

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SOLAREEDGE TECHNOLOGIES LTD.,
Petitioner,

v.

SMA SOLAR TECHNOLOGY AG,
Patent Owner.

IPR2019-01223
Patent 7,816,631 B2

Before LYNNE H. BROWNE, HYUN J. JUNG, and
RICHARD H. MARSCHALL, *Administrative Patent Judges*.

MARSCHALL, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Denying Patent Owner's Motion to Exclude
37 C.F.R. § 42.64

INTRODUCTION

SolarEdge Technologies Ltd. (“Petitioner”) filed a Petition (Paper 2, “Pet.”), requesting institution of an *inter partes* review of claims 1–18 of U.S. Patent No. 7,816,631 B2 (Ex. 1001, “the ’631 patent”). SMA Solar Technology AG (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). Pursuant to 35 U.S.C. § 314, we instituted an *inter partes* review of claims 1–18 of the ’631 patent on all presented challenges. Paper 10 (“Inst. Dec.”).

After institution, Patent Owner filed a Response (Paper 15, “PO Resp.”), Petitioner filed a Reply (Paper 19, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 20, “PO Sur-reply”). Patent Owner also filed a Motion to Exclude (Paper 24, “PO Mot. Exclude”), and Petitioner filed an Opposition to the Motion to Exclude (Paper 25, “Pet. Opp.”). An oral hearing in this proceeding was held on October 26, 2020, and a transcript of the hearing is included in the record (Paper 28, “Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–18 of the ’631 patent are unpatentable.

BACKGROUND

A. Real Parties in Interest and Related Matters

Petitioner states that the “real party-in-interest is Petitioner SolarEdge Technologies Ltd.” Pet. 1. Patent Owner states that the “real party-in-interest is SMA Solar Technology AG.” Paper 4, 2.

The parties do not identify any related litigation matters in the United States. Pet. 1; Paper 4, 2. The parties indicate that a European counterpart to the '631 patent has been asserted in Germany against Petitioner. Pet. 1 (citing Ex. 1035); Paper 4, 2. Petitioner also identifies four other petitions challenging the '631 patent based on different combinations of references. Pet. 18. The '631 patent is the subject of IPR2019-01224, IPR2019-01225, IPR2019-01226, and IPR2019-01227. We instituted review in IPR2019-01224, and we issue the Final Written Decision in that case concurrently with this Decision. We denied institution in IPR2019-01225, IPR2019-01226, and IPR2019-01227.

B. The '631 Patent

The '631 patent issued October 19, 2010, from an application filed June 22, 2005. Ex. 1001, codes (22), (45).

The '631 patent relates to “an inverter with a housing having a cooling unit for cooling the electronic and/or electric components of the inverter.” Ex. 1001, 1:13–15. The '631 patent describes problems with prior art inverter housings having vents and fans that allow contamination to enter the housing, which in turn causes failures of the inverter. *Id.* at 1:21–29. The '631 patent seeks to address these problems by providing an inverter housing with two chambers having different characteristics. *Id.* at 1:40–50. Figure 1 of the '631 patent is reproduced below.

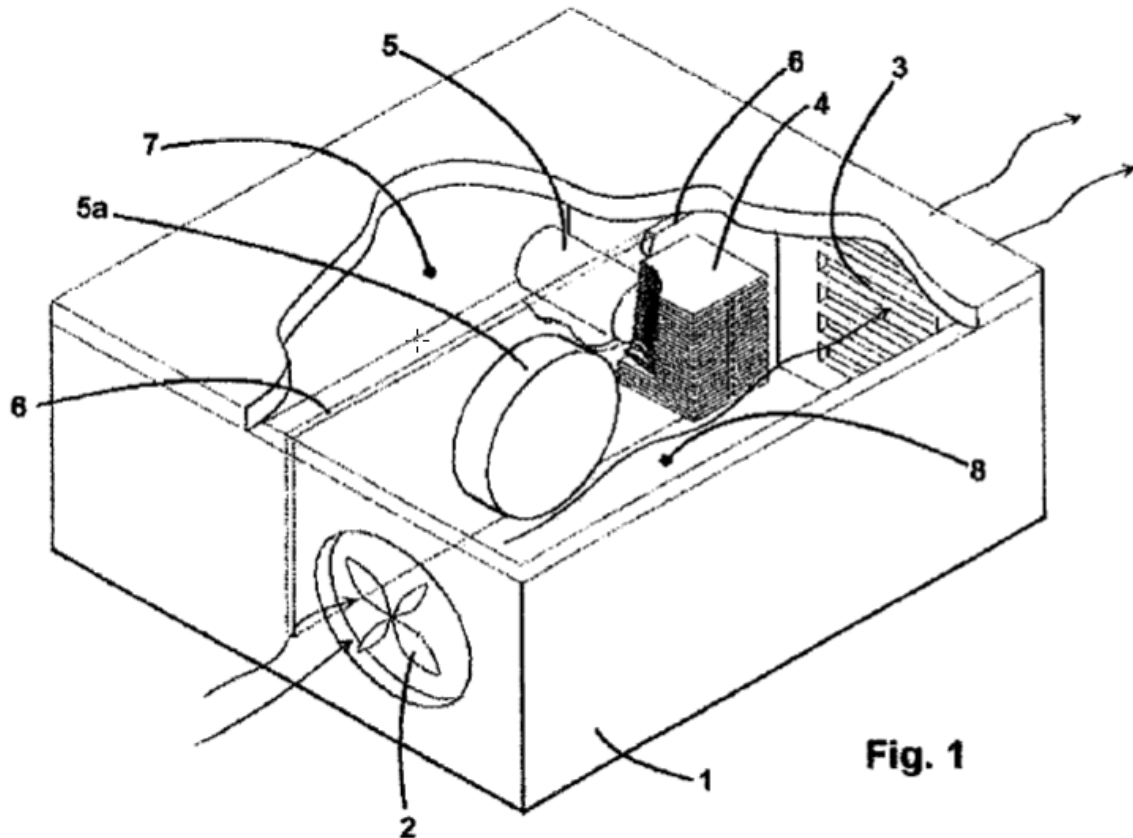


Figure 1 “is a perspective view, with portions broken away, of the housing.” *Id.* at 2:16–18. Housing 1 includes partition wall 6 that divides housing 1 into chambers 7 and 8. *Id.* at 2:22–23. Partition wall 6 receives electronic and electric components 5 that project into chamber 7. *Id.* at 2:24–26. Cooling bodies 4 disposed on components 5 project into chamber 8. *Id.* at 2:27–30. The thermal connection between cooling body 4 and component 5 allows heat transfer from component 5 to cooling body 4. *Id.* at 2:32–35.

The ’631 patent emphasizes the different characteristics of chambers 7 and 8, and the different electrical components contained in each chamber. Chamber 7 includes components with low power dissipation, with no cooling or ventilation provided in the chamber. *Id.* at 2:49–52. Chamber 7 has a “higher protection grade” than chamber 8 “in order to make certain

that the electric or electronic components are protected against dirt and moisture.” *Id.* at 2:43–46. Chamber 8 includes fan 10 and vent slots 3 to cool the chamber, and components such as a “transformer with a high protection grade” that “makes them insensitive to contamination.” *Id.* at 2:36–41.

C. Challenged Claims

The ’631 patent has 18 claims, all of which Petitioner challenges. Of those, claims 1, 9, and 17 are independent. Claims 2–8 depend from claim 1; claims 10–16 depend from claim 9; and claim 18 depends from claim 17.

Claim 1 is reproduced below with spacing and indentations added for readability.

1. An inverter with a housing having a cooling unit for cooling electronic components and electrical components of the inverter mounted in said housing, said housing of the inverter comprising

first and second chambers, said first and second chambers being separated by a wall and configured to receive in the two chambers the electronic components and the electrical components said electronic components and electrical component being cooled by the cooling unit,

said electronic components being sensitive to dirt and humidity and being located on one side of the wall in said first chamber which is closed and which has a higher IP grade rating for protection to humidity and dust than the electrical components mounted in said second chamber,

heat sink cooling fins which are located on the other side of the wall in the said second chamber which is open to ambient atmosphere, said heat sink including heat exchange structure extending through said wall and being thermally conductively coupled to said electronic components in said first chamber and to said cooling fins in said second chamber and at least one of a

choke and a transformer also being located in said second chamber,

said electrical components in said second chamber being less sensitive to humidity and dirt than said electronic components in said first chamber, and

said second chamber having a cooling system including said cooling unit positioned at one end of said second chamber for cooling both said cooling fins and said electrical components.

Ex. 1001, 2:55–3:13 (formatting added).

D. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–18 would have been unpatentable on the following grounds (Pet. 18):

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)/Basis
1–5, 7–18	103(a)	Shinohara ²
1–5, 7–18	103(a)	Shinohara, Brinkmann ³
6	103(a)	Shinohara, Kramer ⁴
6	103(a)	Shinohara, Brinkmann, Kramer
1–5, 7, 8, 13, 17, 18	103(a)	Shinohara, Rodi ⁵
1–5, 7, 8, 13, 17, 18	103(a)	Shinohara, Brinkmann, Rodi
6	103(a)	Shinohara, Kramer, Rodi
6	103(a)	Shinohara, Brinkmann, Kramer, Rodi

¹ The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (Sept. 16, 2011), took effect on March 16, 2013. Because the application from which the ’631 patent issued was filed before that date, unless otherwise stated, our citations to Title 35 are to its pre-AIA version.

² Japanese Application Publication No. JP H11-234963, published August 27, 1999 (Ex. 1002; Ex. 1003 (certified translation)) (“Shinohara”).

³ DE 296 07 354 U1, published August 22, 1996 (Ex. 1004; Ex. 1005 (certified translation)) (“Brinkmann”).

⁴ EP 1 283 589 A2, published February 12, 2003 (Ex. 1006) (“Kramer”).

⁵ EP 0 297 308 A2, published January 4, 1989 (Ex. 1007; Ex. 1008 (certified translation)) (“Rodi”).

All references to Shinohara, Brinkmann, and Rodi in this Decision are to their certified translations filed, respectively, as Exhibits 1003, 1005, and 1008. Petitioner also relies on Declarations of Jonathan R. Wood, Ph.D. and James L. Mullins, Ph.D. *See* Ex. 1012 (“Wood Declaration”); Ex. 1020 (“Mullins Declaration”); Ex. 1044 (“Reply Wood Declaration”). Patent Owner relies on a Declarations of Yogendra Joshi, Ph.D. *See* Ex. 2001 (“Joshi Declaration”); Ex. 2003 (“Response Joshi Declaration”).

ANALYSIS

A. *Legal Standards*

To prevail in its challenges, Petitioner must prove unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e) (2012); 37 C.F.R. § 42.1(d) (2018). “In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burdens of proof in an *inter partes* review).

Petitioner relies on obviousness in its challenges to the claims of the ’631 patent. A claim is unpatentable as obvious under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406

(2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).⁶

B. Level of Ordinary Skill in the Art

The level of skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). “The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art” at the time of the invention. *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *Id.* In a given case, one or more factors may predominate. *Id.*

Petitioner asserts that one of ordinary skill in the art “would have had a bachelor’s degree in mechanical engineering, electrical engineering, or a similar discipline and at least 3 years of design experience with power electronics, including thermal management.” Pet. 26 (citing Ex. 1012 ¶¶ 24–28). Patent Owner does not address Petitioner’s proposal in its

⁶ Neither party presents arguments or evidence as to secondary considerations.

briefing, but its declarant Dr. Joshi agrees with Petitioner’s proposed level of ordinary skill in the art. *See* Ex. 2003 ¶ 24.

We adopt Petitioner’s asserted level of ordinary skill because it is consistent with the problems identified and solutions provided in the ’631 patent and the prior art.

C. Claim Construction

In *inter partes* reviews, we interpret claims in the same manner used in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b) (2019); *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc) (setting forth claim construction approach in district court cases). Under that standard, we generally give claim terms their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history. *See Phillips*, 415 F.3d at 1313–14. Although extrinsic evidence, when available, may also be useful when construing claim terms under this standard, extrinsic evidence is generally “less reliable” than the intrinsic record. *See id.* at 1318–19. Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

1. Whether “Inverter” in the Preambles Limits the Independent Claims

The language that begins claim 1 reads as follows: “An inverter with a housing having a cooling unit for cooling electronic components and electrical components of the inverter mounted in said housing, said housing of the inverter comprising.” Ex. 1001, 2:55–2:58. The preambles of claims

9 and 17 recite: “An inverter comprising.” *Id.* at 3:31, 4:22. Patent Owner contends that “inverter” in the preambles of all three independent claims limits the claims. PO Resp. 22–23. Because the preamble to independent claim 1 differs from independent claims 9 and 17, we will address each claim separately.

a. Claim 1

As a threshold matter, we consider what the preamble to claim 1 includes. Claim 1 does not contain any colon or indentation separating the preamble from the body of the claim. Ex. 1001, 2:55–58. The language that begins claim 1 also includes two terms that could serve as the transition from the preamble to the body of claim 1, “having” and “comprising.” *See id.* In the Petition, Petitioner does not address the preamble or propose any constructions for terms in the preamble other than to argue, for each of the independent claims, that the preamble does not limit the claims. Pet. 27, 51, 66. When addressing the preambles, Petitioner assumes that all of the claim language through the term “comprising” defines the preambles. *Id.*

Patent Owner argues that the term “having” in the preamble marks the end of the preamble, rather than “comprising,” so that the entirety of the preamble reads as “[a]n inverter with a housing having.” PO Resp. 15. Under that approach, the remaining language, “a cooling unit . . . and electrical components of the inverter mounted in said housing, said housing of the inverter comprising,” appears in the body of the claim and limits the claim. *Id.* at 15–16. Patent Owner acknowledges that “comprising” is a “common transitional term,” but contends that “having” may also be used as a transitional term and that it makes sense to view “having” as the transitional term for claim 1 because that places the electronic and electrical

components and the cooling unit in the body of the claim as part of the inverter, rather than as part of the housing. *Id.*; *see also* PO Sur-reply 1–2.

In its Reply, Petitioner argues that “comprising” signifies the end of the preamble in claim 1 because “comprising” represents the typical transitional term identifying the end of the preamble. Pet. Reply. 3. Petitioner also argues that in cases addressing whether preambles are limiting that include “having” as well as “comprising,” the cases presume that “comprising” marks the end of the preamble rather than “having.” *Id.* at 4–5 (citing cases). Petitioner also contends that “comprising” marks the end of the preamble of claim 1 because the next language in claim 1 identifies the first and second chambers of the housing, which “is the main point of the invention.” *Id.* at 5 (citing Ex. 1001, 1:40–50, 2:42–46).

We agree with Petitioner that the preamble of claim 1 ends at the term “comprising” for several reasons. First, “comprising” represents the more common transitional phrase. *See* PO Resp. 15 (acknowledging that “‘comprising’ is considered a common transitional term”); Tr. 47:13–19 (Patent Owner’s counsel indicating that “having” transitional term “not as common as ‘comprising’”). Second, the ’631 patent consistently uses “comprising” as a transitional phrase in other claims, and never uses “having” as a transitional phrase, suggesting that we should not read “having” as the transitional phrase for claim 1. *See* Ex. 1001, 3:31, 4:1, 4:12, 4:22. Third, the body of claim 1 still makes sense when the preamble concludes with “said housing of the inverter comprising” because the body of the claim recites first and second chambers of the housing “configured to receive” certain electronic and electrical components arranged within the housing. *Id.* at 2:57–2:13.

Having determined that the preamble of claim 1 ends at “comprising,” we next consider whether “inverter” is limiting. Even if the body of the claim does not include the term “inverter,” Patent Owner contends that “inverter” in the preamble limits the claim because “the preamble breathes life and meaning into the claims since the terms ‘cooling unit’ and ‘electronic components and electric components’ serve as antecedent basis for the same terms in the body of the claim.” PO Resp. 18. In Patent Owner’s view, since the preamble refers to “electronic components and electrical components of the inverter,” once the body of the claim refers to those components, it necessarily means that the inverter should be considered limiting as well. *Id.* at 18–19. Patent Owner also contends that dependent claim 7 refers to “inverter,” suggesting that the preamble to claim 1 was used as antecedent to “inverter” in claim 7. *Id.* at 19. As to the specification, Patent Owner argues that it “refers only to an inverter and not to any other device such as converter, power supply or module.” *Id.* at 19–20. As to the prosecution history, Patent Owner contends that the applicant relied on the inverter to distinguish the claims over the prior art of record. *Id.* at 21–22.

Petitioner contends that the reference to “inverter” in the preamble merely signifies intended use for certain claimed components. Pet. Reply 6. As to the antecedent basis issue, Petitioner contends that dependent claim 7 supports its position that claim 1 does not require an inverter because claim 7 does not use “inverter” in claim 1 to provide antecedent basis and claim 7 merely requires electronic components found in an inverter, which would be unnecessary if claim 1 already required components found in an inverter. *Id.* at 8–9. Petitioner also alleges that even if some language in the preamble

serves as antecedent basis for limitations in the body of claim 1, that does not mean that “inverter” limits the claim. *Id.* at 9. As to the specification, Petitioner argues that it stresses the two-chambers of the housing and the manner in which it cools components as the key to the invention, without describing the inverter functionality as important or critical to the invention. *Id.* at 6–8. As to the prosecution history, Petitioner argues that “inverter” was not used to distinguish the prior art because the prior art at issue already disclosed inverters and the applicant never argued that it failed to contain an inverter. *Id.* at 10–11.

In its Sur-reply, Patent Owner argues that the heat-dissipation aspects of the invention are necessary because the inverter components generate that heat, and therefore “inverter” is “essential to the invention” and “underscored as important by the specification.” PO Sur-reply 2–3. Patent Owner also contends that dependent claim 7 supports its position because it refers back to the inverter, “regardless of what claim 7 is directed to.” *Id.* at 4. As to the prosecution history issue, Patent Owner contends that the applicant’s reliance on the term “inverter” shows that it limits the claim even if that reliance did not distinguish the claim over the prior art. *Id.* at 4–5.

A preamble generally limits a claim “if it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). On the other hand, “a preamble is not limiting ‘where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.’” *Id.* (quoting *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997)).

These general principles support Petitioner’s position that “inverter” in the preamble does not limit the claim. The body of the claim defines a structurally complete invention requiring a two-chambered housing configured to receive certain components arranged within the housing in certain ways—that language does not suggest that “inverter” must be read as a limitation in order to give those limitations meaning. *See id.* at 810 (concluding that preamble language was not “essential to understand limitations or terms in the claim body”). Instead, “inverter” in the preamble more closely resembles an intended use of the invention.⁷

We further consider several “guideposts” when determining whether language in a preamble limits a claim. *Catalina Mktg.*, 289 F.3d at 808. We agree with Petitioner that those guideposts do not establish that “inverter” in the preamble limits claim 1 here. For example, “inverter” in the preamble of claim 1 does not provide antecedent basis for “inverter” for any limitation in the body of claim 1 or for “inverter” recited in dependent claim 7. Claim 7 depends from claim 1 and further requires “wherein said electronic components comprise electronic components normally found in an inverter.” Ex. 1001, 3:26–28. As claim 7 and other claims make clear, when referring back to a term that provides antecedent basis, the claims use “said” or “the” to refer to the term. *See, e.g., id.* (“said electronic components”). Claim 7

⁷ The fact that “inverter” standing alone recites nothing more than intended use becomes more apparent when considering the preambles of claims 9 and 17, which simply recite “An inverter comprising.” Ex. 1001, 3:31, 4:22; *see also Arctic Cat Inc. v. GEP Power Prods., Inc.*, 919 F.3d 1320, 1328 (2019) (finding preamble language reciting “personal recreational vehicle” not limiting where it merely identified an intended use for the claimed power distribution module, and did not impose any structural requirement on the claimed module).

refers to “*an* inverter,” however, which signifies that it does not rely on a previous use of “inverter,” in the preamble of claim 1 for instance, to provide antecedent basis. *Id.* (emphasis added). This distinguishes this situation from cases where dependent claims clearly use terms in the preamble of the independent claim from which they depend to provide antecedent basis. *See Pacing Tech. v. Garmin*, 778 F.3d 1021, 1024 (Fed. Cir. 2015) (finding recitation of “*the* repetitive motion pacing system” in body of dependent claim relies on preamble of independent claim as antecedent basis (emphasis added)). We also find Patent Owner’s reliance on dependent claim 7 undermines its argument because Patent Owner contends that claim 1, standing alone, requires electronic components of an inverter; if so, claim 7 would add no meaningful limitation to claim 1. *See* PO Resp. 18–19.⁸ Further, the fact that some terms in the preamble of claim 1 provide antecedent basis for terms in the body of claim 1 does not require reading other terms, such as “inverter,” as limiting. *See, e.g., TomTom, Inc. v. Adolph*, 790 F.3d 1315, 1323–24 (Fed. Cir. 2015) (“That [one] phrase in the preamble . . . provides a necessary structure for claim 1 does not necessarily convert the entire preamble into a limitation, particularly one that only states the intended use of the invention.”).

As to the specification, which uses the term “inverter” in several places, each use remains consistent with reading “inverter” as the intended use of the claimed invention rather than a critical requirement of the invention. *See* Ex. 1001, codes (54), (57), 1:1, 1:13, 1:15, 1:19, 1:21, 1:24,

⁸ Petitioner also correctly points out that claim 7 does not require an inverter, or components functioning as an inverter, and instead merely requires components “normally found” in an inverter. *See* Pet. Reply 8, n.5.

1:28, 1:36, 1:41, 1:56. These references to “inverter” are found in the Title, Abstract, Field of Invention, Description of the Prior Art, and Summary sections of the specification and are often paired with a reference to the inverter “housing,” which includes the structures that are the focus of the alleged improvements over the prior art. *See id.* at 1:40–42 (stating that object of invention “is solved . . . in that the housing of the inverter comprises at least two chambers”). Notably, the specification acknowledges that “[i]nverters are well known” and only mentions “inverter” once in the Detailed Description of the Invention, in the first line noting that the “inverter has the housing 1.” *Id.* at 1:19, 2:22. Nothing in the specification suggests that “inverter” provides a critical part of the claimed invention that must be read as part of the claimed invention in order for the invention to have meaning. *See* Ex. 1044 ¶¶ 6–9 (Dr. Wood explaining why “inverter” is not essential to the invention).

As to the prosecution history, “clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation because such reliance indicates use of the preamble to define, in part, the claimed invention.” *Catalina Mktg.*, 289 F.3d at 808. “Without such reliance, however, a preamble generally is not limiting when the claim body describes a structurally complete invention.” *Id.* at 809. Patent Owner acknowledges that when applicant invoked an “inverter” during prosecution, the prior art the applicant was addressing disclosed an “inverter.” *See* PO Resp. 22 (“art cited against the claim also was directed to components of an inverter”). Therefore, the presence of the term “inverter” in the preamble, standing alone, did not distinguish the claims from the prior art. Patent Owner

suggests that “inverter” combined with other limitations of the claim distinguished the prior art, but merely repeating language from the preamble as part of an overall effort to distinguish the prior art does not convert that language into a necessary part of the claimed invention, especially when the applicant made no effort to distinguish the prior art using the claim term in the preamble. *See Catalina Mktg.*, 289 F.3d at 810 (finding that the applicants “did not rely on the preamble phrase to distinguish over” the prior art in question); *Georgetown Rail Equip. Co. v. Holland L.P.*, 867 F.3d 1229, 1238 (Fed. Cir. 2017) (finding arguments in prosecution history in relation to claim limitations in the body of the claim insufficient to distinguish the prior art based on the language in the preamble).

Based on the foregoing, we do not construe “inverter” in the preamble of claim 1 as limiting.

b. Claims 9 and 17

Patent Owner argues that “inverter” in the preambles to claims 9 and 17 limit those claims, but does not set forth any additional arguments beyond those addressed above in support of its argument. *See* PO Resp. 14–23. Patent Owner’s arguments are weaker here than with respect to claim 1. Patent Owner does not argue that any portion of the preambles of claims 9 and 17 provides antecedent basis for any terms in the body of the claims. *See id.* In addition, both preambles of claims 9 and 17 merely recite “[a]n inverter comprising,” without any suggestion that the recitation of “inverter” means anything more than an intended use, and the bodies of the claims define complete inventions. Ex. 1001, 3:31–49, 4:22–45. Patent Owner’s arguments that the specification and prosecution history support its position apply to claims 9 and 17, but those arguments are not persuasive for the

reasons provided above. Accordingly, we do not construe “inverter” in the preambles of claims 9 and 17 as limiting.⁹

2. *High Protection Grade*

Petitioner argues that the limitation reciting a “component of a high protection grade” in independent claims 9 and 17 should be construed as “component of a protection grade sufficient to be insensitive to contamination from exposure to ambient air.” Pet. 25. Petitioner relies on the specification’s description of the components in the second chamber as exposed to ambient air, which requires protection against dust and moisture to function properly. *Id.* (citing Ex. 1001, 1:57–62, 2:36–39); *see also* Pet. Reply 12. According to Petitioner, this link between the components with a high protection grade and their ability to function while exposed to ambient air supports its construction. Pet. 25–26.

In its Preliminary Response, Patent Owner argued that “a component of a high protection grade” means “a component having an IP [(ingress protection)] Rating of IP65.” Prelim. Resp. 22. In our Institution Decision, we declined to adopt Patent Owner’s proposed construction as too narrow and adopted Petitioner’s proposed construction. Inst. Dec. 15. In its Response, Patent Owner argues that we should construe “a component of a high protection grade” to mean “a component having a high ingress protection (IP) grade.” PO Resp. 24. Patent Owner relies on the specification’s description of a high protection grade component as having an IP rating of IP65, “which is an ingress protection grade.” *Id.* (citing Ex.

⁹ Although we conclude that “inverter” does not limit these claims, for the reasons discussed below, we conclude that Petitioner establishes that all of the challenged claims are unpatentable even if the claims require an inverter.

1001, code (57), 1:57–63, 2:36–39, 2:46–48). Patent Owner contends that “a POSITA [(person of ordinary skill in the art)] would understand that a component with a high IP grade is, by definition, a component that itself is enclosed with (or comprises) an enclosure that provides that high IP grade.” *Id.* at 25. Patent Owner argues that the “sensitivity of the component itself has no bearing on the protection grade of the component, and thus cannot be the basis for a definition of the protection grade of the component.” *Id.*; *see also* PO Sur-reply 7. Patent Owner also contends that Petitioner’s proposal lacks support in the specification and improperly encompasses components located in open chambers that may lack sufficient protection. PO Resp. 25 (citing Ex. 1001, 1:26–29). Patent Owner stresses that “it is an enclosure of the component itself that provides a high protection grade . . . and that the protection grade is not provided by the insensitivity of the component.” *Id.* at 25–26 (citing Ex. 1001, 1:40–50, 2:36–39); *see also* PO Sur-reply 8. According to Patent Owner, “a POSITA knows that certain types of components such as transformers and chokes can be relatively insensitive to moisture and dust,” but this does not mean that they necessarily have an “IP grade” because that requires an enclosure. PO Resp. 26.

In its Reply, Petitioner argues that Patent Owner’s new proposal “unnecessarily inserts limitations into the claims, while also being vague as to what constitutes a ‘high’ grade.” Pet. Reply 12 (citing Ex. 1043, 118–119, 128–131; Ex. 1044 ¶¶ 10–13). Petitioner contends that the specification’s reference “to one particular standard (‘e.g. IP65’) is merely illustrative.” *Id.* (citing Ex. 1001, 1:61; Ex. 1043, 118–22; Ex. 1044 ¶ 11). Petitioner also contends that claim 1 refers to “IP grade rating” with respect

to the first chamber, and the absence of “IP” in claims 9 and 17 suggests a broader meaning. *Id.* (citing Ex. 1043, 132).

We find Petitioner’s proposed construction for “high protection grade” more consistent with the claims and specification. Patent Owner’s primary complaint as to Petitioner’s construction involves the reference to “insensitivity”—Petitioner’s proposal covers components “sufficient to be insensitive to contamination from exposure to ambient air.” Pet. 25.

Whatever the drawbacks of such an approach, Petitioner’s proposal tracks very similar language the specification uses to describe components of a “high protection grade.” *See* Ex. 1001, 2:36–39 (describing components in cooled chamber 8 having a “high protection grade” that “makes them insensitive to contamination”). Given that the specification links high protection grade with the insensitivity of components so that they can function in the open, cooled chamber, we see no issue with Petitioner’s proposal that tracks that same approach. *See id.*; *see also id.* at 1:57–62; Ex. 1012 ¶ 113.

In addition, Patent Owner’s approach introduces additional concerns. In our Institution Decision, we emphasized that we did “not view the specification’s reference to ‘e.g. IP65’ as a definition of ‘high protection grade,’” “and read the passage as stating that IP65 provides one example of a grade that falls within the scope of ‘high protection grade.’” Dec. Inst. 14. We also emphasized that “high protection grade” in claims 9 and 17 did not specify any particular grade, while claim 5 specifies an “IP grade rating” of “IP65.” *Id.* While Patent Owner’s revised proposal avoids a specific numerical rating, it still requires some specific numerical “IP grade” without any reference to “IP” in claims 9 or 17. Several claims, including claims 1,

5, and 10, refer to “IP grade rating,” strongly suggesting that the applicant knew how to specifically claim an IP grade rating when it desired, and that we should not read that requirement into other claims that avoid that claim language. Patent Owner’s proposal also begs the question of how “high” the IP grade must be to meet the claim limitation. When pressed on this issue at the oral hearing, Patent Owner’s counsel indicated that “high” would mean more than halfway up the IP grade scale of 00-68, or higher than an IP grade of 34. Tr. 57:1–25. While such a numeric definition provides clarity, nothing in the specification suggests that “high protection grade” means IP grades above 34. Similarly, Patent Owner argues “that a component with a high IP grade is, by definition, a component that itself is enclosed with (or comprises) an enclosure that provides that high IP grade.” PO Resp. 25. Nothing in the specification supports this “enclosure” requirement either, and we are reluctant to read requirements into claims that the specification never mentions.

Based on the foregoing, we construe “high protection grade” in claims 9 and 17 to mean “component of a protection grade sufficient to be insensitive to contamination from exposure to ambient air.”

3. *At Least One of a Choke and a Transformer; At Least One of a Transformer, a Cast Winding, and a Choke*

Petitioner contends that “at least one of a choke and a transformer” in claim 1 means “at least one choke *or* transformer” and “at least one of a transformer, a cast winding and a choke” in claims 13 and 17 means “at least one transformer, cast winding *or* choke.” Pet. at 24–25 (emphasis added). Petitioner contends that the limitations should be read in the disjunctive because the specification indicates that the “second chamber may have a

transformer or a choke (both of which are described as cast windings), but need not have both.” *Id.* at 24 (citing Ex. 1001, 1:40–50, 2:36–39, 2:42–49). Petitioner also argues that the Patent Owner affirmatively adopted this construction during prosecution. *Id.* at 24–25.

In our Institution Decision, we noted the apparent agreement of the parties as to these constructions and adopted Petitioner’s proposed constructions. Dec. Inst. 15–16. In its Response, Patent Owner does not address our adoption of Petitioner’s proposals or argue for any different constructions. Accordingly, because the full record presents no dispute regarding these limitations we adopt Petitioner’s proposed constructions, and construe (1) “at least one of a choke and a transformer” as “at least one choke or transformer” and (2) “at least one of a transformer, a cast winding and a choke” as “at least one transformer, cast winding or choke.”

4. *Higher IP Grade Rating*

Petitioner contends that when claim 1 recites a “first chamber . . . which has a higher IP grade rating for protection to humidity and dust than the electrical components mounted in said second chamber,” the claim means a first chamber “which protects against the ingress of moisture and dust to a greater degree than the second chamber.” Pet. 21. According to Petitioner, the specification supports its proposed construction because it stresses that the two chambers have different protection ratings. *Id.* at 21–22. Petitioner contends that the limitation should not be construed to require “that the first chamber has a higher protection against dust and moisture ingress than the *electronics* in the second chamber,” as the claim language suggests, because a later limitation requires those same components to have less sensitivity than the components in the first chamber. *Id.* at 23.

Petitioner also contends that the specification never compares “the protection rating of the first chamber to the protection rating of the *electronics* in the second chamber,” suggesting that the claim should not be construed to cover an embodiment not disclosed in the specification. *Id.*; *see also* Pet. Reply 13–14.

Patent Owner argues that the limitation “should be interpreted as what the term recites” and that the “ordinary and customary meaning of the term is clear on its face.” PO Resp. 23; *see also* PO Sur-reply 6. According to Patent Owner, the “term clearly compares the IP grade rating of the first chamber with the IP grade rating of the electrical components (of the inverter) mounted in the second chamber.” PO Resp. 23.

In our Institution Decision we declined to construe the limitation, but invited the parties to address the issue further during trial. Inst. Dec. 13. We provide the following analysis to make clear which approach we take to the limitation when addressing Petitioner’s showing on this issue.

The disputed language includes a comparison of IP grades between the first chamber and the “components mounted in said second chamber.” Although both components and the second chamber are referenced, the language references the components first and appears to require a comparison of the IP grade rating of the first chamber and those components rather than the second chamber itself. If the claim meant to clearly compare the IP grade rating of the first chamber and second chamber, as Petitioner proposes, the claim could have placed the reference to “components” after “second chamber,” e.g., “first chamber . . . has a higher IP grade rating than said *second chamber* having components therein,” or something similar. Patent Owner asks us to stop our analysis after reading the disputed phrase,

and not even consult the specification because the claim language contains no ambiguity. *See* PO Resp. 23 (“[T]he term is clear on its face. It does not need to be interpreted.”); Tr. 95:14–22, 96:6–11 (“[T]o construe it, you don’t need to go to the spec to construe it.”).

We decline to limit our analysis to the disputed claim language in isolation. The “context in which a term is used in the asserted claim can be highly instructive” and “claims must be read in view of the specification, of which they are a part.” *Phillips*, 415 F.3d at 1314–15 (citation and quotation marks omitted). When we consider other language in claim 1, ambiguities arise. For example, the limitation at issue seems to stress that the components in the second chamber have an IP grade rating *lower* than the IP grade rating of the first chamber, but a later limitation requires those same components in the second chamber to be “less sensitive to humidity and dirt” than components in the first chamber, which generally suggests a *higher* protection level, or higher IP grade, for the components in the second chamber. Ex. 1001, 2:64–67, 3:8–10. Requiring the same components to have a comparatively low protection rating in one context and a high protection rating in another creates confusion as to the claim meaning. Turning to the specification, we find no support for a reading of the claim requiring a comparison of IP grade ratings between the first chamber and components in the second chamber. Instead, the specification stresses that the first chamber has a higher IP grade rating than the second chamber itself, not the components within that chamber. Ex. 1001, 2:4–5, 2:42–46. Because the specification only describes a relative comparison of IP grades between the first chamber and second chamber, and never mentions a comparison of IP grades between the first chamber and components in the

second chamber, we view the disputed limitation, which references both the components in the second chamber and the second chamber itself, as referring to the second chamber's IP grade rating for comparison with the first chamber's IP grade rating. Construing the limitation as requiring a comparison of IP grades between the chambers also resolves the tension with the later limitation requiring components in the second chamber "less sensitive to humidity and dirt."

Based on the foregoing, we adopt Petitioner's construction and construe "first chamber . . . which has a higher IP grade rating for protection to humidity and dust than the electrical components mounted in said second chamber," to mean a first chamber "which protects against the ingress of moisture and dust to a greater degree than the second chamber."

D. Challenge Under § 103(a) Based on Shinohara and Brinkman

Petitioner challenges claims 1–5 and 7–18 under 35 U.S.C. §103(a) based on Shinohara and Brinkman. Pet. 26–67. For these challenges, Petitioner relies on the Wood Declarations. Exs. 1012, 1044.

1. Shinohara (Ex. 1003)

Shinohara describes "a motor driving apparatus capable of efficiently cooling inverters and other electrical components inside a housing." Ex. 1003, Abstract. Figure 1(b) of Shinohara is reproduced below.

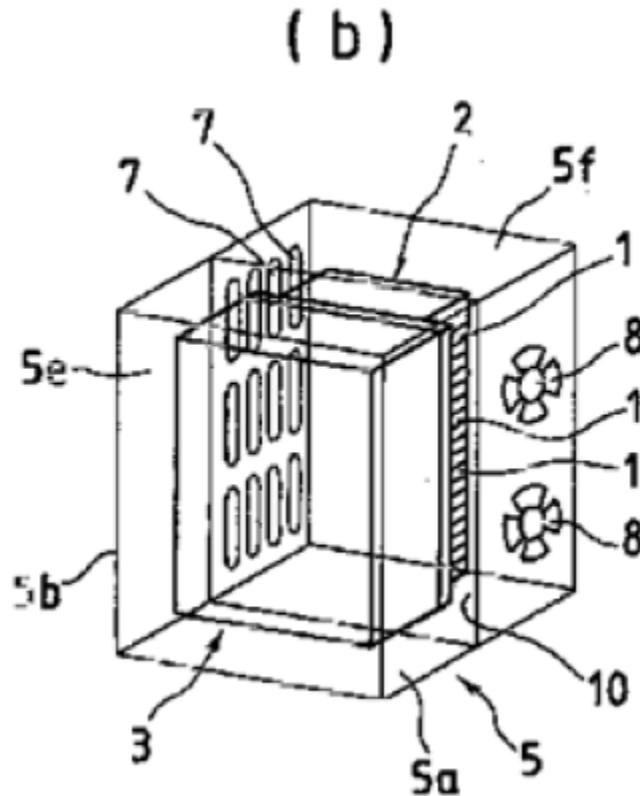


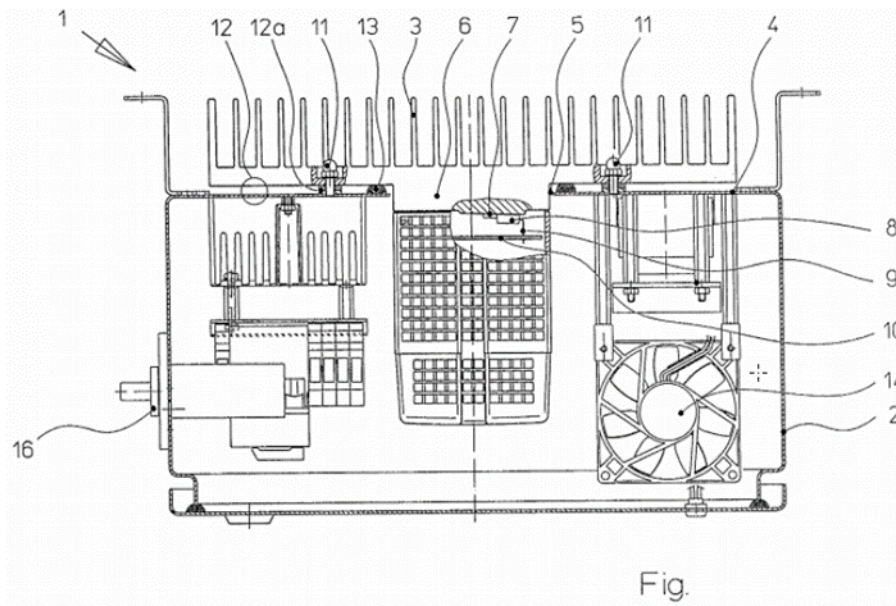
Figure 1(b) is a perspective view of a motor driving apparatus. *Id.* ¶ 15. Partition plate 10 divides housing 5 into spaces 5e and 5f. *Id.* ¶ 21. Figure 1(b) depicts inverter 3 mounted in “hermetically sealed space 5e” and heat sink 2 mounted in cooled space 5f. *Id.* ¶ 21. Space 5f includes fan motors 8 and air vent holes 7 to cool that space. *Id.* ¶¶ 16, 17, 22.

“[E]lectrical components liable to generate heat, such as a regenerative discharge resistor 11 provided inside or outside the inverter 3 or a transformer 12 provided outside, are mounted in the vicinity of the heat sink 2.” *Id.* ¶ 23. Shinohara depicts resistor 11 and transformer 12 in Figure 1(c) without partition plate 10 separating housing 5 into two spaces, but indicates that partition plate 10 can be disposed in the same manner in

Figure 1(c) as in Figure 1(b). *Id.* ¶ 25, Figs. 1(b), 1(c).¹⁰ According to Shinohara, this arrangement protects the inverter and weak-current control circuitry from heat and allows resistors and transformers susceptible to heating to be cooled by forced air from the fan motors. *Id.* ¶¶ 29–30.

2. *Brinkmann (Ex. 1005)*

Brinkmann “relates in particular to the cooling of power components in frequency inverters comprising a housing that is completely closed in accordance with protection level IP65.” Ex. 1005, 1. The only figure of Brinkmann is reproduced below.



The figure “is a partially sectional side view of a frequency inverter.” *Id.* at 3. Frequency inverter 1 comprises housing 2 and cooling element 3

¹⁰ Shinohara references Figures 2(b) and 2(c) when noting that the partition plate 10 can be disposed in the same manner in both figures, which we view as a typographical error that should have referred to Figures 1(b) and 1(c). Ex. 1003 ¶ 25. Partition plate 10 only appears in Figure 1(b), and Figures 2(b) and 2(c) are described elsewhere as depicting the prior art. *See* Ex. 1003 ¶ 2 (“[Prior Art] Structures such as those illustrated in FIG. 2(a) through 2(d) are already publicly known.”).

with cooling element projection 6. *Id.* Housing wall 4 has recess 5 through which cooling element projection 6 extends inwardly into housing 2. *Id.* Power components 8 are fixed to planar cooling element surface 7 of cooling element projection 6. *Id.* Housing 2 “is substantially closed on all sides in accordance with protection level IP65.” *Id.*

3. *Independent Claim 1*

Petitioner asserts that Shinohara and Brinkmann disclose all of the limitations of claim 1 and that one of ordinary skill in the art would have been motivated to apply Brinkmann’s teachings to Shinohara. Pet. 26–45. More specifically, Petitioner contends that Shinohara discloses all of the limitations of claim 1 with the possible exception of “heat exchange structure extending through said wall,” which Petitioner contends Brinkmann discloses. *Id.* at 26, 35–39. Petitioner provides analysis of each limitation in claim 1, with citations to the references that correspond to each of the claim limitations. *Id.* at 26–45. Petitioner also cites to the relevant declarant testimony. *Id.*

Patent Owner raises a number of arguments that the prior art fails to disclose certain limitations, but all of those arguments hinge on Patent Owner’s claim construction arguments, which we decline to adopt. We set forth our analysis of claim 1 using Petitioner’s proposed constructions, which we find persuasive and adopt as our own for the reasons set forth above, followed by an analysis using Patent Owner’s proposed constructions and addressing Patent Owner’s arguments based on those constructions.

a) *Analysis Based on Petitioner's Constructions*

As discussed above, we find Petitioner's claim construction arguments persuasive and adopt Petitioner's constructions as our own.¹¹ Patent Owner does not argue that the combination of Shinohara and Brinkman fails to disclose any of the limitations of the challenged claims if we adopt Petitioner's constructions¹² or argue that Petitioner failed to articulate a sufficient motivation to combine the references.

We discussed the preamble above and conclude that “inverter” in the preamble does not limit claim 1. Certain terms in the preamble that provide antecedent basis for limitations appearing in the body of claim 1 do limit the claim, and we will address those limitations where appropriate below. *See* Ex. 1001, 2:55–57 (“cooling unit for cooling electronic components and electrical components”); Pet. 27–28 (setting forth reasons why Shinohara discloses the terms in the preamble).

¹¹ Although Petitioner broadly argues that the preamble does not limit the claims, it does not dispute that terms appearing both in the preamble and the body of claim 1, such as “cooling unit” and “electronic and electrical components” limit the claim. *See* Pet. 27, 30. We agree that such terms appearing in both the preamble and body of claim 1 limits claim 1.

¹² For the first time in its Sur-reply, in a heading, Patent Owner argues that “Shinohara does not disclose the claimed invention under either claim interpretation.” PO Sur-reply 11. The heading appears in a section addressing Patent Owner's allegation that Shinohara fails to disclose an inverter housing having two chambers. *See id.* at 10. Despite the breadth of Patent Owner's heading, we do not discern any argument by Patent Owner that Shinohara fails to disclose these limitations under Petitioner's construction, which as noted above asserts that the preamble and “inverter” does not limit the claims. *See id.* at 10–14. Even if such an argument did appear in Patent Owner's Sur-reply, we would not consider it as it did not appear in Patent Owner's Response. *See* Paper 11, 7.

As to the body of claim 1, Petitioner argues that Shinohara discloses the “first and second chambers,” because Shinohara’s partition plate 10 creates two chambers 5e, 5f within housing 5. *Id.* at 28 (citing Ex. 1003 ¶¶ 13, 21, 25–26, 29, Fig. 1(b); Ex. 1012 ¶¶ 149–151). Petitioner contends that Shinohara also discloses the chambers “separated by a wall and configured to receive in the two chambers the electronic and electrical components” because Shinohara discloses partition plate 10 separating chambers 5e, 5f, with the chambers receiving various electrical and electronic components. *Id.* at 29–30 (citing Ex. 1003 ¶¶ 13, 14, 21–23, 25–26, 29, Fig. 1(b); Ex. 1012 ¶¶ 152–154). As to the components “being cooled by the cooling unit,” Petitioner argues that Shinohara discloses cooling fans 8 that meet the “cooling unit” limitation, and that fans 8 cool the transformer 12 and resistors 11 in chamber 5f, as well as inverter 3 and “weak-current control circuitry” in chamber 5e by blowing air on heat sink cooling fins in thermal contact with inverter 3. *Id.* at 30–31 (citing Ex. 1003 ¶¶ 12, 14, 22–23, 29–30, Figs. 1–2; Ex. 1012 ¶¶ 155–158).

Claim 1 also requires “said electronic components being sensitive to dirt and humidity and being located on one side of the wall in said first chamber which is closed and which has a higher IP grade rating for protection to humidity and dust than the electrical components mounted in said second chamber.” Petitioner argues that Shinohara discloses this limitation because it describes chamber 5e (corresponding to the claimed “first chamber”) as “closed” and “hermetically sealed” and offering “greater protection against dust and moisture, and thus has a ‘higher IP grade rating’ as required under [Petitioner’s] proposed construction, than the other chamber (5f), which is open to ambient air drawn in via the fan motors 8.”

Pet. 31–32 (citing Ex. 1003 ¶¶ 13, 21–22, 26, 29, Figs. 1–2; Ex. 1012 ¶ 159). Petitioner also contends that Shinohara discloses closed chamber 5e housing the inverter and weak-current components mounted on one side of a wall, and that such components are sensitive to dirt and humidity. *Id.* at 32 (citing Ex. 1003 ¶¶ 13, 21–22, 26, 29, Fig. 1(b); Ex. 1012 ¶¶ 160–161).¹³

As to the limitation requiring “heat sink cooling fins which are located on the other side of the wall in the said second chamber which is open to ambient atmosphere,” Petitioner argues that Shinohara discloses cooling fins of heat sink 2 disposed in second chamber 5f, with the fins mounted on wall 10. Pet. 33–35 (citing Ex. 1003 ¶¶ 12, 14, 16, 21–23, 26, Figs. 1–2; Ex. 1012 ¶¶ 163–165). Petitioner relies on Shinohara’s description and the vents shown in Figure 1(b) as disclosing that Shinohara’s fan motors 8 blow “ambient air at the cooling fins 1.” *Id.* at 34–35 (quoting Ex. 1003 ¶ 16).

¹³ Patent Owner does raise an argument as to this limitation for the first time in its Sur-reply, applying Patent Owner’s own proposed construction. PO Sur-reply 14–17. We do not consider this argument because it was not made in Patent Owner’s Response, and Petitioner would be prejudiced by relying on Patent Owner’s silence on the issue and the inability to respond to the specific arguments made in Patent Owner’s Sur-reply. *See* Pet. Reply 14 (“Patent Owner has not contested that element 1[E] is taught by the prior art.”). Petitioner sets forth an alternative argument anticipating Patent Owner’s proposed construction for this limitation. *See* Pet. 32–33. Petitioner contends that one of ordinary skill would have been motivated to provide the first chamber with an IP grade rating of IP65 based on Brinkmann, and would have been motivated to provide components with an IP grade rating less than IP65 in the second chamber to save money. *Id.* (citing Ex. 1012 ¶ 162; Ex. 1024; Ex. 1025; Ex. 1026, 12.1, 12.4, 12.10). If Patent Owner had timely made this argument, we would find Petitioner’s argument on this point credible and persuasive, and that Petitioner met its burden even using Patent Owner’s construction for this limitation.

Claim 1 also requires a heat sink that includes “heat exchange structure extending through said wall and being thermally conductively coupled to said electronic components in said first chamber and to said cooling fins in said second chamber.” Petitioner contends that to the extent that Shinohara alone does not disclose this limitation, Shinohara when combined with Brinkmann discloses the limitation because Brinkmann discloses a heat sink with projection 6 that extends through housing wall and into Brinkmann’s sealed chamber. *Id.* at 35–37 (citing Ex. 1003 ¶¶ 13, 16, 21, Fig. 1(b); Ex. 1005, 3, Fig. 1; Ex. 1012 ¶¶ 166–173). As to motivation to combine the references, Petitioner contends that one of ordinary skill in the art would have been motivated to apply the teaching of Brinkmann to Shinohara’s housing to meet the claim limitations for a number of reasons. *See* Pet. 38–41. For example, Petitioner contends that the use of Brinkmann’s heat sink extension in Shinohara is nothing more than

the use of a known technique (having a heat sink extend through a wall into a sealed chamber) to improve a similar device (Shinohara’s inverter housing with a sealed chamber holding electronics being cooled by a heat sink outside the chamber) in the same way (allowing the electronics in the sealed chamber to be directly mounted on and be cooled by the heat sink, while protecting the electronics from dust and moisture).

Id. at 39 (citing Ex. 1012 ¶¶ 127–133). Petitioner also argues that one of ordinary skill in the art would appreciate that the benefits of Brinkmann would apply to Shinohara, and that the combination involves the simple substitution of one known element for another, to obtain predictable results. *Id.* at 39–40.

The next limitation of claim 1 requires “at least one of a choke and a transformer also being located in said second chamber,” which the parties agree requires either a choke *or* a transformer, but not both. *See* Inst. Dec. 16. Petitioner contends that Shinohara discloses transformer 12 in second chamber 5f.¹⁴ Pet. 41–42 (citing Ex. 1003 ¶¶ 14, 23, 26; Ex. 1012 ¶¶ 174–175). As to the limitation requiring “said electrical components in said second chamber being less sensitive to humidity and dirt than said electronic components in said first chamber,” Petitioner argues that Shinohara discloses transformer 12 and resistors 11 in “second chamber (5f)” that are both “less sensitive to humidity and dirt than the inverter and weak-current control circuitry components in the first chamber (5e).” *Id.* at 42–43 (citing Ex. 1012 ¶ 161). Petitioner further contends that one of ordinary skill in the art would have understood that to be the case because the more sensitive components are placed in the first, sealed chamber to protect them from moisture and dust. *Id.* at 43 (citing Ex. 1003 ¶ 21; Ex. 1012 ¶ 179; Ex. 1013, 139). The final limitation of claim 1 requires “said second chamber having a cooling system including said cooling unit positioned at one end of said second chamber for cooling both said cooling fins and said electrical components.” Petitioner contends that Shinohara’s cooling fans 8 correspond to the claimed “cooling unit” of the “cooling system” and that they are positioned at one end of second chamber 5f and cool fins and

¹⁴ Petitioner mistakenly refers to “second chamber (5e)” in this section. Pet. 41. We view this as a typographical error because the remainder of the Petition refers to chamber 5f as corresponding to the claimed “second chamber,” and Shinohara discloses transformer 12 in chamber 5f. *See* Pet. 30 (“the recited ‘second chamber’ of the claim is the chamber 5f”), 32 (“second chamber (5f)”), 33–34, 41, 42; Ex. 1003, Figs. 1(b), 1(c).

components in that chamber. *Id.* at 43–45 (citing Ex. 1003 ¶¶ 12, 14, 16, 22–23, 25–26, 30, Figs. 1–2; Ex. 1012 ¶¶ 180–181).

Patent Owner does not dispute that Petitioner carried its burden of proving that the combination of Shinohara and Brinkmann discloses all of the limitations of claim 1, when using Petitioner’s constructions.¹⁵ We are persuaded by Petitioner’s arguments and evidence. We find that Petitioner has established by a preponderance of the evidence that Shinohara and Brinkmann disclose all of the limitations of claim 1 and that one of ordinary skill in the art would have been motivated to combine Brinkmann’s teachings with Shinohara’s housing as Petitioner proposes, for the reasons stated by Petitioner in the Petition, which we adopt as our own findings, as further supported by the Wood Declaration. *See* Pet. 26–45; Ex. 1012 ¶¶ 114–181.

b) Analysis Based on Patent Owner’s Constructions

Patent Owner’s arguments as to claim 1 are premised on our adoption of Patent Owner’s argument that the preamble to claim 1 limits the claim,

¹⁵ In circumstances such as this where Patent Owner has chosen not to address or dispute Petitioner’s arguments and evidence, factual findings for undisputed limitations are not required. *See In re NuVasive, Inc.*, 841 F.3d 966, 974 (Fed. Cir. 2016) (“Although the Board did not make findings as to whether any of the other claim limitations (such as fusion apertures or anti-migration teeth) are disclosed in the prior art, it did not have to: NuVasive did not present arguments about those limitations to the Board. . . . The Board, having found the only disputed limitations together in one reference, was not required to address undisputed matters.”); Paper 11, 7 (emphasizing that “any arguments for patentability not raised in the response may be deemed waived”). Nevertheless, we provide findings here and below for the undisputed limitations in the independent claims to help explain the nature of Petitioner’s contentions and to provide context for the analysis of the limitations that Patent Owner disputes when using its own constructions.

and that “all claim elements recited in this claim are claim elements of an inverter (including a housing with two chambers and electronic and electrical components).” PO Resp. 27. According to Patent Owner, if claim elements are “of an inverter,” then several claim limitations are not met by Shinohara. *Id.* at 27–40. We will assume for purposes of this analysis that Patent Owner’s claim constructions govern, and we address each argument in turn.

Patent Owner argues that Shinohara fails to disclose an inverter housing having two chambers, with components of the inverter in each chamber. PO Resp. 27–35. Patent Owner contends that Shinohara’s “motor drive housing 5” having chambers 5e, 5f does not correspond to an inverter housing having two chambers because Shinohara’s inverter 3 resides entirely within chamber 5e. *Id.* at 27 (citing Prelim. Resp. 24–29; Ex. 2003 ¶¶ 84–85). According to Patent Owner, “Shinohara unambiguously discloses a motor drive circuitry housing 5 that houses the motor drive circuitry which includes the inverter 3 as a component thereof, wherein the circuitry of the inverter 3 is contained within its own housing or box.” *Id.* at 28 (citing Ex. 2003 ¶¶ 86–88); *see also id.* at 28–31. Patent Owner also argues that even though Shinohara states that resistor 11 could reside within inverter 3, resistor 11 is not a component of inverter 3. *See* PO Resp. 27, 31–34. Patent Owner contends that both transformer 12 and resistor 11 are components of Shinohara’s motor drive assembly, not its inverter 3. *Id.* at 33–35. Patent Owner’s remaining arguments are variations on the argument that Shinohara fails to disclose an inverter housing and electronic components of the inverter in the second chamber of the housing. *See* PO Resp. 35–40.

Petitioner contends that “if one simply recognizes that the transformer and cooling fins in Shinohara’s open chamber are components of an inverter in the same way that the transformer and cooling fins in the ’631 patent’s open chamber are inverter components, virtually all of Patent Owner’s arguments evaporate.” Pet. Reply 15; *see also* Pet. 27–28 (citing Ex. 1003 ¶¶ 2–3, 11, 13–14, 16, 21–23, 25–26, 29; Ex. 1012 ¶¶ 147–148) (setting forth why Shinohara discloses preamble of claim 1 based on the assumption that it limits the claim). In Petitioner’s view, Shinohara’s housing 5 “is an inverter housing for the simple reason that it houses an inverter” and “[t]hat it may house additional components or house components that themselves have housings is irrelevant; the claim doesn’t preclude additional components from being in the housing, or from components having additional housings around them.” Pet. Reply 16 (citing Pet. 27–28, 51–52, 66; Ex. 1003 ¶ 2; Ex. 1043, 73–77, 82–83; Ex. 1044 ¶ 28). Petitioner also contends that Shinohara’s description of housing 5 as a “motor drive housing” rather than “inverter housing for driving a motor” makes no difference, as the prior art need not use the same terminology set forth in the claims. *Id.* at 17 (citing PO Resp. 27–35; *In re Bond*, 910 F.2d 831, 833 (Fed. Cir. 1990)). Petitioner also argues that Shinohara’s second chamber 5f contains cooling fins integral with inverter 3 and a transformer that are both inverter components corresponding to the same components shown in the ’631 patent. *Id.* at 18 (citing Ex. 1001, code (57), 2:25–39, Fig. 1; Ex. 1003 ¶¶ 21–26, Figs. 1(a)–1(c); Ex. 1043, 69–70, 80, 83–85, 98–99, 178).

In its Sur-reply, Patent Owner again argues that all of Shinohara’s inverter components reside within box 3 in first chamber 5e, and transformer 12 and resistor 11 in second chamber 5f are “motor drive circuitry,” not

inverter components. PO Sur-reply 11–12 (citing Ex. 1003, Fig. 1(c)). Patent Owner also argues that the cooling fins are merely “thermal transfer components” of inverter 3, rather than electronic or electrical components. *Id.* at 12. Patent Owner further contends that Petitioner had to show that transformer 12 inherently operates as a component of inverter circuitry within box 3, which in turn requires a showing “that the box 3 does not also contain a transformer, and that the motor drive circuitry does not utilize the transformer 12 independent of the function of the inverter within box 3.” *Id.* at 12–13.

We begin our analysis by identifying the structures in the specification that correspond to the inverter housing and components within the housing. The ’631 patent does not identify its “inverter” with a reference number, but it describes its inverter having housing 1 with two chambers 7, 8 separated by partition wall 6. Ex. 1001, 2:22–25. Figure 1 depicts chambers 7 and 8 and “lossy electronic and electric components 5” that “project into the chamber 7.” *Id.* at 2:25–26. Figure 1 of the ’631 patent appears to depict components 5 within an unnumbered cylindrical housing. *Id.* at Fig. 1. “Other lossy components 5a, such as a transformer with a high protection grade” are shown in cooled chamber 8, along with cooling body/heat exchanger 4. *Id.* at 2:27–30, 2:36–37, Fig. 1. Turning to Shinohara, we note that it discloses very similar structure, including housing 5 with two chambers 5e, 5f. Ex. 1003, Fig. 1(b). Shinohara depicts inverter 3, with its own unnumbered housing, in sealed chamber 5e, while transformer 12 and heat sink 2 are disposed in cooled chamber 5f. *Id.* ¶¶ 21–23, Figs. 1(b), 1(c).

Petitioner contends that, even if the term “inverter” is limiting, Shinohara unquestionably discloses a housing that includes an inverter and

two chambers, and that is all the claim requires. *See* Pet. Reply 15–16. We agree. The fact that Shinohara’s inverter drives a motor and calls its housing a “motor drive housing” is of no moment when that housing houses an inverter. Notably, inverter housing 1 shown in the ’631 patent and Shinohara’s housing 5 have a nearly identical arrangement, with sensitive components housed in a first, closed chamber and less sensitive components housed in second, open chamber. *Compare* Ex. 1001, Fig. 1, *with* Ex. 1003, Figs. 1(a)–(c). For example, the ’631 patent’s “lossy electronic and electric components 5” within an unnumbered cylindrical housing that “project[s] into the chamber 7” correspond to Shinohara’s inverter 3, both in the closed chamber, and both disclose a transformer in the open chamber. *Compare* Ex. 1001, 2:25–26, Fig. 1 *with* Ex. 1003 ¶¶ 21–23, Figs. 1(b), 1(c). We see no basis to conclude that Shinohara fails to disclose an inverter housing having two chambers when it discloses the same arrangement shown in the ’631 patent. For similar reasons, we view Shinohara’s transformer 12, at a minimum,¹⁶ as an electronic component “of the inverter.” The ’631 patent depicts the claimed transformer 5a in an open chamber adjacent the closed chamber containing other inverter components. Ex. 1001, Fig. 1. Shinohara discloses the same arrangement. Ex. 1003, Fig. 1(c). We find Petitioner’s arguments and evidence, including its declarant testimony, persuasive on these points, and adopt them as our own. *See* Pet. 27–30, 41; Pet. Reply 14–21; Ex. 1012 ¶¶ 85, 147–154, 174; Ex. 1044 ¶¶ 15–21, 27–28.

¹⁶ Petitioner also relies on cooling fins and resistors 11 as inverter components within Shinohara’s second chamber. *See* Pet. 29–30 (citing Ex. 1003 ¶ 26; Ex. 1012 ¶ 154); Reply 15. We need not reach these issues because we agree Shinohara’s transformer 12 meets the requirement for an electronic component of the inverter in the second chamber.

Patent Owner's arguments place unwarranted restrictions on the scope of the inverter housing and components within the housing, such as the transformer. For example, to successfully argue that Shinohara's housing 5, which includes inverter 3 therein, does not house an inverter, Patent Owner would need to set forth a construction for the inverter "housing" that excludes housings that contain other components or perform certain functions with the inverter, such as driving a motor. Neither the claim language, which is open-ended, nor the brief description of the invention in the specification, would support such a construction, even if it had been argued by Patent Owner. Similarly, Patent Owner argues that Petitioner failed to provide any of the details as to the functionality of Shinohara's transformer 12 and how Shinohara's inverter 3 operates (e.g., with or without an internal transformer), but neither the claim nor the '631 patent specification sets forth any detailed requirements for transformer 12a to be considered "of the inverter," and Patent Owner makes no attempt to provide a narrow construction for "transformer of the inverter" that would exclude Shinohara's structure. *See* PO Sur-reply 12–13.

c) Conclusion as to Claim 1

We find that Petitioner has proven by a preponderance of the evidence that the combination of Shinohara and Brinkmann discloses all of the limitations of claim 1, using Petitioner's proposed constructions that we adopt, or using Patent Owner's proposed constructions. We also find that Petitioner has established by a preponderance of the evidence that one of ordinary skill in the art would have been motivated to combine Shinohara and Brinkmann for the reasons stated by Petitioner. *See supra* § D.3.a.

4. *Independent Claims 9 and 17*

Petitioner asserts that Shinohara and Brinkmann disclose all of the limitations of claims 9 and 17 and that one of ordinary skill in the art would have been motivated to apply Brinkmann's teachings to Shinohara. Pet. 51–59, 66. Similar to claim 1, Petitioner contends that Shinohara discloses all of the limitations of claims 9 and 17 with the possible exception of “heat sink . . . extending from the first chamber through the wall into the second chamber,” which Petitioner contends Brinkmann discloses. *Id.* at 54–58, 66. Independent claims 9 and 17 have several limitations in common and many limitations that are similar to limitations in claim 1. *See* Ex. 1001, 3:31–49, 4:22–45. Petitioner points to the relevant portions of Shinohara and Brinkmann that allegedly disclose the limitations of claims 9 and 17, and relies on the Wood Declaration in support of those arguments. Pet. 51–60, 66.

Patent Owner raises a number of arguments that the prior art fails to disclose certain limitations, but all of those arguments hinge on Patent Owner's claim construction arguments, which we decline to adopt. We set forth our analysis of claims 9 and 17 using Petitioner's proposed constructions, which we find persuasive and adopt as our own for the reasons set forth above, followed by an analysis using Patent Owner's proposed constructions and addressing Patent Owner's arguments based on those constructions.

a) *Analysis Based on Petitioner's Constructions*

As discussed above, we find Petitioner's claim construction arguments persuasive and adopt Petitioner's constructions as our own. Patent Owner does not argue that the combination of Shinohara and

Brinkman fails to disclose any of the limitations of the challenged claims if we adopt Petitioner’s constructions, nor does Patent Owner argue that Petitioner failed to articulate a sufficient motivation to combine the references.

We discussed the preamble above, and conclude that “inverter” in the preamble does not limit claims 9 or 17. Claims 9 and 17 require “a housing comprising a first chamber and a second chamber, the chambers being separated from each other by a wall.” Similar to claim 1, Petitioner relies on Shinohara’s housing 5 with first and second chambers 5e, 5f and partition plate 10 as disclosing these limitations. Pet. 51–52, 66 (citing Ex. 1003 ¶¶ 13, 21, 25–26, 29, Fig. 1(b); Ex. 1012 ¶¶ 213–215). Claims 9 and 17 require “a cooling unit for forcing an air flow through the second chamber” and “a first heat generating electric or electronic component arranged in the first chamber.” Petitioner relies on Shinohara’s fans to meet the cooling unit and Shinohara’s “weak-current control circuitry components” in chamber 5e to meet the first heat generating components. Pet. 52–53 (citing Ex. 1003 ¶¶ 12, 14, 16, 21–23, 25–26, 29–30, Figs. 1–2; Ex. 1012 ¶¶ 216–219).

Claims 9 and 17 require “a second heat generating electric or electronic component of a high protection grade being arranged in the second chamber.” We apply Petitioner’s construction of “component of a high protection grade” here—i.e., “component of a protection grade sufficient to be insensitive to contamination from exposure to ambient air.” Pet. 25. Petitioner contends that Shinohara discloses resistors 11 and transformer 12 that generate heat and have protection grades sufficient to be insensitive to contamination from ambient air. *Id.* at 53 (citing Ex. 1003 ¶¶ 13, 14, 21–23, 25–26, 29; Ex. 1012 ¶¶ 220–224), 66. According to

Petitioner, the components are less sensitive to dust and moisture because they are able to operate in the second chamber, “where they have ambient air blown on them.” *Id.* at 54 (citing Ex. 1012 ¶ 224); Ex. 1012 ¶ 224 (“To a PHOSITA [(person having ordinary skill in the art)] it would not make sense to place electronic components sensitive to moisture and dust in the second chamber 5f, because the second chamber 5f has ambient air being blown through it by the fans.”). In addition, while Patent Owner argues that this limitation requires a high “IP grade” not disclosed by Shinohara that we discuss below, Patent Owner acknowledges that components such as transformers are typically insensitive to moisture and dust. PO Resp. 43 (“A POSITA would know that certain types of components such as resistors and transformers can be relatively insensitive to moisture and dust.”), 44 (acknowledging that “transformers are generally relatively insensitive to moisture and dust”); *see also* Tr. 73:9–12 (Patent Owner’s counsel acknowledging that its high protection grade argument is contingent on adopting Patent Owner’s construction for the term).

Claims 9 and 17 also require “a heat sink being in thermal contact with the first heat generating electric or electronic component and extending from the first chamber through the wall into the second chamber.” Petitioner contends that to the extent that Shinohara alone does not disclose this limitation, Shinohara when combined with Brinkmann discloses the limitation because Brinkmann discloses a heat sink with projection 6 that extends through housing wall and into Brinkmann’s sealed chamber. Pet. 56–57 (citing Ex. 1005, 3, Fig. 1; Ex. 1012 ¶¶ 225–232). Petitioner relies on the same motivation to combine arguments for claims 9 and 17 as discussed

above in the context of claim 1. *See id.* at 57–58 (citing Ex. 1012 ¶¶ 126–144), 66.

Claims 9 and 17 further require “wherein the first chamber is dust and moisture tight against the ambient air, and wherein the second heat generating electric or electronic component and the portion of the heat sink extending into the second chamber is configured to be cooled by the air flow.” Petitioner contends that Shinohara’s first chamber 5e “is ‘dust and moisture tight against the ambient air’ in that it is ‘hermetically sealed.’” Pet. 58 (quoting Ex. 1003 ¶ 21) (citing Ex. 1003 ¶¶ 13, 21–22, 26, 29, Figs. 1–2; Ex. 1012 ¶ 233). Petitioner also contends that Shinohara discloses a fan in the second chamber that cools the cooling fins and electrical components in the second chamber. *Id.* at 58–59 (citing Ex. 1003 ¶¶ 12, 14, 16, 22–23, 25–26, 30, Figs. 1–2; Ex. 1012 ¶¶ 211, 234–235).

Claim 17 includes limitations not found in claim 9, including “the second chamber being open to the ambient and having a lower protection grade rating than the first chamber.” Petitioner contends that Shinohara discloses a second chamber 5f open to ambient air, which would have a lower IP grade rating than the “hermetically sealed” first chamber 5e. Pet. 59–60 (citing Ex. 1003 ¶¶ 12–14, 16, 21–23, 26, 29, Figs. 1–2; Ex. 1012 ¶¶ 236–239; Ex. 1014, 13–15), 66.

The last limitation of claim 17 recites “the cooling unit comprising a fan, the heat generating second component comprising at least one of a transformer, a cast winding and a choke.” Petitioner argues that Shinohara discloses fan motors 8 for cooling its second chamber 5f, as well as a heat generating component such as a transformer in the second chamber 5f. Pet.

61–63 (citing Ex. 1003 ¶¶ 12, 14, 16–17, 19, 23, 25–26, 30; Ex. 1012 ¶¶ 240–243, 248–252).

Patent Owner does not dispute that Petitioner carried its burden of proving that the combination of Shinohara and Brinkmann discloses all of the limitations of claims 9 and 17 when using Petitioner’s constructions. We are persuaded by Petitioner’s arguments and evidence. We find that Petitioner has established by a preponderance of the evidence that Shinohara and Brinkmann disclose all of the limitations of claims 9 and 17 and that one of ordinary skill in the art would have been motivated to combine Brinkmann’s teachings with Shinohara’s housing as Petitioner proposes, for the reasons stated by Petitioner in the Petition. We adopt Petitioner’s arguments and evidence as our own findings on these challenges. *See* Pet. 51–63, 66; Ex. 1012 ¶¶ 211–243, 249–252, 266–268.

b) Analysis Based on Patent Owner’s Constructions

Although we reject Patent Owner’s claim constructions for the reasons discussed above, for completeness, we will assume for purposes of this analysis that Patent Owner’s claim constructions govern. Patent Owner raises two arguments with respect to claims 9 and 17. First, Patent Owner argues that Shinohara fails to disclose “a second heat generating electric or electronic component *of the inverter*” in the second chamber of the inverter housing. PO Resp. 40–41, 49. Patent Owner contends, as it did in connection with its arguments as to claim 1, that all components of Shinohara’s inverter 3 reside in its inverter housing within chamber 5e and that resistor 11 and transformer 12 in chamber 5f do not reside within a chamber of the inverter housing of claim 9. *Id.* Patent Owner also argues that Shinohara fails to disclose at least one of a transformer, a cast winding,

or a choke in the second chamber of the inverter housing because Shinohara's components in the second chamber relate to Shinohara's motor drive housing rather than an inverter housing. *Id.* at 46–48. These arguments mirror those addressed above in the context of claim 1 based on the assertion Shinohara fails to disclose an inverter housing with two chambers and components “of the inverter” in the second chamber, arguments we addressed and found unpersuasive above. For the same reasons discussed above, we find the arguments unpersuasive here as well.

Second, Patent Owner argues that Shinohara does not disclose a “component of a high protection grade” in the second chamber, as required by claims 9 and 17. PO Resp. 42–46. Patent Owner relies on its construction of “high protection grade” as meaning a high IP grade. *Id.* at 43 (citing Ex. 2003 ¶ 125). Patent Owner acknowledges that Shinohara's resistors and transformer “can be relatively insensitive to moisture and dust,” but argues that insensitivity does not necessarily equate to a high IP grade. *Id.* at 43–44 (citing Ex. 1014, 7; Ex. 1024; Ex. 1025; Ex. 1026, 4; Ex. 2003 ¶¶ 81, 127–130; Ex. 2006, 96–97). Patent Owner further argues that Shinohara's silence regarding IP grade means that its components do not have an IP grade, and that in any event they would not need an IP grade above IP20. *Id.* at 44 (citing Ex. 2003 ¶¶ 131–132; Ex. 2006, 103:13–19). As to whether it would have been obvious to select a high protection grade for Shinohara's resistor 11 or transformer 12, Patent Owner “notes” that Petitioner's declarant, Dr. Wood, made his own inverters in the past and included “an open housing where the sensitive and insensitive electronic components weren't particularly IP grade protected.” *Id.* at 45 (citing Ex. 1012 ¶ 70; Ex. 2006, 78:7–17). Patent Owner also contends that one would

not have been motivated to add an enclosure that provides a higher IP grade for cost reasons, and that a higher IP grade is unnecessary. *Id.* at 45–46 (citing Ex. 1012 ¶ 155; Ex. 2003 ¶¶ 133–137).

Petitioner argues that even using Patent Owner’s new construction for “high protection grade,” it would have been obvious to select components having a high IP grade given their placement in a chamber exposed to dust and moisture. Pet. Reply 22–23. Petitioner argues that Patent Owner’s focus on whether Petitioner’s declarant constructed the claimed invention is legally irrelevant, and Patent Owner’s argument that there is no need to provide protection via a high IP grade conflicts with the claimed invention, which calls for that approach. *Id.* at 22–23. According to Petitioner, “a POSITA would have been aware of, and found it obvious, to use high-grade components if he were particularly concerned about contamination in the open chamber, as explained in the petition.” *Id.* at 23 (citing Pet. 7–8, 32–33, 53–54, 66; Ex. 1012 ¶¶ 88–90, 162, 224, 266; Ex. 1044 ¶¶ 29, 32–33). Petitioner also posits that selecting a high IP grade “may be an example of ‘over-engineering,’” but that “does not make it unobvious.” *Id.* at 23. Petitioner also argues that resistors and transformers having IP grade ratings up to IP65 were commercially available and provided grade choices that “would have been obvious to a POSITA, who was perfectly capable of balancing design interests such as cost versus suitable protection against elements.” *Id.* at 23–24 (citing Pet. 7–8, 32–33, 53–54, 66; Ex. 1012 ¶¶ 88–90, 162, 224, 266; Ex. 1043, 61–62, 108–114, 171; Ex. 1044 ¶¶ 34).

In its Sur-reply, Patent Owner argues that Petitioner’s obviousness argument “essentially states that selecting a high IP grade for the components in the second chamber is nothing else than an optimization

through routine experimentation,” and argues that this new argument should not be considered. PO Sur-reply 19 (citing Pet. Reply 22–24). Patent Owner also argues that routine optimization theory fails because it lacks a result-effective variable. *Id.* at 20. Finally, Patent Owner contends that Petitioner fails to identify any need or demand to select a high IP grade. *Id.*

We find that Petitioner establishes sufficiently that it would have been obvious to select a high IP grade for Shinohara’s resistors 11 or transformer 12 in the second chamber. Petitioner, supported by credible testimony from its declarant, persuasively argues that selecting a component with a high IP grade for use in an environment more prone to contamination would have been obvious. *See* Pet. Reply 23; Pet. 33 (transformers come in variety of IP grade ratings, including IP54), 53–54 (components in open chamber call for less sensitivity to contamination); Ex. 1012 ¶¶ 88–90, 162, 224, 266; Ex. 1044 ¶¶ 29, 32–34; Ex. 1024, 1; Ex. 1025, 2. This evidence includes product documents indicating that transformers with a “high” IP grade were known and readily available commercially. *See* Ex. 1024, 1 (product data sheet showing transformers with “IP23, IP54 or IP65 protection” available); Ex. 1025, 2 (noting that available transformers “can be supplied either open or enclosed in steel wall or floor mounted enclosures up to IP65 rating”). Contrary to Patent Owner’s assertion, Petitioner explains that one may need such a transformer and would have been motivated to provide the added protection of a high IP grade in certain environments subject to contamination, such as an open chamber of a housing. *See* Pet. Reply 23; Pet. 33, 53–54; Ex. 1012 ¶¶ 88–90, 162, 224, 266; Ex. 1044 ¶¶ 29, 32–34. We adopt Petitioner’s argument and evidence in support of its obviousness argument as to the “high protection grade” limitation in claims 9 and 17 as

our own. *See* Pet. Reply 23; Pet. 33, 53–54; Ex. 1012 ¶¶ 88–90, 162, 224, 266; Ex. 1044 ¶¶ 29, 32–34; Ex. 1024, 1; Ex. 1025, 2.

Patent Owner’s arguments do not persuade us that Petitioner failed to make its case here. Patent Owner concedes that “the same transformer can be purchased with different enclosures providing different IP grades based on the enclosure this transformer may be enclosed with. IP20 is the most common degree of protection.” PO Resp. 26 (citing Ex. 1026, 4). Patent Owner argues that even though it may have been possible to select a high IP grade for a component, there would have been no reason to do so given the cost considerations. Patent Owner’s briefing does not take into account the breadth of the limitation it conceded at the oral hearing, where Patent Owner contended that a “high” IP grade rating on the scale of IP00-IP68 includes any component with a rating above IP34. Tr. 57:1–25. The question becomes whether it would have been obvious to select components having an IP grade above IP34 when components having various IP grade ratings, including IP54 and IP65, were already well known and readily available in the art. *See* Ex. 1044 ¶¶ 29, 32–34; Ex. 1024, 1; Ex. 1025, 2. Patent Owner does not argue or point to any evidence that such a minor change would have resulted in material cost differences, or persuasively argue that such a difference would have dissuaded one of ordinary skill in the art from making such a selection. Patent Owner’s argument that there is no need for such protection fails to persuasively refute Petitioner’s position that such protection may have been desired when placing a component in an open chamber exposed to contamination, and the availability of transformers having IP ratings well above IP34 presumably existed to meet that market need. *See* PO Resp. 45. We also do not view a selection of a known,

available component with a slightly higher IP rating as requiring “optimization” of the type that requires a result-effective variable, and therefore, this does not amount to an improper “new” argument as Patent Owner argues. *See* PO Sur-reply 19. We also view the issue of whether Dr. Wood personally constructed a device that meets the claim requirements prior to this dispute, or failed to do so, as largely irrelevant and insufficient to undermine Petitioner’s obviousness arguments.

c) Conclusion as to Claims 9 and 17

We find that Petitioner has proven by a preponderance of the evidence that the combination of Shinohara and Brinkmann discloses all of the limitations of claims 9 and 17, using Petitioner’s proposed constructions that we adopt as our own, or using Patent Owner’s proposed constructions. We also find that Petitioner has established by a preponderance of the evidence that one of ordinary skill in the art would have been motivated to combine Shinohara and Brinkmann for the reasons stated by Petitioner.

5. Dependent Claims 2–5, 7, 8, 10–16, and 18

We have reviewed Petitioner’s challenge of claims 2–5, 7, 8, 10–16, and 18. *See* Pet. 45–50, 59–67. Patent Owner does not address Petitioner’s arguments and evidence as to any of the dependent claims. *See* PO Resp. 27–52. Based on our review of Petitioner’s arguments and evidence for these claims, we determine that Petitioner establishes by a preponderance of the evidence that the combination of Shinohara and Brinkmann discloses the additional limitations of claims 2–5, 7, 8, 10–16, and 18. We adopt Petitioner’s arguments and evidence as to the obviousness of dependent

claims 2–5, 7, 8, 10–16, and 18 based on Shinohara and Brinkmann as our own. *See* Pet. 45–50, 59–67; Ex. 1012 ¶¶ 182–210, 236–265, 269–272.¹⁷

6. *Conclusion*

“Once all relevant facts are found, the ultimate legal determination [of obviousness] involves weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan.”

Arctic Cat Inc. v. Bombardier Recreational Prods. Inc., 876 F.3d 1350, 1361 (Fed. Cir. 2017). Above, based on the full record before us, we provide our factual findings regarding (1) the level of ordinary skill in the art, (2) the scope and content of the prior art, and (3) any differences between the claimed subject matter and the prior art.¹⁸

In particular, we find that (1) Petitioner’s proposed level of ordinary skill in the art is consistent with the art of record; (2) Shinohara and Brinkmann disclose all the limitations of claims 1–5 and 7–18; (3) one of ordinary skill in the art would have had a reason to combine the Shinohara with Brinkmann in the manner Petitioner proposes; and (4) there is no objective evidence of nonobviousness in the record. Weighing these underlying factual determinations, a preponderance of the evidence

¹⁷ We need not make formal findings as to the undisputed assertions by Petitioner that the references disclose the limitations of the dependent claims, and Petitioner’s undisputed stated motivation to combine. *See NuVasive*, 841 F.3d at 974 (Board not required to make findings or address undisputed matters); Paper 11, 7. Here and elsewhere in this Decision, we adopt Petitioner’s argument and evidence as our own to make the clear the basis for our conclusion that the claims at issue would have been obvious.

¹⁸ Neither party presents argument and evidence as to objective indicia of nonobviousness.

persuades us that claims 1–5 and 7–18 of the ’631 patent are unpatentable over the combination of Shinohara and Brinkmann.

E. Challenges Under § 103(a) Based Shinohara, Brinkman, and Rodi

Petitioner contends that claims 1–5, 7, 8, 13, 17, and 18 are unpatentable over Shinohara, Brinkmann, and Rodi. Pet. 71–73. Petitioner relies on Rodi to disclose the limitation requiring “at least one of a transformer, a cast winding and a choke,” if that limitation requires all three components. *Id.* at 71. Petitioner contends that “Rodi teaches having transformers and chokes (all of which are cast windings) in a chamber of a power supply housing cooled by ambient air.” *Id.* at 71–72 (citing Ex. 1108, 1:35–40, 3:10–39, Figs. 1–2). Petitioner also contends that one of ordinary skill in the art “would have been motivated to place such components in the air cooled chamber, so that they could be efficiently cooled.” *Id.* at 72 (citing Ex. 1012 ¶ 305).

Patent Owner argues that the addition of Rodi fails to remedy the alleged deficiencies Patent Owner identified in the challenge based on Shinohara and Brinkmann. PO Resp. 50–52. Patent Owner does not otherwise challenge Petitioner’s reliance on Rodi as disclosing “at least one of a transformer, a cast winding and a choke,” or Petitioner’s rationale for the combination of Shinohara, Brinkmann, and Rodi. *See id.*

Petitioner’s challenges based on Rodi appear to be an alternative argument in the event that we construe “at least one of” in the conjunctive to require all components listed in the claims. Pet. 71. In that sense, this challenge represents a back-up argument in the event that Patent Owner argued for such a construction, and we agreed. Because Patent Owner

agrees with Petitioner that “at least one of a transformer, a cast winding and a choke” only requires the presence of one of those components, not all three, this challenge was arguably unnecessary and cumulative of the challenge based on Shinohara and Brinkmann. Nevertheless, based on our review of Petitioner’s arguments and evidence, we determine that Petitioner establishes by a preponderance of the evidence that Rodi discloses the “at least one of a transformer, a cast winding and a choke” limitation under the construction agreed to by the parties. *See* Ex. 1008, 1:35–40. As a result, we find that the combination of Shinohara, Brinkmann, and Rodi discloses all of the limitations of the challenged claims, and that one of ordinary skill in the art would have been motivated to combine the references as Petitioner proposes. *See* Pet. 71–73 (citing Ex. 1012 ¶¶ 305–306). We adopt Petitioner’s argument and evidence as to these issues as our own. *See id.*

Based on the foregoing, we find that (1) Petitioner’s proposed level of ordinary skill in the art is consistent with the art of record; (2) Shinohara, Brinkmann, and Rodi disclose all the limitations of claims 1–5, 7, 8, 13, 17, and 18; (3) one of ordinary skill in the art would have had a reason to combine Shinohara, Brinkmann, and Rodi in the manner Petitioner proposes; and (4) there is no objective evidence of nonobviousness in the record. Weighing these underlying factual determinations, a preponderance of the evidence persuades us that claims 1–5, 7, 8, 13, 17, and 18 of the ’631 patent are unpatentable over the combination of Shinohara, Brinkmann, and Rodi.

F. Challenge of Claim 6 Under § 103(a) Based on Shinohara, Brinkmann, and Kramer and Shinohara, Brinkman, Rodi, and Kramer

Petitioner contends that claim 6 would have been obvious over Shinohara, Brinkmann, and Kramer or Shinohara, Brinkmann, Rodi, and

Kramer. Pet. 67–71, 73. For these challenges, Petitioner relies on the Wood Declaration. *Id.*

Claim 6 depends from claim 1 and further recites “wherein said at least one of the choke and the transformer is located on a side of the wall in said second chamber.” Ex. 1001, 3:23–25. Petitioner argues that Kramer discloses a transformer on the wall dividing the transformer from the sensitive electronics of the inverter. Pet. 68–69 (citing Ex. 1006 ¶¶ 6–7, 11, 13, 16–22, 38–39, 43, 45, 47, 55, 57, Fig. 7a; Ex. 1012 ¶¶ 274, 276–282, 285, 287–289, 292–293, 297). Petitioner also argues that a number of rationales support the addition of Kramer’s teachings. *Id.* at 69–71 (citing Ex. 1003 ¶¶ 2, 11, 13, 16, 21–22, 26, 29, Figs. 1–2; Ex. 1005, 1–3, Figs. 1; Ex. 1006, code (57), ¶¶ 6–7, 9, 18–19, 22, 38, 55, claim 19, Figs. 1, 3, 7; Ex. 1012 ¶¶ 293–300). Patent Owner argues that because claim 6 depends from claim 1, and Petitioner’s reliance on Kramer does not remedy the alleged deficiencies in the challenge to claim 1, this challenge fails for the same reasons. PO Resp. 49–50, 52. Patent Owner does not raise any additional arguments specific to Kramer or claim 6, or Petitioner’s stated rationale for the addition of Kramer to the combination. *See id.*

Based on our review of Petitioner’s arguments and evidence as to these challenges to claim 6, we determine that Petitioner establishes by a preponderance of the evidence that the combination of Shinohara, Brinkmann, and Kramer or Shinohara, Brinkmann, Rodi, and Kramer discloses the additional limitations of claim 6, and that one of ordinary skill in the art would have been motivated to make the combination in the manner Petitioner proposes. We adopt Petitioner’s arguments and evidence as to the

obviousness of dependent claim 6 based on these challenges as our own.
See Pet. 68–71; Ex. 1012 ¶¶ 274, 276–282, 285, 287–289, 292–300.

Based on the foregoing, we find that (1) Petitioner’s proposed level of ordinary skill in the art is consistent with the art of record; (2) the asserted references disclose all the limitations of claim 6; (3) one of ordinary skill in the art would have had a reason to combine Shinohara, Brinkmann, and Kramer as well as Shinohara, Brinkmann, Rodi, and Kramer in the manner Petitioner proposes; and (4) there is no objective evidence of nonobviousness in the record. Weighing these underlying factual determinations, a preponderance of the evidence persuades us that claim 6 of the ’631 patent is unpatentable over the combination of Shinohara, Brinkmann, and Kramer or Shinohara, Brinkmann, Rodi, and Kramer.

G. Remaining Challenges

Petitioner includes a number of additional challenges based on Shinohara alone or various combinations of references that do not include Brinkmann. For example, Petitioner contends that claims 1–5 and 7–18 are unpatentable as obvious over Shinohara alone, claim 6 is unpatentable based on Shinohara and Kramer, claims 1–5 and 7–18 are unpatentable based on Shinohara and Rodi, and claim 6 is unpatentable based on Shinohara, Rodi, and Kramer. Pet. 18, 26–73. We need not reach the merits of these challenges because we have already concluded that all challenged claims are unpatentable for the reasons provided above. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, Nos. 2019-1594, -1604, -1605, 2020 WL 2071962, at *4 (Fed. Cir. Apr. 30, 2020) (non-precedential)

(recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

H. Patent Owner’s Motion to Exclude

Patent Owner moves to exclude Exhibits 1019, 1021, 1023, 1027, 1030, and 1031, and related portions of Exhibits 1012 and 1041. PO Mot. Exclude 1, 7–8. Petitioner opposes Patent Owner’s Motion to Exclude in all respects. Pet. Opp. 1–14.

As to Patent Owner’s effort to exclude the Exhibits 1019, 1021, 1023, 1027, 1030, 1031, and 1041, the arguments appear weak, but we need not reach the merits of these issues because we do not rely on any of the exhibits in our analysis. Patent Owner’s Motion to Exclude is therefore moot as to Exhibits 1019, 1021, 1023, 1027, 1030, 1031, and 1041.

As to Patent Owner’s effort to exclude portions of Ex. 1012, Dr. Wood’s Declaration, Patent Owner’s arguments fall into two groups. For paragraphs 70, 79, 81, 82 of Exhibit 1012, which discuss allegedly inadmissible Exhibits 1027, 1030, and 1031, Patent Owner argues that the paragraphs “should be excluded under FRE 702 as an opinion not based on sufficient facts or data and under FRE 401 as irrelevant because they are based on inadmissible evidence.” PO Mot. Exclude 6–7. Petitioner argues that “Patent Owner provides no explanation of which statements it purports are not based on sufficient facts or data,” and argues that the cited exhibits are admissible. Pet. Opp. 9.

We agree with Petitioner that Patent Owner’s arguments are not adequately developed and do not support exclusion of the paragraphs in

question. Patent Owner does not specify which statements in the cited paragraphs are not based on sufficient facts or data, and does not support its argument that we must exclude paragraphs that cite to inadmissible exhibits with any citation to legal or other authority. *Cf.* FRE 703 (allowing experts to base opinions on inadmissible facts or data under certain circumstances).

As to paragraphs 49–54 and 68–74, Patent Owner argues that the Petition does not cite to the paragraphs, and they are therefore irrelevant. PO Mot. Exclude 8. Petitioner argues that these paragraphs provide basic background information and that several of the paragraphs are cited in either Petitioner’s Reply or Dr. Wood’s Reply Declaration. Pet. Opp. 13–14.

We disagree with Patent Owner’s apparent position that we should exclude all paragraphs from a declarant’s declaration that are not cited in a party’s papers. Such material could be relevant or helpful background to the Board when reviewing the technical background of the prior art or the declarant’s expertise. Further, Patent Owner’s list of “uncited” material is inaccurate because several paragraphs were relied upon by Petitioner, and Patent Owner does not explain how such paragraphs can be irrelevant under these circumstances. *See* Pet. Reply 20 (citing Ex. 1012 ¶ 73), 21 (citing Ex. 1012 ¶ 68); Ex. 1044 ¶¶ 16, 17, 38.

Based on the foregoing, we deny Patent Owner’s Motion to Exclude.

CONCLUSION¹⁹

A summary of our conclusions appears in the chart below:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–5, 7–18	103(a) ²⁰	Shinohara		
1–5, 7–18	103(a)	Shinohara, Brinkmann	1–5, 7–18	
6	103(a)	Shinohara, Kramer		
6	103(a)	Shinohara, Brinkmann, Kramer	6	
1–5, 7, 8, 13, 17, 18	103(a)	Shinohara, Rodi		
1–5, 7, 8, 13, 17, 18	103(a)	Shinohara, Brinkmann, Rodi	1–5, 7, 8, 13, 17, 18	
6	103(a)	Shinohara, Kramer, Rodi		
6	103(a)	Shinohara, Brinkmann, Kramer, Rodi	6	
Overall Outcome			1–18	

¹⁹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

²⁰ Because we determined that all of the challenged claims are unpatentable based on two distinct obviousness challenges, we did not reach whether the same claims are also unpatentable based on other challenges.

ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–18 of U.S. Patent 7,816,631 B2 have been shown, by a preponderance of the evidence, to be unpatentable;

FURTHER ORDERED that Patent Owner’s Motion to Exclude is *denied*; and

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

IPR2019-01223
Patent 7,816,631 B2

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