex. 1002, ¶¶ 105–107). For example, Palusamy teaches that sampling module 30 stores collected sensor sample data in a time history database 62, transient analysis module 32 computes transient parameters, and display module 36 outputs a display of data representations schemes useful to plant operators. Ex. 1009, 4:25–63. Other than its general arguments regarding the “transient phrase,” which we have rejected for the reasons discussed above, Patent Owner does not dispute that Palusamy discloses element (8) of claim 1. See PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “storing transient pressure data in internal memory, and analyzing and displaying collected data alone or with other kinds of data from other sources, using a data management program,” as claim 1 recites.

Therefore, for the foregoing reasons, we find that Petitioner has demonstrated by a preponderance of the evidence that Palusamy anticipates claim 1 of the '034 patent.

c. Analysis of Palusamy as Applied to the Claim 2

Claim 2
“2. The method of claim 1, further comprising defining transient pressure parameters.”

Petitioner contends Palusamy discloses the elements of claim 2 through its disclosure of transient pressure parameters being defined values stored in an input database 60. Pet. 33 (citing Ex. 1009, 4:31–34). Petitioner highlights Palusamy’s teaching that “input database 60 contains . . . threshold limits that determine when a transient has occurred” and that these threshold values “are determined by engineering calculations and judgments made by the plant designers.” *Id.* at 33–34 (citing Ex. 1009, 4:31–34, 6:41–44). Petitioner also supports its contentions with citations to the Lander Declaration. *Id.* at 34 (citing Ex. 1002, ¶ 108). Other than its general arguments regarding the “transient phrase,” which we have rejected for the reasons discussed in the context of claim 1, Patent Owner does not dispute that Palusamy discloses the elements of claim 2. *See* PO Resp. 37–46.

After considering Petitioner’s cited evidence from Palusamy and the testimony of Mr. Landers, we find that Petitioner has shown by a preponderance of the evidence that Palusamy anticipates claim 2 of the '034 patent.

d. Analysis of Palusamy as Applied to the Claim 3

Claim 3
“3. The method of claim 1, further comprising installing multiple dynamic pressure sensors in an operating fluid chamber.”

Referring to Figure 5 of Palusamy, and the description thereof, Petitioner asserts Palusamy shows an additional dynamic transient pressure sensor installed in a fluid chamber. Pet. 34 (citing Ex. 1009, 3:31–36, 3:68–4:3, 6:1–4, Fig. 5; Ex. 1002, ¶¶ 122–124). Petitioner contends Figure 5 shows that “[t]his additional dynamic transient pressure sensor is installed at a second critical location 166 that is different from a first critical location 164.” *Id.* Petitioner also supports its contentions with citations to the Lander Declaration. *Id.* at 34 (citing Ex. 1002, ¶¶ 109–111). Patent Owner does not dispute that Palusamy discloses the elements of claim 6. See PO Resp. 37–46.

After considering Petitioner’s cited evidence from Palusamy and the testimony of Mr. Landers, we find that Petitioner has shown by a preponderance of the evidence that Palusamy anticipates claim 3 of the ’034 patent.

e. Analysis of Palusamy as Applied to the Claim 5

Claim 5
“5. The method of claim 3, further comprising analyzing data from one or multiple test sites simultaneously.”

Petitioner contends Palusamy discloses “analyzing data, using software module 30 of computer 12, from one or more multiple test sites (e.g., first critical location 164 and second critical location 166 of Figure 5, shown above).” Pet. 34 (citing Ex. 1009, 6:49–52). Petitioner highlights

that Palusamy teaches that, once a transient has been detected, “transient recording starts for all monitored locations in the plant and continues until a steady state is reestablished for a predetermined period” and that transient analysis module 32 “computes transient parameters that result in compilation of a transient parameter database 64,” which provides inputs for the fatigue calculation software module 34. *Id.* at 35 (citing Ex. 1009, 4:41–50, 6:49–52). Petitioner also supports its contentions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶¶ 112–113). Patent Owner does not dispute that Palusamy discloses the elements of claim 5. *See* PO Resp. 37–46.

After considering Petitioner’s cited evidence from Palusamy and the testimony of Mr. Landers, we find that Petitioner has shown by a preponderance of the evidence that Palusamy anticipates claim 5 of the ’034 patent.

f. Analysis of Palusamy as Applied to the Claim 9

Claim 9 is substantially similar to claim 1, except for the following limitations:

- [9.5] temporarily storing the pressure data in a buffer at a first, higher sampling rate,
- [9.6] periodically permanently storing the pressure data at a second, lower rate,
- [9.7] comparing the pressure data with the defined pressure threshold, upon receiving the pressure data at values outside of the threshold:
- [9.8] permanently recording the pressure data in the buffer, increasing the second rate to match the first rate, permanently storing the pressure data at the first, higher rate.

Ex. 1001, 8:57–8:6 (annotations added for reference). Petitioner contends that Palusamy discloses the above elements 9.5–9.8 for the following

reasons. We find the deficiency with Petitioner's evidence to show that Palusamy discloses these limitations to be dispositive for claim 9.

First, Petitioner contends Palusamy teaches that during, steady-state operating conditions, pressure sensors are sampled at a rate of at least 10 samples per second, which amounts to 200 samples for every 20 second time window, and computer 12 receives and stores all of the samples in temporary memory. Pet. 37 (citing Ex. 1009, 5:18–20, 7:12–14, 8:19–24; Ex. 1002 ¶ 120); *see also* Pet. Reply 17. Second, Petitioner contends Palusamy teaches that “after data temporarily stored in the buffer is analyzed to determine the condition of operation, then depending on the state of operation, hundreds of data points for transient conditions or 4 to 5 data points for steady state conditions are permanently stored in memory.” *Id.* at 38 (citing 5:18–20, 7:9–10, 18:11–23; Ex. 1002, ¶¶ 122–124); *see also* Pet. Reply 17. Third, Petitioner contends Palusamy teaches that during, steady-state operating conditions, a “signal processor compares sample data to transient pressure parameters (*e.g.*, pressure threshold) to identify transient pressures.” *Id.* at 30 (citing Ex. 1009, 5:54–59; Ex. 1002, ¶ 102); *see also id.* at 39. Fourth, Petitioner contends Palusamy teaches recording permanently the pressure data outside of a pressure threshold during a transient operating condition. *Id.* at 39 (citing Ex. 1009, 5:61–68, 6:33–40; Ex. 1002, ¶ 126). Fifth, Petitioner contends Palusamy teaches that, during a transient operating condition, the rate at which the sample data in the temporary memory is stored in permanent memory switches to match the rate at which the computer received and stored the sensor sample data into the temporary memory. Pet. 39–41 (citing Ex. 1009, 7:1–14; 7:65–68, 6:31–34; Ex. 1002, ¶¶ 127–128); *see also* Pet. Reply 18.

We find several flaws in the underpinning of Petitioner’s contentions, however. First, Palusamy does not disclose that, during steady-state operating conditions, computer 12 receives and stores all 200 data samples of a pressure sensor during the 20 second time window. Palusamy teaches instead that computer 12 collects only a select few of the 200 samples (e.g., 4 or 5) within a 20 second time window during steady-state operating conditions. Ex. 1009, 5:54–57 (“[A] determination is made 89 whether data from the sensor for a predetermined time widow for example, 4 or 5 samples *has been collected.*”)(emphasis added). Palusamy confirms our understanding by teaching that “[t]ransient data is recorded at a higher sampling rate.” Ex. 1009, 2:22–24 (emphasis added). Additionally, Palusamy teaches that, once a transient is detected, “high speed recording *begins,*” which means the “rotating storage is not updated [with the 4 or 5 sensor samples collected] as in the steady state case *and all samples get stored.*” *Id.* at 7:47–49. Thus, we find Petitioner’s underlining factual assertion that Palusamy’s computer 12 temporarily stores the sensor pressure data in a buffer at a first, higher sampling rate during a steady state operating condition unpersuasive.

Petitioner argues that our finding that Palusamy stores only a few select sensor samples (e.g., 4 or 5 of 200) during steady state operation misapprehends the teachings of Palusamy. Pet. Reply 16–17. Petitioner asserts that our finding “ignores Palusamy’s disclosure that in a 20-second time window, 200 samples acquired at a sampling rate of 10 samples per second are compressed to 4 or 5 datapoints, which are kept, or recorded, in steady state.” *Id.* at 17 (citing 1016, ¶¶ 75–76). The problems with Petitioner’s argument, however, is that it provides no evidence that computer

12 temporarily stores the “acquired” 200 pressure samples during a steady state. We agree with Petitioner that a “sampling rate” is not necessarily equal to the “storing rate” because “sampling rate” refers to the number of readings a digitizer or digital sensor takes during a time window, which is separate and distinct from the storing rate, which is the number of sensor sample readings a computer collects to place in memory. See Pet. Reply 16–17. Even though Palusamy teaches a sampling rate of at least 200 samples per 20 second time window, this does not necessarily mean computer 12 actually collects all of the at least 200 sample to temporarily store them in memory. To the contrary, as noted above, Palusamy teaches that computer 12 only collects about 4 or 5 of the samples during steady state. Thus, as Petitioner acknowledges, Palusamy teaches that “in steady state, the sampling rate [of the pressure sensors] is higher than the storing rate [of the sensor sample data].” *Id.* at 17.

Second, we disagree with Petitioner that Palusamy teaches to check each of the at least 200 sensor samples during a steady state to determine whether a sample exceeds a threshold to detect a transient state. See Pet. Reply 17 (arguing that column 5, lines 54–57, of Palusamy describes “an inquiry is made into whether *any* sample data exists, after an integrity check, to undergo the next step of a check threshold violation”) (emphasis added). Palusamy states, “a determination is made 89 whether data from the sensor for a predetermined time window for example, 4 or 5 samples has been collected,” which is properly understood as describing decision block 89 as asking whether computer 12 has collected the 4 or 5 samples of data for the selected time window (i.e., 20 seconds). “If so,” Palusamy states, “*the samples* are compared 90 (FIG. 3B) to a threshold level that determines that

determines whether a transient has occurred,” which teaches that Palusamy’s system first collects and stores sensor sample data at a slow rate during a steady state and determines whether a transient state exists based on the 4 or 5 samples collected. Ex. 1009, 5:56–58 (emphasis added). If a transient state is detected, then Palusamy teaches “[t]ransient data *is recorded at a higher sampling rate*, so that the parameters of the transients . . . can be determined for stress analysis.” *Id.* at 2:22–24 (emphasis added). Thus, rather than collecting and testing all of the at least 200 sensor samples during a steady state condition to determine whether a transient state exists, we find Palusamy teaches collecting far fewer sensor samples (i.e., collecting 4 or 5 samples in a 20 second window) and only using those samples to determine whether a transient state exist.

Finally, we do not agree Palusamy teaches collecting and checking each of the at least 200 sensor samples for a given 20 second time window to decide whether to store permanently hundreds of the data points collected, if in a transient condition, or store permanently 4 to 5 data points from the hundreds collected, if in a steady state condition. Pet. 38. Palusamy unambiguously states that the 4 to 5 points collected during steady state conditions are the data points used to determine whether the operating conditions are steady or transient, rather than basing this determination on each sampling of the sensors. *Id.* at 5:54–59. Although it is correct that Palusamy teaches that 4 or 5 data points are “kept” during steady state recording and hundreds of data points are “kept” during transient state recording at column 7, lines 9–11, we find this passage to simply reflect the fact that 4 to 5 data points are collected during steady state recording and hundreds of data points are collected during transient state recording. *See*

Ex. 1009, 7:1–68, 5:54–59, 2:22–24. Our understanding is consistent with Petitioner’s argument that “[t]he word ‘kept’ . . . conveys that some or all of the sampled data is recorded.” Pet. 44.

We find no persuasive support within Palusamy, and Petitioner has not identified any, suggesting that computer 12 collects and records hundreds of sensor data samples and subsequently decides how many of those samples will be permanent stored based on whether the operating conditions are steady or transient. Palusamy describes a system that evaluates sensor data samples to decide the recording rate *prospectively*, rather than the recording rate of data samples already collected. For example, in describing Figure 6, Palusamy states that, once it is determined that the defined threshold has been violated, the system switches to transient mode and “high speed recording *begins*,” which means “all samples get stored.” *Id.* at 7:45–49 (emphasis added). “While in the transient mode, data is stored in the . . . database 62 at the higher speed sampling rate established for the system.” *Id.* at 65–68.

We do not find Dr. Lander’s declarations in support of Petitioner’s contention that the Palusamy discloses elements 9.5, 9.7, and 9.8 persuasive. For example, this testimony relies on an interpretation of Palusamy that is inconsistent with what the reference actually teaches, which Dr. Lander admits. *See* Ex. 2005, 98:16–99:23, 101:20–102:11, 106:3–107:13.

Nor do we find claim 2 of Palusamy to be persuasive evidence that computer 12 of Palusamy records sensor signal data in a temporary buffer at a high sample rate during steady state operation. Claims 2 depends from claim 1 and states, in relevant part,

sampling at a sampling rate and storing sensor samples in a storage at a first storage rate if the sensor signal is within the first threshold range . . . sampling at the sampling rate and storing sensor samples in the storage at a second higher storage rate than the first storage rate if the sensor signal is equal to or outside the first threshold range limit values, whereby the transient is detected.

Ex. 1009, 18:16–23. Although this claim may suggest sampling a sensor at the same rate during both steady and transient states, it does suggest that a signal processor receives or records the sampled data at the same rate during both states.

As a result, we find that Petitioner has not persuasively shown that Palusamy disclose elements 9.5, 9.7, and 9.8 of claim 9. Therefore, after reviewing Petitioner’s cited evidence from Palusamy and the declaration of Dr. Lander, as well as the arguments and evidenced put forth by Patent Owner, we find that Petitioner has not shown by a preponderance of the evidence that Palusamy anticipates claim 9 of the ’034 patent.

g. Claim 11

Because claim 11 depends indirectly from claim 9, which has not been shown to be unpatentable (*see* above II(E)(1)(f) and below II(E)(2)(e)), Petitioner has not shown by a preponderance of the evidence that claim 11 is unpatentable. *See Callaway Golf Co. v. Acushnet Co.*, 576 F.3d 1331, 1344 (Fed. Cir. 2009) (a dependent claim cannot be invalid because of anticipation or obviousness unless the independent claim from which it depends was also found invalid).

h. Analysis of Palusamy as Applied to the Claim 18

Claim 1 – Preamble

“18. A method of monitoring pressure comprising:”

Petitioner contends that Palusamy discloses the preamble of claim 18 by describing a method and apparatus that “monitor[s] and analyz[es] fatigue accumulated by components and systems subjected to, among other things, pressure transients.” Pet. 43 (citing Ex. 1009, Abstract, 1:8–11; Ex. 1002 ¶ 134). Palusamy explains that the disclosed system “continuously monitors the sensors and records steady-state and transient phenomena.” *Id.* at 24 (citing Ex. 1009, Abstract, 3:31–34) (emphasis omitted). Patent Owner does not dispute that Palusamy discloses the preamble of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses a “method of monitoring pressure,” as the preamble of claim 18 recites.

Claim 18 – element (1)

“installing transient pressure sensors within an operating fluid chamber,”
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Petitioner contends that Palusamy discloses element (1) of claim 18. Pet. 43. Petitioner asserts that this limitation is shown by Palusamy’s description of pressure sensors 16 and 18 and their placement at critical locations in a fluid pipe to detect pressure transients. *Id.* (citing Ex. 1009, 3:31–34, 6:1–9, Fig. 5). Petitioner supports its assertion further with citations to the Lander Declaration. *Id.* (citing Ex. 1002 ¶ 135). Other than

its general arguments regarding the “transient phrase,” which we have rejected for the reasons discussed in the context of claim 1, Patent Owner does not dispute that Palusamy discloses element (1) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “installing transient pressure sensors within an operating fluid chamber,” as claim 18 recites.

Claim 18 – element (2)
“establishing predetermined data sampling rates,”

Petitioner contends that Palusamy discloses element (2) of claim 18. Pet. 43. Petitioner asserts this limitation is shown through Palusamy’s description of an exemplary sampling rate of “10 samples per second” and by claiming a method that includes the step of “sampling at a sampling rate.” *Id.* (citing Ex. 1009, 7:12–14, 18:16–18).³ Petitioner supports its contentions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶ 136). Patent Owner does not dispute that Palusamy discloses element (2) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy

³ Petitioner also cites to Palusamy’s description of the operation of sampling software module 36 as causing data to be “sampled at rates high enough to assure gathering of all relevant data.” Pet. 43 (citing Ex. 1009, 8:19–24). We do not find this evidence persuasive or particularly relevant because it relates to the sample data recording rates of the computer, rather than a sampling rate of the sensor.

discloses “establishing predetermined data sampling rates,” as claim 18 recites.

Claim 18 – element (3)

“establishing predetermined sample data recording rates,”

Petitioner contends that Palusamy discloses element (3) of claim 18. Pet. 44 (citing Ex. 1009, 7:9–14). The passage from Palusamy that Petitioner relies upon to disclose this limitation states,

rather than 4 or 5 datapoints being kept as in steady state recording, hundreds of data points are kept for each sensor signal. If a sensor signal is sampled at 10 samples per second, 200 samples will be kept for that parameter in a 20 second time window.

Ex. 1009, 7:9–14. Petitioner explains “[t]he word ‘kept’ in the cited passage conveys that . . . the sample data is recorded,” thus, this passage discloses exemplary predetermined sample data recording rates of 1 datapoint per 5 seconds and 10 datapoints per second. Pet. 44. Patent Owner does not dispute that Palusamy discloses element (3) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “establishing predetermined sample data recording rates,” as claim 18 recites.

Claim 18 – element (4)

“establishing transient pressure parameters,”

Petitioner contends that Palusamy discloses element (4) of claim 18. Pet. 44. Petitioner contends Palusamy’s teaching that “input database 60

contains . . . threshold limits that determine when a transient has occurred” discloses this limitation. *Id.* (citing Ex. 1009, 4:31–34, 6:41–44). Petitioner supports its assertions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶ 138). Other than its general arguments regarding the “transient phrase,” which we have rejected for the reasons discussed in the context of claim 1, Patent Owner does not separately dispute that Palusamy discloses element (4) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “establishing transient pressure parameters,” as claim 18 recites.

Claim 18 – element (5)
“measuring fluid pressures”

Petitioner contends that Palusamy’s disclosure of a sensor used to measure fluid pressure in a pipe satisfies element (5) of claim 18. Pet. 44 (citing Ex. 1009, 5:32–41). Petitioner supports its contentions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶¶ 140–141). Patent Owner does not dispute that Palusamy discloses element (5) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “measuring fluid pressures,” as claim 18 recites.

Claim 18 – element (6)

“transmitting fluid pressure sample data to a receiver and signal processor,”

Petitioner contends that “[t]he same argument and support shown with respect to the ‘transmitting data sample information . . .’ element of claim 1 applies here.” Pet. 44. Having considering the argument and support shown for element 3 of claim 1, above, we agree. Patent Owner does not dispute that Palusamy discloses element (6) of claim 18. *See* PO Resp. 37–46.

Therefore, we find Petitioner has shown persuasively that Palusamy discloses “transmitting fluid pressure sample data to a receiver and signal processor,” as claim 18 recites.

Claim 18 – element (7)

“recording sample data at the predetermined recording rates,”

Petitioner contends that Palusamy discloses element (7) of claim 18. Pet. 44. As support, Petitioner contends Palusamy “explain[s], as an example, that during steady state, pressure data is recorded at a rate of 4 samples per 20-second time window or 5 samples per 20-second time window” and “during transient state, pressure data is recorded at a rate of 10 samples per second.” *Id.* (citing Ex. 1009, 7:9–14, 18:11–23). Petitioner supports its contentions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶¶ 142–43). Patent Owner does not dispute that Palusamy discloses element (7) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy

discloses “recording sample data at the predetermined recording rates,” as claim 18 recites.

Claim 18 – element (8)

“analyzing sample data,”

Petitioner contends that “[t]he same argument and support shown with respect to the ‘analyzing data samples with the signal processor’ element of claim 1 applies here.” Pet. 45. Having considering the argument and support shown for element 5 of claim 1, above, we agree. Patent Owner does not dispute that Palusamy discloses element (8) of claim 18. See PO Resp. 37–46.

Therefore, we find Petitioner has shown persuasively that Palusamy discloses “analyzing sample data,” as claim 18 recites.

Claim 18 – element (9)

“comparing sample data to the transient pressure parameters for identifying transient pressures,”

Petitioner contends that Palusamy discloses element (9) of claim 18. Pet. 45. As support, Petitioner identifies Palusamy’s teaching of a threshold limit that computer 12 uses to compare sensor sample data to identify transient pressures. *Id.* (citing Ex. 1009, 5:54–59, 4:31–34, 6:41–44). Petitioner supports its assertions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶ 147). Other than its general arguments regarding the “transient phrase,” which we have rejected for the reasons discussed in the context of claim 1, Patent Owner does not separately dispute that Palusamy discloses element (9) of claim 18. See PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy

discloses “comparing sample data to the transient pressure parameters for identifying transient pressures,” as claim 18 recites.

Claim 18 – element (10)
“increasing data sampling rates and data recording rates during transient detection,”

Petitioner contends that Palusamy discloses element (10) of claim 18. Pet. 45. As support, Petitioner identifies Palusamy’s teaching that, during a transient state, “[t]ransient data is retained at a higher sampling rate” and “higher speed sampling rate [is] established for the system.” *Id.* citing (Ex. 1009, Abstract, 7:65–68, 7:44–68, 7:5–16, 4:41–48, 5:54–68, 9:5–12). Petitioner asserts “the word ‘retained’ above . . . means ‘recorded,’ which has the same meaning as ‘stored.’” *Id.* In addition, Petitioner identifies that claim 2 of Palusamy as support because it the steps of “storing sensor signal samples in the storage at a second storage rate higher than the first storage rate if the sensor signal is equal to or outside the first threshold range limit values, whereby the transient is detected.” *Id.* (citing 18:19–24 (claim 2)). Petitioner supports its assertions further with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶¶ 148–149). Other than its general arguments regarding the “transient phrase,” which we have rejected for the reasons discussed in the context of claim 1, Patent Owner does not dispute that Palusamy discloses element (10) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “comparing sample data to the transient pressure parameters for identifying transient pressures,” as claim 18 recites.

Claim 18 – element (11)

“storing transient data in internal memory,”
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Petitioner contends that Palusamy discloses element (11) of claim 18 by teaching that “[w]hile in the transient mode, data is stored in the . . . database 62,” which is internal memory of computer 12. Pet. 45. Petitioner supports its contentions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶ 150). Patent Owner does not separately dispute that Palusamy discloses element (11) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “storing transient data in internal memory,” as claim 18 recites.

Claim 18 – element (12)

“analyzing and displaying collected data,”
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Petitioner contends that Palusamy discloses element (12) of claim 1. Pet. 46–47. Petitioner contends Palusamy’s descriptions of the operation of the transient analysis module 32 and display module 36 show a system that analyzes and displays the data collected. *Id.* (citing Ex. 1009, 4:41–63, Figs. 1A, 1B). Petitioner supports its contentions with citations to the Lander Declaration. *Id.* at 47 (citing Ex. 1002, ¶¶ 151–153). Patent Owner does not dispute that Palusamy discloses element (12) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “analyzing and displaying collected data,” as claim 18 recites.

Claim 18 – element (13)

“returning data sampling rates and data recording rates to predetermines rates when sample data returns to non-transient pressure parameters.”
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Petitioner contends that Palusamy discloses element (8) of claim 1. Pet. 47. Petitioner identifies that Palusamy teaches that “[t]ransient recording continues until the algorithm to determine recording duration indicates that steady state recording can begin again” and that “[w]hen base mean values can be established and held . . . for a given period . . . transient data collection stops and the system is returned to the steady state mode.” Ex. 1009, 7:14–16, 7:39–43. In addition, Petitioner supports its contentions with citations to the Lander Declaration. *Id.* (citing Ex. 1002, ¶ 154). Patent Owner does not dispute that Palusamy discloses element (13) of claim 18. *See* PO Resp. 37–46.

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “returning data sampling rates and data recording rates to predetermines rates when sample data returns to non-transient pressure parameters,” as claim 18 recites.

Therefore, for the foregoing reasons, we find Petitioner has demonstrated by a preponderance of the evidence that Palusamy anticipates claim 18 of the ’034 patent.

2. *Obviousness Of Claims 1 and 3–18 (Grounds 2–6)*

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which such subject

matter pertains.” 35 U.S.C. § 103(a). The question of obviousness under 35 U.S.C. § 103 is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

When evaluating claims for obviousness, it is well settled that “the prior art as a whole must be considered.” *In re Hedges*, 783 F.2d 1038, 1041 (Fed. Cir. 1986); *see also In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) (explaining that a reference “must be read, not in isolation, but for what it fairly teaches in combination with the prior art as a whole”). “It is impermissible within the framework of section 103 to pick and choose [teachings] from any one reference . . . to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.” *Hedges*, 783 F.2d at 1041 (quoting *In re Wesslau*, 353 F.2d 238, 241 (CCPA 1965)). In the same vein, invalidity on the ground of obviousness requires more than establishing that the claim elements were previously known. As the Court instructs in *KSR*:

[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.

KSR Int’l Co., 550 U.S. at 418–19.

a. Incorporation by Reference

Patent Owner makes a general objection to Petitioner’s unpatentability arguments based on obviousness (i.e., Grounds 2–6) because the Petition “presents virtually no analysis showing a reason to combine references and instead makes conclusory statements while improperly incorporating the contents of Dr. Lander’s Declaration.” PO Resp. 47 (citing *Cisco Systems, Inc. v. C-Cation Tech., LLC.*, IPR2014-00454, paper 12). We agree.

It is improper to incorporate by reference arguments from one document into another document. 37 C.F.R. § 42.6(a)(3). “Th[e] practice of citing [a] [d]eclaration to support conclusory statements that are not otherwise supported in the Petition . . . amounts to incorporation by reference.” *Cisco Systems, Inc. v. C-Cation Tech., LLC.*, IPR2014-00454, paper 12, at 9. “One purpose of the prohibition against incorporation by reference is to eliminate abuses that arise from incorporation.” *Id.* at 10 (citing Rules of Practice for Trials Before The Patent Trial and Appeal Board and Judicial Review of Patent Trial and Appeal Board Decisions; Final Rule, 77 Fed. Reg. 48,612, 48,617 (Aug. 14, 2012); *DeSilva v. DiLeonardi*, 181 F.3d 865, 866–67 (7th Cir. 1999) (Incorporation “by reference amounts to a self-help increase in the length of the [] brief[,]” and “is a pointless imposition on the court’s time. A brief must make all arguments accessible to the judges, rather than ask them to play archeologist with the record.”)).

Here, Petitioner has generically identified seven “KSR Factors” that it alleges are “non-limiting rationales that support a finding of obviousness.” Pet. 18–19. In the portions of the Petition discussing obviousness (i.e., Grounds 2–4 and 6), Petitioner does not address specifically any of these

factors, however. Rather, Petitioner cites to the declaration of Dr. Lander and identifies several different “KSR Factors,” after making a conclusory statement that a skilled artisan “would know” to combine the references in the manner claimed. *See id.* at 51–52, 54–56, 58–61, 64, 69, 75. Allowing Petitioner to incorporate by reference the numerous additional arguments regarding motivation to combine from Dr. Lander’s Declaration would serve to circumvent the page limits imposed on petitions for *inter partes* review, while imposing on our time by asking us to sift through and address arguments the Petitioner did not believe were significant enough to include in the Petition. This is improper. Therefore, we do not consider the arguments regarding a motivation to combine that are not made in the Petition, but are instead only incorporated by reference through citations to Dr. Lander’s Declaration.⁴

b. Objective Evidence of Nonobviousness

Patent Owner argues that evidence of commercial success, licensing, and industry praise demonstrates the non-obviousness of the claimed invention. PO Resp. 56. First, for commercial success, Patent Owner identifies the TP-1 product, which is allegedly marked with the ’034 patent, as having created an entirely new market for transient detection that has generated over a million dollars in sales through 10 years. *Id.* at 57–58

⁴ Even if we were to address Dr. Lander’s evaluation of the “KSR Factors,” it would not change our decision in this case because they rely consistently on conclusory remarks that describe what a skilled artisan could have done once presented with the prior art references, rather than explaining why a skilled artisan would have selected the references and combined them to arrive at the claimed invention.

(citing Ex. 2016, ¶¶ 9–12; Ex. 2015, ¶¶ 6–7). Second, for evidence of licensing, Patent Owner identifies its own license to the '034 patent, arguing that it took this license because the “patented system of dynamic pressure transducers and digital technology to monitor pipelines for indefinite periods of time” is unique because “the system activates a high speed data recorder to record the event 100x/second.” *Id.* at 59 (citing Ex. 2017, ¶¶ 16–17; Ex. 2002). Third, for industry praise, Patent Owner identifies a research paper wherein the author characterized the TP-1 products as the “best commercially available unit on the market for the purpose of continuous longterm transient pressure monitoring of water and wastewater systems” and a report by one of the users of the TP-1 product who states that “[a] unique feature of the calibration was the use of transient pressure recorders capable of capturing dynamic pressure readings up to 1,000 Hz during surge.” *Id.* at 59–60 (citing Ex. 2007, 83; Ex. 2011, 2–3).

In addition, Patent Owner notes that Petitioner has represented that standard pressure monitors miss “transient spikes” because to detect such transients a system “[m]ust have a High sample rate,” and that “[s]ample rates of 1 s/s, 16 s/s or 32 s/s are inadequate.” *Id.* at 61–62 (citing Ex. 2008, 46, 48, 53; Ex. 2003, 1 (noting that a high sample rate provides an innovation to detect pressure transients that are often invisible at lower resolutions)).

“[W]hen secondary considerations are present, though they are not always dispositive, it [would be] error not to consider them.” *In re Kao*, 639 F.3d 1057, 1067 (Fed. Cir. 2011). We evaluate the strength of Patent Owner’s evidence, however, by assessing whether it is “reasonably commensurate with the scope of the claims” and whether it has “a nexus . . .

[to] the merits of the *claimed invention*.” *Id.* at 1068. Patent Owner must establish a connection between its evidence and the claimed invention for it to have “substantial weight.” *Id.* How much weight afforded Patent Owner’s evidence depends on “the degree of the connection between the features presented in evidence and the elements recited in the claims.” *ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1221 (Fed. Cir. 2016); *see Merck & Cie v. Gnosis S.P.A.*, 808 F.3d 829, 837 (Fed. Cir. 2015) (“To the extent that the [Patent Owner] demonstrates the required nexus, [the] objective evidence of nonobviousness will be accorded more or less weight.”). For the following reasons, though we find that evidence of commercial success, licensing, and industry praise is present here, we also find that this evidence is entitled to limited weight.

Patent Owner presents un rebutted evidence that the TP-1 was a commercialized product that practiced the invention and received some praise. Patent Owner asserts that the TP-1 was “marketed as an improvement over prior art solutions because it detects transients that were undetectable using conventional systems,” but argues that the TP-1 was successful because “[n]othing prior to the TP-1 was available in the marketplace” and the TP-1 thus “created a new market, a market for transient detection.” PO Resp. 58. However, the ’034 patent acknowledges that prior art systems for detecting transients do, in fact, exist, though it asserts that prior art systems “continuously record pressure at a constant rate” and thus “do not have the flexibility to present detailed data concerning sharp transient pressures.” Ex. 1001, 2:28–35. Patent Owner does not persuasively tie the alleged commercial success to this allegedly novel feature of increasing data sampling rates and/or data recording rates during

transient detection, or to any other allegedly novel feature claimed in the '034 patent.

We also note that Patent Owner merely provides us with some information about the amount revenue it has generated without giving us any persuasive contextual information that would allow us to evaluate whether that amount of revenue is indicative of success or not. *See In re Applied Materials*, 692 F.3d 1289, 1299 (Fed. Cir. 2012) (“Just as the number of units sold without evidence of the market share is only weak evidence of commercial success, . . . so too is an assertion of market share lacking in sales data.”).

Regarding the evidence of licensing activity and industry praise, we accord this evidence limited weight for similar reasons. The praise that the TP-1 product received, and the alleged reason Patent Owner sought to license the '034 patent, was the fact that the configuration of the TP-1 product could detect rapid transients lasting less than one second. The claimed invention of the '034 patent, however, covers more broadly temporary pressure fluctuations lasting both more and less than one second (*see supra* II(D)(1)). As a result, the claims are considerably broader than the particular feature that received praise and motivated Patent Owner to license the '034 patent. Patent Owner fails to persuasively tie this alleged evidence to the specific novel features claimed in the '034 patent that were not present in the prior art. *See ClassCo*, 838 F.3d at 1221–22 (“Here, because [the] claims . . . are considerably broader than the particular features praised in the articles, it would be reasonable . . . to assign this evidence little weight.”).

We find the *Hiniker* case to be instructive for this issue also. In *Hiniker*, the specification of the patent highlighted operational advantages enabled by the claimed invention and the patent owner submitted objective evidence similarly supportive of the operational advantages, but because those operational advantages were not a recited part of the claimed invention, the Federal Circuit did not find the objective evidence to be commensurate with the claim scope. *Hiniker*, 150 F.3d at 1368–69. “The invention disclosed in *Hiniker*’s written description may be outstanding in its field, but the name of the game is the claim.” *Id.* at 1369.

The same is true in this case because the scope of the claims in the ’034 patent are substantially broader than a transient pressure detection system that detects temporary pressure fluctuations lasting less than one second. Thus, although we have factored into our obviousness analysis Patent Owner’s objective evidence of nonobviousness, we have found it to be of limited weight.

c. Analysis of Claims 4 and 6–8 in View of Palusamy and Worthington (Ground 2)

i. Overview of Worthington

Worthington seeks to provide “a system of autonomous sensors for the inspection of pipelines, bridges, buildings and other structures.” Ex. 1010, 1:8–10. The general components of the system include the following: sensors, pre-amplifiers, remote acoustic processors and central acoustic signal processors. *Id.* at 1:10–13. Worthington asserts the disclosed system provides non-destructive testing that identifies and localizes deterioration of a structure by using a series of sensors to detect and record acoustic emissions of distress. *Id.* at 1:60–65. “An important aspect of the invention

is that a transient or sound associated with an indicator of deterioration is precisely timed at its location of reception.” *Id.* at 1:55–57.

For example, for a prestressed concrete cylinder pipe in which hydrophones are inserted in the pipe while the pipe is in use, “[t]he hydrophones listen for sounds which are consistent with the breaking of the pre-tensioned reinforcements.” *Id.* at 2:28–32. Deterioration of the concrete pipe walls reduces the load-carrying capability of the prestressing wire and causes the wire to break, which results in energy release, some of which is in the form of acoustic energy that propagated through the wall of the pipe and into the column of water within the pipe. *Id.* at 3:10–19. “Each energy release propagates a transient acoustic signal through the pipe” and “[t]he hydrophones detect those acoustic transients.” *Id.* at 3:22–24. The hydrophones are “tuned to recognize a significant sound that emanates from a breaking or moving reinforcement.” *Id.* at 2:43–45. “The sound of failure of the prestressed wire is what is used to trigger the sound and time recordings in the memory.” *Id.* at 5:34–36.

Co-located with each hydrophone at the data sampling site is a global position satellite system (“GPS”) receiver that provides precise time of detection information and exact location information. *Id.* at 3:25–31. Also co-located with each hydrophone is a “signal detector/recorder” that digitizes and analyzes the detected acoustic noise to identify transient signals that are consistent with criteria established by the system’s human operator. *Id.* at 3:34–48. “The sound of failure of the prestressed wire is what is used to trigger the sound and time recordings in the memory.” *Id.* at 5:34–36. The detected data of interest is transferred to a “signal analyzer” for classification and the data “matching the acoustic signature of structural

deterioration are identified as such.” *Id.* at 4:7–23. After a signal is identified as deterioration-related, data from adjacent hydrophones are evaluated to determine whether the same transient was detected within the signal-travel-time of the original hydrophone and, if so, computations are performed to determine the location of origin of the deterioration are performed. *Id.* at 4:30–52. As a result, “the location of points of deterioration are determined, and the purpose of the [system Worthington discloses] is performed.” *Id.* at 4:55–56.

ii. *Claim 4*

Claim 4
“4. The method of claim 3, further comprising identifying a source of a transient pressure using two or more dynamic pressure sensors”

Petitioner contends that the combined teachings of Palusamy and Worthington teach or suggest the elements of claim 4 for the following reasons. Palusamy shows “the presence of an additional dynamic transient pressure sensor,” both of which are located at a respective “critical location.” Pet. 48 (citing Ex. 1009, 6:1–16, Fig. 5). Palusamy provides an example in which the system is monitoring the pressure at only one of the “critical locations,” but because of the known factors about the environment at those locations, the pressures from a first critical location can be used to calculate the pressure at another critical location. *Id.* at 48–49 (citing 6:1–4, 11:1–12:25, Fig. 5).

Petitioner turns to Worthington’s disclosure of a system that records soundwaves associated with an indicator of structural deterioration using multiple sensors (e.g., hydrophones) to detect the origin of the deterioration. *Id.* at 49–50 (citing Ex. 1010, 2:5–7, 4:30–48). Worthington teaches that the

sensors “may also include water pressure, water temperature and water velocity sensors.” *Id.* at 50 (citing Ex. 1010, 1:14–15, 1:36–37). From these disclosures, Petitioner concludes,

[a person of skill in the art] would know to combine Palusamy’s teachings of multiple additional dynamic transient pressure sensors and data obtained from such multiple sensors with Worthington’s teachings of using multiple sensor data to determine the source of dynamic transient pressure.

Pet. 51 (citing Ex. 1002, ¶ 163).

Petitioner’s reasoning is unpersuasive to show that a skilled artisan would have had a rationale to combine Palusamy and Worthington in the way claim 7 recites. We find *Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987 (Fed. Cir. 2017), to be analogous to the facts before us. In that case, the Federal Circuit held the Board erred by accepting petitioner’s rationale that “a person of ordinary skill in the art reading [the prior art] would have understood that the combination of [the prior art] would have allowed for the selective access features of [one reference] to be used with [the other reference’s] content-dependent identifiers feature.” *Personal Web Techs.*, 848 F.3d at 993. This reasoning was held to “say no more than that a skilled artisan, once presented with the two references, would have understood that they *could be* combined.” *Id.* “And that is not enough: it does not imply a motivation to pick out those two references and combine them to arrive at the claimed invention.” *Id.* at 993–994 (citing *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.”)).

Similarly, here, Petitioner merely makes a conclusory statement that a skilled artisan “would know” to combine Palusamy and Worthington in the manner recited to determine the source of a dynamic transient pressure.

Pet. 51. Nothing in Petitioner’s conclusory statement explains why a skilled artisan would have had reason to combine these two references to arrive at the claimed invention, however.

When we consider Worthington, as a whole, for what it fairly suggests to one of ordinary skill in the art, it is clear that it teaches the use of sensors that are tuned to recognize significant sounds emanating from a structure, which are indicative of structural deterioration in the structures. Ex. 1010, Abstract, 1:63–2:4, 2:27–32, 2:43–45, 3:10–24, 4:23–24. Worthington teaches “[t]he sound of failure . . . is what is used to trigger the sound and time recordings.” *Id.* at 5:34–36. For example in the context of deterioration noises from a prestressed concrete pipe, “the snapping of a prestressed wire or the grinding noises associated with movement and re-anchoring of broken ends of the wire are sensed.” *Id.* at 6:3–8. A “[s]tructural deterioration is identified in those instances when the signature of the emission matches the known emission of deterioration.” *Id.* at 2:2–4, 4:22–23.

Palusamy, on the other hand, teaches using sensors to measure the working environment in which the structures are operating to determine the amount stress and fatigue the components have endured. *See* Ex. 1009, Abstract, 3:17–22 (“The apparatus and methods described herein . . . can be applied to any process plant, or even individual components or systems subject to fatigue loadings due to fluid flow, thermal and pressure transients.”). In Palusamy, the sensors are placed at selected “critical

locations” to obtain measurements at those locations to provide data for calculation of fatigue accumulation. *See id.* at Abstract, 6:3–4.

Thus, while both references may relate to measuring pressure fluctuations, Worthington teaches measuring fluctuations caused by sounds emanating from a deteriorating structure and Palusamy teaches measuring fluctuations caused by the operation of a system. In other words, Palusamy is concerned with evaluating the operating conditions within a structure, whereas Worthington is concerned with evaluating the integrity of the structure itself. Although the principles of physic used by these different applications are similar, this fact alone fails to explain why a skilled artisan would have modified how Palusamy applies those principles with the way Worthington applies them.

Given these difference between the teachings of Palusamy and Worthington, we do not find Petitioner has shown persuasively why a skilled artisan would have had reason to combine the teachings of these two references in a manner that would result in the claimed invention. Weighing the totality of the evidence, including Patent Owner’s evidence regarding secondary considerations, we find Petitioner has not shown by a preponderance of the evidence that claim 4 is unpatentable because it would have been obvious to a skilled artisan at the time of the invention in view of Palusamy and Worthington.

iii. Claim 6

Claim 8
“6. The method of claim 3, further comprising identifying an unknown or illegal diversion of pressure.”

Petitioner contends that the combined teachings of Palusamy and Worthington disclose the elements of claim 6 for the following reasons. Palusamy shows an additional dynamic transient pressure sensor installed in a fluid chamber. Pet. 51; *see id.* at 34 (citing Ex. 1009, 3:31–36, 3:68–4:3, 6:1–4, Fig. 5; Ex. 1002, ¶¶ 122–124). Worthington teaches “a system for identifying a source of transient pressure caused by an unknown diversion of fluid from a pipe” because the system “is capable of identifying a leak.” *Id.* at 51 (citing Ex. 1010, 10:17–20, 8:47–54, 2:27–34). Petitioner adds that the operation of Worthington’s sensors measuring acoustic transients caused by sounds generated from a deteriorating structure uses the same principles of physics as the sensors Palusamy uses to measure pressure transients in the operating fluid. *Id.* at 51–52 (citing Ex. 1002, ¶¶ 164–168). From this, Petitioner concludes,

[a person of skill in the art] would know to combine Palusamy’s teachings of collecting transient pressure sensor data with Worthington’s teachings of using the transient pressure sensor data to identify the transient pressure source as a point of illegal or unknown diversion.

Pet. 52 (citing Ex. 1002, ¶ 169).

Petitioner’s reasoning is unpersuasive to show a reason that a skilled artisan would have combined Palusamy and Worthington in the way claim 6 recites. Similar to claim 4 above, Petitioner simply makes a conclusory statement that a skilled artisan “would know” to combine Palusamy and Worthington in the manner recited to determine the transient pressure source. *Id.* Nothing in Petitioner’s conclusory statement implies a rationale to pick out the two references and combine them to arrive at the claimed invention, however. *See Personal Web Techs.*, 848 F.3d at 993–94.

Given the difference between the teachings of Palusamy and Worthington, as discussed above for claim 4, we do not find Petitioner has shown persuasively why a skilled artisan would have had a reason to pick out these two references and combine them in a manner that would result in the claimed invention. Therefore, considering the totality of the evidence, we find Petitioner has not shown by a preponderance of the evidence that claim 6 is unpatentable because it would have been obvious to a skilled artisan at the time of the invention in view of Palusamy and Worthington.

iv. Claim 7

Claim 7
“7. The method of claim 1, further comprising recording time of transient detections using a clock or timer, and determining a source of transient pressure from the time of detection and other data characteristics.”

Petitioner contends that the combined teachings of Palusamy and Worthington disclose the elements of claim 7 for the following reasons. Palusamy discloses “a clock or timer that is used to keep time (*i.e.*, record chronological time) for transient detections” and explains that the pressure data is stored with the associated time of recordation. Pet. 52–53 (citing Ex. 1009, 4:41–48, 5:54–6:16, 6:9–16, 7:44–68, 9:5–12; Ex. 1002, ¶¶ 170–173). Worthington “discloses that the time of transient detection of two sensors (one upstream sensor and one downstream sensor) can detect the source of transient pressure.” *Id.* at 53–54 (citing Ex. 1010, 4:30–48). From this, Petitioner concludes,

[a person of skill in the art] would know to combine Palusamy’s teachings of using a clock or timer for recording time of

transient detections with Worthington’s teachings of determining transient pressure source.

Id. at 54 (citing Ex. 1002, ¶ 177).

Petitioner’s reasoning is unpersuasive to show a reason that a skilled artisan would have combined Palusamy and Worthington in the way claim 7 recites. Similar to claim 4 above, Petitioner simply makes a conclusory statement that a skilled artisan “would know” to combine Palusamy and Worthington in the manner recited to determine the transient pressure source. *Id.* Nothing in Petitioner’s conclusory statement implies a rationale to pick out the two references and combine them to arrive at the claimed invention, however. *See Personal Web Techs.*, 848 F.3d at 993–94.

Given the difference between the teachings of Palusamy and Worthington, as discuss above for claim 4, we do not find Petitioner has shown persuasively why a skilled artisan would have had a reason to pick out these two references and combine them in a manner that would result in the claimed invention. Therefore, considering the totality of the evidence, we find Petitioner has not shown by a preponderance of the evidence that claim 7 is unpatentable because it would have been obvious to a skilled artisan at the time of the invention in view of Palusamy and Worthington.

v. *Claim 8*

Claim 8
“8. The method of claim 7, wherein the clock or timer is a Global Positioning System receiver.”

Because claim 8 depends from claim 7, which has not been shown to be unpatentable (*see supra* II(E)(2)(c)(iv)), Petitioner has not shown by a preponderance of the evidence that claim 8 is unpatentable. *See Callaway*

Golf Co. v. Acushnet Co., 576 F.3d 1331, 1344 (Fed. Cir. 2009) (a dependent claim cannot be invalid because of anticipation or obviousness unless the independent claim from which it depends was also found invalid).

Additionally, Petitioner’s reasoning is unpersuasive to show a reason that a skilled artisan would have combined Palusamy and Worthington in the way claim 8 recites. Petitioner asserts that because Palusamy discloses using a clock or timer to store pressure sensor data with the associated time it was recorded and because Worthington discloses using a GPS as a clock or timer, a person of ordinary skill “would know to combine the clock or timer disclosed in Palusamy with Worthington’s discloser of a GPS that performs the function of a clock or timer.” Pet. 54 (citing Ex. 1009, 3:31–34, 7:44–68; 4:41–48; 5:54–6:16; 9:5–12; Ex. 1010, 1:51–44; Ex. 1002, ¶¶ 178–180). Petitioner simply makes a conclusory statement that a skilled artisan “would know” to combine Palusamy and Worthington in the manner recited. *Id.* Nothing in Petitioner’s conclusory statement implies a rationale to pick out the two references and combine them to arrive at the claimed invention, however. *See Personal Web Techs.*, 848 F.3d at 993–94.

Given the differences between Palusamy and Worthington, as discuss above for claim 4, we do not find Petitioner has shown persuasively why a skilled artisan would have had a reason to modify Palusamy’s sensors to have GPS co-located with each sensor as a clock or timer to determine the precise time of detection and the exact location of the sensor. Palusamy teaches a system that has an “input database 60 [that] contains: . . . component identification information, including *sensor locations*.” Ex. 1009, 4:31–36. Palusamy places its sensors at selected “critical locations” to obtain measurements at those specific locations to provide data for

calculation of fatigue accumulation at those locations. *See id.* at Abstract, 6:3–4. It is unclear why a skilled artisan would have had a need to locate GPS at each of the sensors to determine its location. In addition, Palusamy teaches a host computer that records the times at which the pressures were record (Ex. 1009, 5:65–68), thus it is also unclear why a skilled artisan would have had a need to locate GPS at each of the sensors to determine the time of detection of the transient pressures. Therefore, for the reasons above and this additional reason, Petitioner has not shown by a preponderance of the evidence that claim 8 is unpatentable because it would have been obvious to a skilled artisan at the time of the invention in view of Palusamy and Worthington.

vi. Claims 11–15 and 17

Because claims 11–15 and 17 each depend from claim 9, which has not been shown to be unpatentable (*see above* II(E)(1)(f) and below II(E)(2)(f)), Petitioner has not shown by a preponderance of the evidence that claims 11–15 and 17 are is unpatentable in view of Palusamy and Worthington. *See Callaway Golf Co*, 576 F.3d at 1344.

*d. Analysis of Claim 16 in View of Palusamy and ZIP
(Ground 3)*

Because claim 16 depends from claim 9, which has not been shown to be unpatentable (*see above* II(E)(1)(f) and below II(E)(2)(f)), Petitioner has not shown by a preponderance of the evidence that claim 16 is unpatentable in view of Palusamy and ZIP. *See Callaway Golf Co.*, 576 F.3d at 1344.

e. Analysis of Claims 1, 3, 5, and 18 in View of Palusamy and McCracken (Ground 4)

“[I]t is well settled that ‘a disclosure that anticipates under § 102 also renders the claim invalid under § 103, for anticipation is the epitome of obviousness.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). Petitioner has already shown by a preponderance of the evidence that Palusamy alone anticipates claims 1, 3, 5, and 18 (*see above* II(E)(1)(b), II(E)(1)(d), II(E)(1)(e), II(E)(1)(g)). For substantially the same reasons discussed above, we determine on this record that Palusamy teaches or suggests each of the limitations of claims 1, 3, 5, and 18. On this record, and having considered the totality of the evidence including Patent Owner’s evidence regarding secondary considerations, we determine Petitioner has established by a preponderance of the evidence that claims 1, 3, 5, and 18 are unpatentable in view of the combined teachings of Palusamy and McCracken.

f. Analysis of Claims 9 and 10 in View of Palusamy (Ground 5)

Petitioner’s obviousness analysis of claim 9 in view of Palusamy is limited to addressing a potential deficiency with Palusamy to not disclosing the element, “permanently recording the pressure data in the buffer.” Pet. 70–71. Petitioner argues that any difference between the recited “buffer” and Palusamy’s database 62 “is simply a matter of semantics.” *Id.* Accepting this argument, however, still fails to remedy the deficiency with Palusamy to teach or suggest elements 9.5, 9.7, and 9.8 discussed above (*see*

above II(E)(1)(f)). Therefore, Petitioner has not shown by a preponderance of the evidence that claim 9 would have been obvious in view of Palusamy.

Because claim 10 depends from claim 9, which has not been shown to be unpatentable, Petitioner has not shown by a preponderance of the evidence that claim 10 is unpatentable. *See Callaway Golf Co.*, 576 F.3d at 1344.

g. Analysis of Claim 11 in View of Palusamy, Worthington, and Kurisu (Ground 6)

Because claim 11 depends indirectly from claim 9, which has not been shown to be unpatentable (*see above* II(E)(1)(f) and II(E)(2)(f)), Petitioner has not shown by a preponderance of the evidence that claim 11 is unpatentable in view of Palusamy, Worthington, and Kurisu. *See Callaway Golf Co.*, 576 F.3d at 1344.

3. Summary Conclusions of Petitioner's Unpatentability Challenges of Claims 1–18

For the foregoing reasons, Petitioner has shown by a preponderance of evidence that claims 1–3, 5, and 18 of the '034 patent are unpatentable, but it has not shown that claims 4 and 6–17 are unpatentable.

F. Patent Owner's Motion to Amend

Patent Owner has filed a contingent motion to amend the '034 patent. PO MTA 1. Patent Owner seeks to amend the '034 patent by substituting proposed claim 19–26 for respective issued claims 1–4, 7, 9, 17, and 18, all “contingent upon a finding of unpatentability with respect to the original challenged claims.” *Id.* We have determined above that issued claims 1–3 and 18 are unpatentable, but not issued claims 4, 7, 9, and 17. Therefore, we

address proposed claims 19–21 and 26 below, but Patent Owner’s Motion to Amend regarding proposed claims 22–25 is dismissed as moot.

Patent Owner contends that proposed claims 19–21 and 26 narrow the scope of their corresponding issued claims by adding limitations directed to the detection of fast transient pressures having a duration of less than one second. *Id.* at 3–4. Proposed claims 19–21 and 26 recite:⁵

[19.P] A method for detecting dynamic pressures comprising:

[19.1] installing a dynamic transient pressure sensor in an operating fluid chamber for sensing operating pressure,

[19.2] measuring fluid pressures in the operating fluid chamber, wherein the dynamic transient pressure sensor is configured to detect at least dynamic transient pressures having a duration of less than one second,

[19.3] transmitting data sample information from the dynamic transient pressure sensor to a receiver and signal processor,

[19.4] recording data sample information in a temporary buffer at a predetermined interval, the predetermined interval being less than one second, and

[19.5] analyzing the data samples with the signal processor,

[19.6] identifying dynamic transient pressures in the operating fluid chamber when a variation in the data samples exceeds a threshold level,

[19.7] increasing ~~data sampling rates and/or data~~ recording rates during dynamic transient pressure detection until pressures reach steady state,

⁵ In the proposed claims, material deleted from the issued claims is shown by a strike-through and material added to the issued claims is shown by underlining. See 37 C.F.R. §§ 1.121(c)(2), 42.121(b).

[19.8] storing dynamic transient pressure data in internal memory, the internal memory being permanent storage, and

[19.9] analyzing and displaying collected data ~~alone or with other kinds of data from other sources~~, using a data management program.

[20] The method of claim 1, further comprising defining a plurality of transient pressure parameters, wherein the threshold level comprises the plurality of transient pressure parameters.

[21] The method of claim 1, further comprising installing multiple dynamic transient pressure sensors in an operating fluid chamber

[26.P] A method of monitoring pressure comprising:

[26.1] installing transient pressure sensors within an operating fluid chamber, wherein the dynamic transient pressure sensors are each configured to detect at least dynamic transient pressures having a duration of less than one second,

[26.2] establishing predetermined data sampling rates,

[26.3] establishing predetermined sample data recording rates,

[26.4] establishing transient pressure parameters that define a threshold level,

[26.5] measuring fluid pressures in the operating fluid chamber,

[26.6] transmitting fluid pressure sample data to a receiver and signal processor,

[26.7] recording sample data at the predetermined recording rates,

[26.8] analyzing sample data,

[26.9] comparing sample data to the transient pressure parameters that define a threshold level for identifying transient pressures,

[26.10] increasing data sampling rates and data recording rates during transient detection,

[26.11] storing transient data in internal memory,

[26.13] returning data sampling rates and data recording rates to predetermines rates when sample data returns to non-transient pressure parameters.

PO MTA 17–18, 21–22. Patent Owner contends that the original disclosure of the '034 patent supports each element of proposed claims 19–21 and 26 and that no new matter has been added by the amendments. *Id.* at 5–8, 10–11. In addition, Patent Owner contends that the amendments in proposed claims 19–21 and 26 are responsive to Petitioner’s alleged grounds of unpatentability because they add or clarify the uniqueness of the claimed invention over the cited prior art, which did not appreciate the possibility of fast transient pressures having a duration of less than one second. *See id.* at 12–15.

In a *inter-partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend. 35 U.S.C. § 316(d). When assessing the patentability of the proposed substitute claims, “the burden of persuasion ordinarily will lie with the petitioner to show that any proposed substitute claims are unpatentable by a preponderance of the evidence.” *Lectrosonics, Inc. v. Zaxcom, Inc.*, Case IPR2018-01129, slip op. at 4 (PTAB Feb. 25, 2019) (Paper 15) (precedential). Before we evaluate the patentability of Patent Owner’s proposed substitute claims, however, we first must consider whether the proposed claims satisfy the threshold statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.221. *Id.* at 4–10. Accordingly, Patent Owner must demonstrate (1) the amendment responds

to a ground of unpatentability involved in the trial; (2) the amendment does not seek to enlarge the scope of the claims of the patent; (3) the amendment proposes a reasonable number of substitute claims; and (4) the amendment does not introduce new subject matter and has written description support in the original disclosure. *Id.*

Petitioner does not argue that Patent Owner’s proposed amendments are unreasonable in number, non-responsive to the alleged grounds of unpatentability, or enlarge the scope of the claims. *See* Pet. Opp. MTA 1–25. We determine on this record that Patent Owner has complied with these requirements. Patent Owner proposes only one substitute claim to replace each challenged claim, which is presumptively reasonable. 37 C.F.R. § 42.121(a)(3) (A reasonable number of substitute claims, by rebuttable presumption, is “one substitute claim . . . to replace each challenged claim.”). We agree with Patent Owner that the amendments proposed to claims 19–21 and 26 serve to narrow issued claims 1–4, 7 and 18, respectively, by adding limitations without removing any substantive limitations. Finally, we agree that Patent Owner’s amendments address an issue that was central to Petitioner’s alleged grounds of unpatentability—namely, whether Palusamy discloses a system configured to detect fast transient pressures having a duration of less than one second.

Petitioner argues, however, that Patent Owner’s motion to amend should be denied because proposed claims 19 and 26 introduce new matter

that lacks written description support in the original disclosure and because Palusamy anticipates claims 19, 20, and 26.⁶ Pet. Opp. MTA 6–21.

1. *Claims 19 and 26 Do Not Introduce New Matter*

A motion to amend “may not . . . introduce new matter.” 35 U.S.C. § 316(d)(3). New matter is any matter that lacks support in the original application. *See TurboCare Div. of Demag Delaval Turbomach. v. General Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001) (“When [an] applicant adds a claim . . . the new claim[] . . . must find support in the original specification.”). A proposed claim that introduces new matter is properly rejected under 35 U.S.C. § 112 for lack of written description. *See, e.g., In re Rasmussen*, 650 F.2d 1212, 1214 (CCPA 1981) (“The proper basis for rejection of a claim amended to recite elements thought to be without support in the original disclosure, therefore, is § 112, first paragraph . . .”). Thus, a proposed claim does not introduce new matter when the written description in the original application “reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). For this reason, our Rules require a motion to amend to set forth “[t]he support in the original disclosure of the patent for each claim that is added or amended.” 37 C.F.R. § 42.121(b)(1).

Patent Owner identifies on an element-by-element basis specific portions of the original disclosures for the ’034 patent where written description support can be found for proposed claims 19 and 26. PO MTA

⁶ Although the headings in Petitioner’s brief state that the substitute claims are “either anticipated or rendered obvious” by the prior art, Petitioner’s argument relies solely on anticipation. *See* Pet. Opp. MTA 18–21.

5–7, 10–11. After reviewing these cited portions of the '034 patent's original disclosure, we find the proposed amendments are supported by the written description and no new matter has been added.

Petitioner argues that the written description support in the original disclosures⁷ for the '034 patent is deficient for the following amendments: (1) “wherein the dynamic transient pressure sensor is configured to detect at least dynamic pressures having a duration of less than one second”; (2) “a predetermined interval, the predetermined interval being less than one second”; and (3) “a first, higher sampling rate that is faster than one sample per second”. Pet. Opp. MTA 6–18. We disagree for the following reasons.

- a. *“wherein the dynamic transient pressure sensor is configured to detect at least dynamic pressures having a duration of less than one second”*

Petitioner argues Patent Owner's evidence of written description support for “wherein the dynamic transient pressure sensor is configured to detect at least dynamic pressures having a duration of less than one second” is insufficient because the specification of '034 patent discloses many different possible ranges and descriptions for the pressure fluctuation duration, “*i.e.*, does not find blaze marks that single out particular trees,” which would not allow a skilled artisan “to ***immediately*** discern the less-than-one-second limitations.” *Id.* at 16–17 (citing *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1326 (Fed. Cir. 2000); *see id.* 6–14). The

⁷ Petitioner generally cites to the '034 Patent specification and not the originally filed Specification for U.S. Application No. 10/927,120 because “there is no meaningful difference between the originally filed Specification and the '034 Patent specification.” Pet. Opp. MTA 7 n. 6. Accordingly, we will do the same.

specification of the '034 patent specifically discloses that a dynamic pressure sensor *may* be configured to detect “the most severe transient pressures,” some of which “will have a duration of less than one second.” Ex. 1001, 3:23–26, 2:41–44. In addition, as Petitioner concedes, the '034 patent specification illustrates an example in which the configuration of the pressure sensors of the preferred embodiment is such that a transient pressure having a duration of .5 seconds is detected, which is a dynamic pressure having a duration of less than one second. Ex. 1001, 6:32–42, Fig.1; see Pet. Opp. MTA 8–10. We find this evidence from the specification of '034 patent sufficient to show the inventor actually invented the invention claimed. *Ariad Pharms.*, 598 F.3d at 1352 (“[T]he written description requirement does not demand either examples or an actual reduction to practice; a constructive reduction to practice that in a definite way identifies the claimed invention can satisfy the written description requirement.”).

Petitioner’s argument does not have merit because the claim language does not include details that do not appear in the written description. Similar to *Synthes USA, LLC v. Spinal Kinetics, Inc.*, “[t]he written-description question here is the familiar one involving whether the claim language is simply too broad given the disclosure—notwithstanding that claim language may be and commonly is broader than described embodiments, as it identifies what aspects of the disclosed embodiments matter.” 734 F.3d 1332, 1346 (Fed. Cir. 2013). Here, Petitioner essentially argues that the proposed amendment broadly covers “dynamic pressures having a duration of less than one second,” whereas the specification only discloses a dynamic pressure having a duration of about .5 seconds. Pet. Opp. MTA 8–10. We

find that a skilled artisan would immediately recognize that the exemplary embodiment could detect dynamic pressures having a duration of less than one second and, thus, the differences between the embodiment disclosed and what is more broadly claimed are immaterial. *See Synthes USA*, 734 F.3d at 1347.

- b. *“a predetermined interval, the predetermined interval being less than one second”// “a first, higher sampling rate that is faster than one sample per second”*

Petitioner argues Patent Owner’s evidence of written description support for “a predetermined interval, the predetermined interval being less than one second” and “a first, higher sampling rate that is faster than one sample per second” is insufficient “[f]or substantially similar reasons” argued for “wherein the dynamic transient pressure sensor is configured to detect at least dynamic pressures having a duration of less than one second.” Pet. Opp. MTA 17. We find Petitioner’s argument unpersuasive for reasons substantially similar to those discussed above (*see supra* II(F)(1)(a)).

2. *Petitioner Has Not Shown Claims 19–21 Are Unpatentable*

Petitioner argues that Palusamy anticipates proposed claim 19. Pet. Opp. MTA 18–19. Petitioner contends that Palusamy’s description of a high-speed digitizer with a typical sampling rate of about 200,000 samples per second, as well as the use of a 10 samples per second sampling rate during transient state, discloses proposed claim element 19.4. *See id.* (citing Ex. 1009, 3:51–53, 7:12–14; Ex. 1016, ¶¶ 84–88). We are not persuaded, however.

Claim element 19.4 recites,

[19.4] recording data sample information in a temporary buffer at a predetermined interval, the predetermined interval being less than one second

PO MTA 17. Proposed claim element 19.4 requires a signal processor to record sensor signal data in a temporary buffer at a high sample rate, which is a rate faster than one sample per second. Although Petitioner does not identify what it contends is the “temporary buffer” in Palusamy, Petitioner has taken the position in this proceeding that the temporary buffer in Palusamy is its “rotating storage 90,” which is used throughout steady operating conditions. Pet. Sur-Reply 4–5.

Petitioner’s argument for proposed claim element 19.4 fails to specifically address the amended language proposed and clearly show how Palusamy discloses the added limitations. Pet. Opp. MTA 18–19. Instead, Petitioner identifies the fact that Palusamy discloses sensors that may be sampled at a rate of between 10 and 200,000 samples per second, which is clearly faster than one sample per second. *Id.* The problem with Petitioner’s argument for proposed claim element 19.4, however, is that it does not show persuasively that, in Palusamy, *the signal processor records* the data samples in a temporary buffer at a high sample rate or at predetermined intervals of less than one second. A “sampling rate” is not necessarily equal to the “storing rate” because “sampling rate” refers to the number of readings a digitizer or digital sensor takes during a time window, which is separate and distinct from the storing rate, which is the number of sensor sample readings a computer collects to place in memory. See Pet. Reply 16–17. Even though Palusamy teaches a sampling rate of at least 200 samples per 20 second time window, this does not necessarily mean computer 12

actually collects and records all of the at least 200 samples to temporarily store them in memory during steady operating conditions. Thus, accepting Palusamy discloses sampling the sensors at a high sampling rate, we still find Petitioner has not shown that the signal processor in Palusamy records the sampled signal data in the rotating storage (i.e., temporary buffer) at a high sample rate (i.e., at predetermine intervals that are less than one second).

Palusamy discloses that its signal processor has two modes of recording—steady state recording and transient state recording. “Transient recording retains a great deal more data than steady state recording.” Ex. 1009, 7:5–6. “Data is sampled *and collected* for a time window of preferably 20 seconds for each sensor.” *Id.* at 6:19–21 (emphasis added). During steady state recording, “4 or 5 samples [are] *collected* [for a 20 second window]” from the sensors and compared to a threshold level that determines whether a transient has occurred. *Id.* at 5:54–59 (emphasis added). Rotating storage is updated as long as the sensor values of the steady state recordings are within the defined threshold range. *Id.* at 5:59–60, 6:61–68. On the other hand, if the sensor values of the steady state recordings are outside the defined threshold range, then the signal processor switches from steady state recording to transient recording. *Id.* at 7:1–5. During transient recording, the signal processor begins “high speed recording” and the “rotating storage is not updated as in the steady state case and all samples get stored.” *Id.* at 7:45–49. “[R]ather than 4 or 5 datapoints being kept [for a 20 second window] as in steady state recording, hundreds of data points are kept.” *Id.* at 7:9–11. Once the signal values during transient recording stay within the threshold range for a period of time, “high

speed recording would stop . . . and resumption of the updating of rotating storage would occur” (i.e., steady state recording resumes). *Id.* at 7:57–61. In view of Palusamy’s description of the disclosed system, we find that it does not disclose a signal processor that records sensor signal data in the rotating storage (i.e., a temporary buffer) at a predetermined interval that is less than one second. We find that Palusamy discloses a system in which the signal processor only receives and records sampled sensor data during steady state conditions at predetermined intervals *greater than one second*. Petitioner, thus, has not shown persuasively that Palusamy discloses at least the proposed claim elements 19.4.

Therefore, for the foregoing reasons, we find Petitioner has not proven by a preponderance of the evidence that proposed claims 19 is unpatentable in view of Palusamy.

Because Patent Owner has satisfied the necessary requirements to amend original claim 1 and substitute it with proposed claim 19, we understand proposed claims 20 and 21 to depend from *amended* claim 1 (i.e., proposed claim 19). Therefore, we find Petitioner has not shown by a preponderance of the evidence that Palusamy anticipates proposed claims 20 and 21 for the same reasons discussed above for proposed claim 19. *See Callaway Golf Co.*, 576 F.3d at 1344.

3. *Petitioner Has Shown Proposed Claim 26 Is Anticipated by Palusamy*

The only substantive change proposed claim 26 makes to original claim 18 relates to element 26.1, which recites

[26.1] installing transient pressure sensors within an operating fluid chamber, wherein the dynamic transient

pressure sensors are each configured to detect at least dynamic transient pressures having a duration of less than one second

PO MTA 17. The changes to elements 26.4 and 26.9 do not substantively alter the scope of original claim 18 because, in view of specification of the '034 patent, a skilled artisan would have already understood “transient pressure parameters . . . define a threshold level.” *See* Ex. 1001, 3:36–42. In fact, Petitioner identifies Palusamy’s disclosure of thresholds to show Palusamy teaches corresponding claim 18 elements 4 and 9. *See* Pet. 44–45. The change to element 26.5 appears merely clarifies that the “measure fluid pressures” step of original claim 18 occurs “in the operating fluid chamber,” which is where claim 18 recites the transient pressure sensors are located. Ex. 1001, 8:39–40. Therefore, we focus on whether Petitioner has shown Palusamy discloses element 26.1 of proposed claim 26.

Petitioner contends that Palusamy’s description of a high-speed digitizer with a typical sampling rate of about 200,000 samples per second, as well as the use of a 10 samples per second sampling rate during transient state, discloses proposed claim element 26.1. *See* Pet. Opp. MTA 18–19 (citing Ex. 1009, 3:51–53, 7:12–14; Ex. 1016, ¶¶ 84–88). Petitioner argues that “in the 20-second window example, Palusamy’s sampling rate of 10 samples per second is . . . capable of detecting pressure fluctuations lasting ‘less than one second.’” *Id.* at 19 (citing 1016, ¶¶ 24–87). Patent Owner agrees. Tr. 116:8–14 (“If you could sample 10 samples per second, that’s sufficient enough to detect a transient occurring less than one second.”).

After considering Petitioner’s contentions and the evidence cited in support thereof, we find Petitioner has shown persuasively that Palusamy discloses “installing transient pressure sensors within an operating fluid

chamber, wherein the dynamic transient pressure sensors are each configured to detect at least dynamic transient pressures having a duration of less than one second,” as proposed claim 26 recites. Element 26.1 merely requires the dynamic transient pressure sensors to have a sampling rate that is sufficient to detect at least dynamic transient pressures having a duration of less than one second. A high sampling rate does not necessarily require a signal processor to receive and record all of the sampled data at the high sample rate. Importantly, unlike claim 9 and proposed claim 19, proposed claim 26 does not include any limitations that require a signal processor to store in a temporary memory the sampled data at the higher sampling rate, nor does proposed claim 26 recite evaluating the higher sampling rate data to determine whether to permanently store the data received or to increase the permanent storage rate of the data received in a temporary buffer.

Therefore, in addition to the reasons we have found Palusamy anticipates original claim 18 (*see above* II(E)(1)(h)), we find Petitioner has demonstrated by a preponderance of the evidence that Palusamy anticipates proposed claim 26.

4. *Summary Conclusions for Patent Owner’s Motion to Amend*
Patent Owner has shown proposed claims 19–21 meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.221, and Petitioner has not shown by a preponderance of the evidence that these claims are unpatentable. Petitioner has shown by a preponderance of the evidence that Palusamy anticipates proposed claim 26, however. Therefore, we grant Patent Owner’s Motion to Amend with respect to proposed claims 19–21, but we deny the motion for proposed

claim 26. We additionally dismiss as moot Patent Owner's Motion to Amend regarding proposed claims 22–25.

G. Patent Owner's Unopposed Motion to Seal

Patent Owner requests that we seal Exhibit 2015 due to the inclusion of business information that Patent Owner regards as confidential. Paper 19. Petitioner has not opposed Patent Owner's request. There is a strong public policy in favor of making information filed in an inter partes review open to the public, especially because the proceeding determines the patentability of claims in an issued patent and, therefore, affects the rights of the public. *See Garmin Int'l, Inc. v. Cuozzo Speed Techs., LLC*, Case IPR2012-00001 (PTAB Mar. 14, 2013) (Paper 34). Under 35 U.S.C. § 316(a)(1) and 37 C.F.R. § 42.14, the default rule is that all papers filed in an *inter partes* review are open and available for access by the public; a party, however, may file a concurrent motion to seal and the information at issue is sealed pending the outcome of the motion. It is, however, only “confidential information” that is protected from disclosure. 35 U.S.C. § 316(a)(7); *see* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,760 (Aug. 14, 2012). The standard for granting a motion to seal is “for good cause.” 37 C.F.R. § 42.54(a). The party moving to seal bears the burden of proof in showing entitlement to the requested relief, and must explain why the information sought to be sealed constitutes confidential information. 37 C.F.R. § 42.20(c).

In reviewing the Exhibit, we conclude that it may contain confidential information. We are persuaded that good cause exists to have the redacted portions remain under seal, and the Motion to Seal is granted. Patent Owner's Motion to Seal represents that the parties agree to the Board's

default protective order set forth in the Office Patent Trial Practice Guide. The Board's default protective order is hereby entered in this proceeding.

The Office Patent Trial Practice Guide provides:

Expungement of Confidential Information: Confidential information that is subject to a protective order ordinarily would become public 45 days after denial of a petition to institute a trial or 45 days after final judgment in a trial. There is an expectation that information will be made public where the existence of the information is referred to in a decision to grant or deny a request to institute a review or is identified in a final written decision following a trial. A party seeking to maintain the confidentiality of information, however, may file a motion to expunge the information from the record prior to the information becoming public. § 42.56. The rule balances the needs of the parties to submit confidential information with the public interest in maintaining a complete and understandable file history for public notice purposes. The rule encourages parties to redact sensitive information, where possible, rather than seeking to seal entire documents.

77 Fed. Reg. at 48761.

Consequently, 45 days from entry of this Decision, all information subject to a protective order will be made public by default. In the interim, Patent Owner may file a motion to expunge any such information that is not relied upon in this Decision. *See* 37 C.F.R. § 42.56.

III. CONCLUSION

We have reviewed the Petition, Patent Owner's Response, Petitioner's Reply, Patent Owner's Sur-Reply, and Petitioner's Sur-Reply. We have considered all of the arguments made by Petitioner and Patent Owner, as well as all of the evidence cited both for and against the patentability of the challenged claims, and have weighed and assessed the entirety of this evidence as a whole.

For the reasons discussed in § II.E.1, *supra*, we are persuaded that Petitioner has demonstrated by a preponderance of evidence that claims 1–3, 5, and 18, but not claim 9, of the '034 patent are unpatentable in view of Palusamy. For the reasons discussed in § II.E.2.c, *supra*, we are not persuaded that Petitioner has demonstrated by a preponderance of evidence that claims 4, 6–8, 11–15, and 17 of the '034 patent are unpatentable over Palusamy and Worthington. For the reasons discussed in § II.E.2.d, *supra*, we are not persuaded that Petitioner has demonstrated by a preponderance of evidence that claim 16 of the '034 patent is unpatentable over Palusamy and ZIP. For the reasons discussed in § II.E.2.e, *supra*, we are persuaded that Petitioner has demonstrated by a preponderance of evidence that claims 1, 3, 5, and 18 of the '034 patent are unpatentable over Palusamy and McCracken. For the reasons discussed in § II.E.2.f, *supra*, we are not persuaded that Petitioner has demonstrated by a preponderance of evidence that claims 9 and 10 of the '034 patent are unpatentable over Palusamy. For the reasons discussed in § II.E.2.g, *supra*, we are not persuaded that Petitioner has demonstrated by a preponderance of evidence that claim 11 of the '034 patent is unpatentable over Palusamy, Worthington, and Kurisu.

Because we find claims 1–3 and 18 of the '034 patent to be unpatentable, we have also reviewed and considered Patent Owner's Motion to Amend to substitute proposed claims 19–21 and 26 for unpatentable claims 1–3 and 18, as well as Petitioner's Opposition to the Motion to Amend, and Patent Owner's Reply to the Opposition.

For the reasons discussed in § II.F, *supra*, we find proposed claims 19–21 have not been shown to be unpatentable, and grant Patent Owner's Motion to Amend for those claims. We deny Patent Owner's Motion to

Amend regarding claim 18, however, because Petitioner has shown proposed claim 26 to be unpatentable. Patent Owner's Motion to Amend regarding proposed claims 22–25 is dismissed as moot because original claims 4, 7, 9, and 17 have not been shown to be unpatentable.

For the reasons discussed in § II.G, *supra*, we find good cause exists to have the redacted portions of Ex. 2015 remain under seal, and grant Patent Owner's Motion to Seal.

IV. ORDER

Accordingly, it is

It is ORDERED that claims 1–3, 5, and 18 of the '034 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend is *granted* as to proposed claims 19–21, such that claim 1 is replaced with substitute claim 19, claim 2 is replaced with substitute claim 20, and claim 3 is replaced with substitute claim 21;

FURTHER ORDERED that Patent Owner's Motion to Amend is *denied* as to proposed claim 26, such that claim 18 will not be replaced with proposed substitute claim 26;

FURTHER ORDERED that Patent Owner's Motion to Amend is *dismissed as moot* as to proposed claims 22–25;

FURTHER ORDERED that the Motion to Seal is *granted*;

FURTHER ORDERED that the Board's default protective order is entered in this proceeding;

FURTHER ORDERED that the confidential version of Exhibit 2015 is sealed; and

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

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