

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC and ECOBEE TECHNOLOGIES ULC,
Petitioners,

v.

ECOFACITOR, INC.,
Patent Owner.

IPR2021-01218
Patent 8,019,567 B2¹

Before WESLEY B. DERRICK, JEFFREY W. ABRAHAM, and
SCOTT B. HOWARD, *Administrative Patent Judges*.

HOWARD, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

¹ Ecobee Technologies ULC was joined as a party to this proceeding via a Motion for Joinder in IPR2022-00686.

I. INTRODUCTION

A. *Background and Summary*

Google LLC (“Petitioner”) filed a Petition seeking to institute an *inter partes* review of claims 1–20 of U.S. Patent No. 8,019,567 B2 (Ex. 1001, “the ’567 patent”).² Paper 2 (“Petition,” “Pet.”). EcoFactor, Inc. (“Patent Owner”) did not file a Patent Owner Preliminary Response. We instituted an *inter partes* review of claims 1–20 of the ’567 patent on all grounds of unpatentability alleged in the Petition. Paper 9 (“Institution Decision” or “Inst. Dec.”).

After institution of trial, Patent Owner filed a Response (Paper 12, “PO Resp.”), Petitioner filed a Reply (Paper 15, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 16, “PO Sur-reply”).

An oral hearing was held on December 6, 2022, and the record contains a transcript of this hearing. Paper 21 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–3, 7, and 15–20 of the ’567 patent are unpatentable.

B. *Real Parties in Interest*

Petitioner identifies itself as the real party in interest. Pet. 6. Joined party ecobee, Inc. identifies ecobee, Inc. and ecobee Ltd. as the real parties in interest. *Ecobee Technologies ULC v. EcoFactor, Inc.*, IPR2022-00686, Paper 1, 6 (Petition).

² Ecobee Technologies ULC, was joined to this proceeding upon instituting *inter partes* review in IPR2022-00686 and granting ecobee’s motion for joinder. See Paper 14.

Patent Owner identifies itself as the real party in interest. Paper 4, 1 (Patent Owner’s Mandatory Notices).

C. Related Matters

Both parties identify three district court cases as related matters: *ecobee, Inc. v. EcoFactor, Inc.*, No. 1:21-cv-00323-MN (D. Del.); *Google LLC f/k/a Google Inc. v. EcoFactor, Inc.*, No. 3:21-cv-01468-JD (N.D. Cal.); and *Resideo Technologies, Inc. v. EcoFactor, Inc.*, No. 3:21-cv-01496 (N.D. Cal.). Pet. 6–7; Paper 4, 2.

Petitioner identifies two additional district court cases—*EcoFactor, Inc. v. Johnson Controls, Inc.*, No. 6:21-cv-00413 (W.D. Tex.) and *Carrier Global Corporation v. EcoFactor, Inc.*, No. 1-21-cv-00328 (D. Del.)—and an International Trade Commission proceeding—*In re Certain Smart Thermostat Systems, Smart HVAC Systems, Smart HVAC Control Systems, and Components Thereof*, Inv. No. 337-TA-1258. Pet. 6–7. We understand that these two additional district court cases have been dismissed and that the ITC proceeding has been terminated with respect to the ’567 patent.

Patent Owner identifies an additional ITC proceeding—*In re Smart HVAC Systems, and Components Thereof*, Inv. No. 337-TA-1185—as one “that may affect, or be affected by, a decision in this proceeding.”³ Paper 4, 1–2.

D. The ’567 Patent

The ’567 patent is titled “System and Method for Evaluating Changes in the Efficiency of an HVAC System,” and issued on September 13, 2011, from an application filed on September 16, 2008. Ex. 1001, codes (22),

³ We understand that ITC Investigation No. 337-TA-1185 does not involve the ’567 patent itself.

(45), (54). The '567 patent identifies provisional application 60/994,011, filed on September 17, 2007, as a related application. *Id.* at code (60), 1:5–10.

The '567 patent generally relates to “systems and methods for evaluating changes in the operational efficiency of an HVAC system over time.” Ex. 1001, code (57). More specifically, the '567 patent is directed to evaluating changes in operational efficacy by comparing temperature measurements from locations conditioned by the HVAC system and measurements of outside temperatures from sources other than the HVAC system and comparing these to the expected temperature measurements for HVAC conditioned locations, taking into account the status of the HVAC system, where the expected temperature measurements are based at least in part on past temperature measurements. *Id.*

E. Illustrative Claims

The '567 patent contains 20 claims, of which claims 1, 8, and 15 are independent, illustrative of the claimed inventions, and reproduced below with limitation annotations used by the parties.

1. [1a] A system for evaluating changes in the operational efficiency of an HVAC system over time comprising:
 - [1b] at least one HVAC control system associated with a first structure that receives temperature measurements from at least a first structure conditioned by at least one HVAC system, and receives status of said HVAC system;
 - [1c] one or more processors that receive measurements of outside temperatures from at least one source other than said HVAC system and [1d] compare said temperature measurements from said first structure, wherein said one or more processors compares the inside temperature of said first structure and the outside temperature over time to derive an estimation for the rate of change in

- inside temperature of said first structure when said HVAC system is in a first state of repair; and
- [1e] one or more databases that store at least said temperature measurements obtained from said first structure over time,
- [1f] wherein said one or more processors compares an inside temperature recorded inside the first structure with said estimation for the rate of change in inside temperature of said first structure to determine whether the operational efficiency of the HVAC system has decreased over time; and
- [1g] wherein if said operational efficiency has decreased, said one or more processors analyzes the changes in the operational efficiency over time to suggest a cause of degradation.

Ex. 1001, 13:22–49.

- 8. [8a] A system for detecting and correcting for anomalous behavior in HVAC control systems comprising:
 - [8b] a first HVAC control system that receives temperature measurements from at least a first structure conditioned by at least one HVAC system, and receives status of said HVAC system;
 - [8c] at least a second HVAC control system that obtains temperature measurements from at least a second structure conditioned by a second HVAC system, and status of said second HVAC system;
 - [8d] one or more processors that receive measurements of outside temperatures from at least one source other than said first and second HVAC systems and compare said temperature measurements from said first HVAC system and said second HVAC system and said outside temperature measurements over time to determine the relative efficiency of the first HVAC system and the second HVAC system; and
 - [8e] one or more databases that store said temperatures measurements,

[8f] wherein said one or more processors compares the relative efficiency of the first HVAC system and the second HVAC system to determine whether the operational efficiency of the first HVAC system has decreased over time; and

[8g] wherein if said operational efficiency has decreased, said one or more processors analyzes the changes in the operational efficiency over time to suggest a cause of degradation.

Ex. 1001, 14:3–32.

15. [15a] A method for evaluating changes in the operational efficiency of an HVAC system over time comprising:

[15b] storing temperature measurements from at least a first structure conditioned by an HVAC system; and

[15c] comparing with one or more processors said temperature measurements from said first structure with outside temperature measurements over time to derive expected temperature measurements of a rate of change in inside temperature of said first structure when the HVAC system is in a first state of repair [15d] wherein the expected temperature measurements are based at least in part upon past temperature measurements and based at least in part on outside temperature measurements,

[15e] wherein said one or more processors compares an inside temperature recorded inside the first structure with said expected temperature measurements to determine whether the operational efficiency of the HVAC system has decreased.

Ex. 1001, 14:55–15:5.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–20 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2, 5–7, 15, 16, 19, 20	103(a) ⁴	Hildebrand, ⁵ Van Ostrand ⁶
1–3, 5–7, 15–17, 19, 20	103(a)	Hildebrand, Van Ostrand, Rosen ⁷
4, 18	103(a)	Hildebrand, Van Ostrand, Ehlers ^{8, 9}
8, 9, 12	103(a)	Spalink ¹⁰
8–10, 12–14	103(a)	Spalink, Rosen
11	103(a)	Spalink, Ehlers

Petitioner relies on the testimony of Mr. Rajendra K. Shah (Ex. 1002 (Declaration of Rajendra Shah)). Patent Owner relies on the testimony of Dr. John A. Palmer (Ex. 2002 (Declaration of John A. Palmer, Ph.D.)). Mr. Shah and Dr. Palmer were each cross-examined and their testimony can be found at Exhibit 2004 and Exhibit 1019, respectively.

⁴ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102, 103 that became effective on March 16, 2013. Because the application that lead to the issuance of the ’567 patent was filed on September 16, 2008, the pre-AIA versions of sections 102 and 103 apply.

⁵ US 5,729,474, issued March 17, 1998 (Ex. 1004).

⁶ US 2005/0159846 A1, published July 21, 2005 (Ex. 1007).

⁷ US 6,789,739 B2, issued September 14, 2004 (Ex. 1009).

⁸ US 2004/0117330 A1, published June 17, 2004 (Ex. 1013).

⁹ The parties refer to Ehlers as Ehlers ’330. *See, e.g.*, Pet. 7–8. Because there is only one Ehlers patent in this proceeding, we have removed the reference to “’330” from all quotes.

¹⁰ US 2006/0111816 A1, published May 25, 2006 (Ex. 1008).

II. ANALYSIS

A. Legal Standards

In *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), the Supreme Court set out a framework for assessing obviousness under 35 U.S.C. § 103 that requires consideration of four factors: (1) the “level of ordinary skill in the pertinent art,” (2) the “scope and content of the prior art,” (3) the “differences between the prior art and the claims at issue,” and (4) if in evidence, “secondary considerations” of non-obviousness such as “commercial success, long-felt but unsolved needs, failure of others, etc.” *Id.* at 17–18. “While the sequence of these questions might be reordered in any particular case,” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007), the U.S. Court of Appeals for the Federal Circuit has repeatedly emphasized that “it is error to reach a conclusion of obviousness until all those factors are considered,” *WBIP, LLC v. Kohler*, 829 F.3d 1317, 1328 (Fed. Cir. 2016).¹¹

B. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. “The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). The “person having ordinary skill in the art” is a hypothetical construct, from whose vantage

¹¹ Because neither party address objective evidence of non-obviousness, we focus solely on the first three *Graham* factors.

point obviousness is assessed. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998).

Factors pertinent to a determination of the level of ordinary skill in the art include “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Envtl. Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). “Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case.” *Id.*

Petitioner defines the level of ordinary skill in the art as “encompass[ing] a (1) Bachelor’s degree in engineering, computer science, or a comparable field of study, and (2) at least five years of [either] (i) professional experience in building energy management and controls” or “(ii) relevant industry experience,” but that “[a]dditional relevant industry experience may compensate for lack of formal education or vice versa.” Pet. 20 (citing Ex. 1002 ¶¶ 31–33).

Patent Owner argues that a person having ordinary skill in the art “would have a bachelor’s degree in engineering, computer science, or a comparable field, with 2–3 years’ experience in temperature controls, embedded control systems, electronic thermostats, or HVAC controls, or similarly relevant industry experience, with relevant experience substituting for education and vice versa.” PO Resp. 5 (citing Ex. 2002 ¶ 25).

The ’567 patent is directed to a using a thermostat to detect faults in the HVAC system. *See* Ex. 1001, code (57). That aligns more closely with

the level of skill proposed by Patent Owner—which focuses on thermostats and HVAC control systems—than the one proposed by Petitioner—which focuses on energy controls. *Compare* Ex. 2002 ¶ 27, *with* Ex. 1002 ¶¶ 31–33. Accordingly, we adopt Patent Owner’s propose definition. However, we consider the parties’ positions to be substantially similar, and note that neither party argues that the level of skill is determinative to the outcome of the case. Accordingly, we would have reached the same factual findings and conclusions of law had we adopted Petitioner’s proposed definition.

C. Claim Construction

We apply the same claim construction standard used in the federal courts, in other words, the claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), which is articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). *See* 37 C.F.R. § 42.100(b) (2021). Under the *Phillips* standard, the “words of a claim ‘are generally given their ordinary and customary meaning,’” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1312–13.

Petitioner identifies ITC investigations which involve, or may involve, issues relating to claim construction in related patents, including issues resolved in the Initial Determination in Investigation No. 337-FA-1185. Pet. 9–10; Ex. 1010, 32, 41, 45, 48–49, 53, 58, 61. Petitioner contends, however, “that the prior art presented herein does not implicate the claim construction disputes between the parties, and thus no construction of terms is necessary.” Pet. 10.

Patent Owner argues that “the claim terms of the ’567 patent should be given their plain and ordinary meaning.” PO Resp. 8.

Because no express construction is needed for our decision, we do not construe any of the claim limitations. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (noting that “we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Relative Credibility of the Experts

Petitioner argues that because Mr. Shah has significantly more experience than Dr. Palmer, we should find Dr. Palmer’s testimony less credible. Pet. Reply 7–9. Patent Owner argues that “Dr. Palmer’s experience, and his opinions in this matter, are equally valuable as those of Mr. Shah.” PO Sur-reply 1–2.

We decline to find Dr. Palmer less credible based solely on his experience. In judging the credibility of experts, we focus on whether the witness offers corroboration for his opinions, provides opinions that are consistent with the prior art, and the witness’ cross-examination testimony.

Moreover, we note that Mr. Shah and Dr. Palmer substantially parrot the Petition and Patent Owner Response, respectively. Such testimony is generally unhelpful. Testimony which goes into more detail and expands on the points made in the papers (but not going beyond the points made in the papers) is more helpful and, as a general matter, given more weight so long as it is consistent with, and supported by, the other evidence in the record.

E. Obviousness over Hildebrand and Van Ostrand (Claims 1, 2, 5–7)¹²

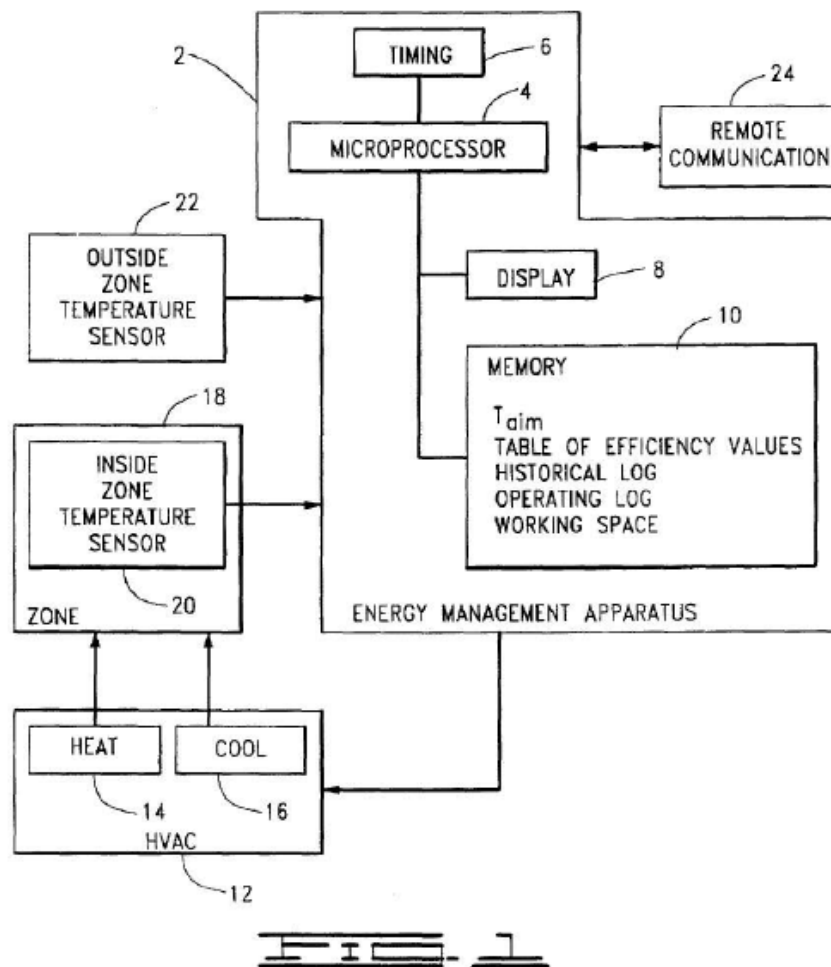
Petitioner challenges claims 1, 2, and 5–7 as unpatentable as obvious over Hildebrand in view of Van Ostrand. Pet. 10–40.

1. Hildebrand

Hildebrand is titled “Method of Anticipating Potential HVAC Failure” and discloses repeatedly determining an efficiency value representing the ability of a temperature modification device, e.g., heating, ventilating, and air conditioning equipment, to change temperature in a predetermined zone, and relying on deterioration in efficiency to anticipate potential failure of the temperature modification device. Ex. 1004, codes (54), (57).

¹² Petitioner also argues that claims 15, 16, 19, and 20 are obvious under the same grounds. We address the arguments directed to those claims in Section II.G, *infra*.

Hildebrand's Figure 1, reproduced below, is a block diagram of a system for performing its method.



Hildebrand Figure 1 discloses a block diagram of a system for anticipating potential failure of a temperature modification device, such as embodied in an HVAC system. Ex. 1004, 1:7–9, 3:22–23. Specifically, Figure 1 depicts: (i) energy management apparatus 2 that includes microprocessor 4, timing circuit 6, display 8, and memory 10 (*id.* at 3:41–49, Fig. 1.); (ii) heating, ventilating, and air conditioning (HVAC) system 12 that includes a heating subsystem 14 and a cooling subsystem 16 (*id.* at 4:1–7, Fig. 1); (iii) zone 18, which is the zone to be heated or cooled, and, in which, temperature sensor 20 is located (“inside zone temperature sensor”) (*id.* at 4:8–15, Fig. 1);

(iv) temperature sensor 22 located outside zone 18 (“outside zone temperature sensor”) (*id.* at 4:16–21, Fig. 1); and (v) remote communication system 24 (*id.* at 4:22–34, Fig. 1).

Hildebrand discloses collecting indoor temperatures and outdoor temperatures using the inside zone temperature sensor and outside zone temperature sensors, respectively, and repeatedly calculating operational efficiency values for the HVAC system. Ex. 1004, code (57). Hildebrand further discloses comparing a current efficiency value with a previous efficiency value and determining whether the efficiency of the HVAC system has deteriorated over time, that is, that the HVAC system is less able to change the temperature in the zone to be heated or cooled. *Id.* Hildebrand further discloses generating a control signal for initiating inspection if the determined deterioration exceeds a predetermined tolerance and communicating that signal enabling the device to be serviced in response to the signal and before the device actually fails. *Id.*

2. *Van Ostrand*

Van Ostrand is titled “Failure Mode for HVAC System” and discloses an HVAC system with a central control that can detect failed components. Ex. 1007, codes (54), (57), ¶¶ 6–7. Van Ostrand’s system “bypass[es] a failed HVAC system component and/or stages to assure at least partial system capacity.” *Id.* ¶ 2. Van Ostrand explains that “[t]ypical HVAC systems include multiple stages of heating and/or cooling capacity” with these varying in capacity, such that lower demand is met by lower capacity stages and higher demand is met by higher capacity stages. *Id.* ¶ 4. Van Ostrand discloses that

[t]he central control detects the failed stages and/or components by [either] direct communication with the failed stages and/or

components . . . [or] [a]lternatively, . . . by monitoring the temperature of a [HVAC] controlled area to determine if any particular stage is operating properly. A higher stage having more capacity will create a more positive slope to the controlled environment temperature vs. time curve than a lower stage if the higher stage is properly operating.

Id. ¶ 7.

Van Ostrand sets forth several approaches grounded on monitoring the change in temperature. In one, the rate of change of temperature inside a HVAC controlled structure during a first period of time before a heating or cooling element (or stage) is turned on and compared to the rate of temperature change during a second period of time after the heating or cooling element (or stage) is turned on. Ex. 1007 ¶¶ 29–31, Figs. 4–5. In another, Van Ostrand’s system includes a controller that, “after a number of cycles[,] ‘learns’ the capacity of each state of the system” and “[w]hen the system does not respond with the learned capacity, the controller 12 infers that there has been a failure.” *Id.* ¶ 33.

3. *Analysis of Claims 1, 2 and 5–7*

a) *The Parties Arguments*

Claim 1 recites, *inter alia*, “[1c] one or more processors that receive measurements of outside temperatures from at least one source other than said HVAC system.” Ex. 1001, 13:28–30.

Petitioner argues that “Hildebrand teaches that the HVAC control system (energy management apparatus 2) has **one or more processors**, in the form of microprocessor 4, as shown in Fig. 1.” Pet. 26 (citing Ex. 1004, Fig. 1, 3:41–44; Ex. 1002 ¶ 76). Petitioner further argues that “microprocessor 4 receives measurements of outside temperature from the outside zone temperature sensor 22, as shown in Fig. 1, reproduced again

below with added red outlining.” *Id.* at 27 (citing Ex. 1004, Fig. 1, 4:16–21; Ex. 1002 ¶ 77).

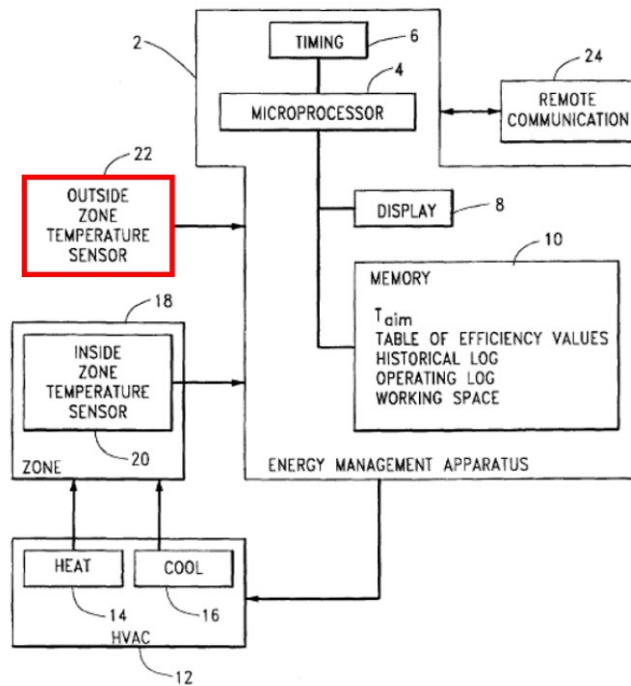


FIG. 1

Id. Figure 1 “is a block diagram of a system for performing the method” of Hildebrand. Ex. 1004, 3:22–23. Petitioner has annotated outside zone temperature sensor 22 with a red box. *See* Pet. 27. Relying on the testimony of Dr. Shah, Petitioner argues that because “[t]he HVAC system is ‘HVAC system 12’, which is separate from the outside zone temperature sensor 22,” “[t]he outside zone temperature sensor 22 is **at least one source other than said HVAC system**” as recited in claim 1. *Id.* at 28 (citing Ex. 1002 ¶ 78; Ex. 1004, Fig. 1, 4:1–10). Petitioner further argues that “[t]he ITC has

previously found an identical limitation of the related '322 patent to be disclosed by Hildebrand.” *Id.* (citing Ex. 1010, 475-476).¹³

Petitioner also argues that, as Dr. Palmer testifies, there is no need for the HVAC control system to have an outside temperature sensor. Pet. Reply 12 (citing Ex. 1019, 19:16–20:2). Petitioner further argues that “an outdoor temperature sensor which forms a part of an actual heating or cooling apparatus would not be a source other than an HVAC system.” *Id.*

Patent Owner argues that in providing his opinion. “Mr. Shah ignores his own declaration, where he states that ‘HVAC systems, including HVAC control systems, thermostats, processors, network communications, and software, were widely known and understood.’” PO Resp. 17–18 (quoting Ex. 1002 ¶65). Patent Owner further argues that “[t]hermostats require a temperature sensor to perform their functions” and that a person having ordinary skill in the art “would understand a temperature sensor to be part of the thermostat and part of the HVAC control system, and thus also be part of the HVAC system.” *Id.* at 18 (citing Ex. 2002 ¶ 58); *see also* PO Sur-reply 5 (“As Dr. Palmer noted, a ‘PHOSITA¹⁴ would understand a temperature sensor to be part of the thermostat and part of the HVAC control system, and thus also be part of the HVAC system.’” (quoting Ex. 2002 ¶ 58) (footnote added)). Patent Owner further argues that, based on the '567 patent, “it is clear that temperature measurement[s] are integral to the HVAC control

¹³ We note Petitioner did not comply with our rules by numbering each page of the exhibit sequentially. *See* 37 C.F.R. § 42.63(d)(1), (2). Accordingly, we cite to the native pagination of non-patent documents.

¹⁴ The parties refer to a POSITA. That has been changed in all quotes to PHOSITA—person having ordinary skill in the art—to match the language in 35 U.S.C. § 103(a).

system, which is part of the HVAC system, and therefore to satisfy the limitations of element [1c] requires a source of temperature that is not a dedicated sensor integrated into the energy management apparatus.” PO Resp. 18.

b) Our Analysis

We agree with Patent Owner that Petitioner has not sufficiently shown that Hildebrand teaches or suggests limitation [1c]. The gravamen of Petitioner’s argument is that Hildebrand’s HVAC system is limited to HVAC system 12—the heating system, cooling system, and fan. *See* Pet. 12 (“The HVAC system is ‘HVAC system 12’”); Ex. 1004, 4:1–10 (describing HVAC system 12). Although nominally supported by Mr. Shah’s testimony, that testimony is conclusory, parrots the Petition, and provides no corroborating evidence to show that a person having ordinary skill in the art would have understood that an HVAC system was limited to the heating and cooling systems. We give Mr. Shah’s testimony on that point no weight. *See In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (“[T]he Board is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations.”); *Verlander v. Garner*, 348 F.3d 1359, 1371 (Fed. Cir. 2003) (Board has discretion to accord little weight to broad conclusory statements from expert witness); 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”).

Moreover, Petitioner’s argument is inconsistent with Mr. Shahs’ direct testimony that clearly states that the HVAC system is broader then just the heating and cooling system and fan and includes other elements, such as thermostats and HVAC control systems. *See* Ex. 1002 ¶ 65 (“HVAC

systems, including HVAC control systems, thermostats, processors, network communications, and software, were widely known and understood.”).

Applying Mr. Shah’s definition, the HVAC system as recited in claim 1 includes more than Hildebrand’s heating and cooling systems. Indeed, when discussing dependent claim 5, Petitioner argues that Hildebrand’s HVAC system also includes a thermostat. *See* Pet. 39.

We do not find the Administrative Law Judge’s (“ALJ”) finding in an ITC proceeding involving a different record (and different patent) to be persuasive. Although the ALJ considered Hildebrand, there is nothing in the excerpt of the opinion to conclude that he considered Mr. Shah’s definition of an HVAC system. *See* Ex. 1010, 475–76. Nor is it clear from the record that the ALJ considered contrary testimony from Patent Owner’s expert. *Id.*

Hildebrand Figure 1 shows an HVAC system including heating and cooling elements (HVAC system 12), energy management apparatus 2 including microprocessor 4, inside zone temperature sensor 18 and outside zone temperature sensor 22, both of which are connected to the energy management apparatus. Ex. 1001, 3:22–23 (describing figure 1 as a system), Fig. 1. HVAC systems require a temperature sensor to work and, in the context of Hildebrand’s system, this includes an outside zone temperature sensor 22. *See* Ex. 1004, 5:61–6:11 (describing how the outside zone temperature is used). Each of those elements listed in the previous sentence are part of the HVAC system as claimed in the ’567 patent. *See* Ex. 2002 ¶¶ 58–59.

Because the outside zone temperature sensor is part of the HVAC system, Petitioner has not sufficiently shown that Hildebrand teaches limitation [1c]. Accordingly, Petitioner has not shown by a preponderance of the evidence that claim 1 is unpatentable over the combination of

Hildebrand and Van Ostrand. Similarly, because Petitioner does not address that deficiency with regard to claims 2, and 5–7, which depend from claim 1, Petitioner has not shown by a preponderance of the evidence that claims 2 and 5–7 are unpatentable over the combination of Hildebrand and Van Ostrand. *See* Pet. 38–40.

*F. Obviousness over Hildebrand, Van Ostrand, and Rosen (Claims 1–3 and 5–7)*¹⁵

Petitioner challenges claims 1–3 and 5–7 as unpatentable as obvious over Hildebrand in view of Van Ostrand and Rosen. Pet. 10–40, 45–50.

1. Rosen

Rosen is titled “Thermostat System with Location Data” and is directed to “a thermostat system incorporating a communication interface for receiving and displaying diverse information from a remote correspondent.” Ex. 1009, code (54), 1:8–11. Relevant to this proceeding, Rosen teaches using the internet to obtain current weather information for a remote location:

At one or more predetermined times of day (and/or on-demand if provided for in the operating program) which have been previously stored in the memory 8 and established by the clock 13, the CPU 9 starts the process shown in FIG. 5 by issuing signals to the I/O unit 10 to cause the communications interface 14 to establish communications, via link 16, with a remote correspondent 15. The remote correspondent 15 has a known data communications “address” and, in the example, is a source of current information, such as local weather. Such local current weather information sources are widely available and are *routinely accessed by, for example, using the internet.*

. . . .

¹⁵ We address the parties’ arguments directed to claims 15–17, 19, and 20 in Section II.H, *infra*.

As an example, assume that Montreal weather is of interest to an occupant of a conditioned space in the Montreal area which uses the subject thermostat system and that “temperature”, “high” and “low” are the key terms for the subject of local weather stored in the memory 8. Periodically, as determined by times stored in the memory 8, *the CPU 9 issues signals to access the remote correspondent 15 (a site providing local Montreal weather in the example) and download the current weather information as a data stream.*

Id. at 4:40–49 (emphases added).

2. Analysis of Claim 1

a) Undisputed Limitations.

Claim 1 recites “[1a] [a] system for evaluating changes in the operational efficiency of an HVAC system over time comprising.” Ex. 1001, 13:22–23. Petitioner argues that Hildebrand teaches that limitation. Pet. 40–41 (incorporating arguments at Pet. at 22–23). Specifically, Petitioner argues that Hildebrand teaches a method that monitors the operation efficiency of an HVAC system over time. *Id.* at 22–23 (citing Ex. 1004, 1:46–49, 2:2–9, 2:29–51, 7:18–66; Ex. 1002 ¶¶ 68, 69, 101; Ex. 1010, 474–75).

Claim 1 also recites “[1b] at least one HVAC control system associated with a first structure that receives temperature measurements from at least a first structure conditioned by at least one HVAC system, and receives status of said HVAC system.” Ex. 1001, 13:24–27. Petitioner argues that Hildebrand teaches that limitation. Pet. 23–26. Specifically, Petitioner argues that Hildebrand teaches an HVAC control system in the form of energy management apparatus 2 which is associated with a first structure (zone 18) that is conditioned by HVAC system 12. *Id.* at 23–24 (citing Ex. 1004, Fig. 1, 2:55–67, 3:41–43, 4:45–48, 5:3–10, 5:40–44;

Ex. 1002 ¶¶ 70–71). Petitioner further argues that the HVAC control system receives temperature measurements from the structure taken by internal zone temperature sensor 20. *Id.* at 24–25 (citing Ex. 1004, 4:11–14, 5:11–17, 6:12–16; Ex. 1002 ¶ 72). Petitioner further argues that the HVAC control system receives the HVAC system status. *Id.* at 25–26 (citing Ex. 1004, 4:55–5:27, 6:17–64, 8:53–57, col. 9; Ex. 1002 ¶¶ 73–75; Ex. 1010, 475).

Claim 1 also recites

[1d] compare said temperature measurements from said first structure, wherein said one or more processors compares the inside temperature of said first structure and the outside temperature over time to derive an estimation for the rate of change in inside temperature of said first structure when said HVAC system is in a first state of repair.

Ex. 1001, 13:31–36. Petitioner argues that Hildebrand teaches that limitation. Pet. 28–31. Petitioner relies on Hildebrand’s teaching of “measur[ing] the temperature change over a specific period of time, and at a particular outside temperature, . . . to estimate the heating or cooling rate of change.” *Id.* at 28–30 (citing Ex. 1004, 1:58–2:3, 6:17–44, 7:45–55, 12:66–13:37; Ex. 1002 ¶¶ 79–80). Petitioner further relies on Hildebrand storing the rate of change of the inside temperature each time it is calculated, resulting in a table that describes the rate of change of the inside temperature as a function of outside temperature. *Id.* at 30 (citing Ex. 1004, 7:38–50; Ex. 1002 ¶¶ 81–82). Petitioner further notes that “Hildebrand teaches both the calculation of the rate of change of inside temperature over a time period . . . and the calculation of the efficiency values $K \dots (\Delta t / |T_{\text{start}} - T_{\text{aim}}|)$,” and that these are the reciprocal of one another.” *Id.* at 30–31 (citing Ex. 1004, 6:25–30, 6:37–64, 7:45–50, 12:66–13:37, 13:50–14:52; Ex. 1002 ¶ 83). Petitioner further relies on “Hildebrand teach[ing] that the system can

monitor deterioration in an HVAC system, which reflect changes in the state of repair.” *Id.* at 31 (citing Ex. 1004, 2:62–3:6, Ex. 1002 ¶ 84).

Claim 1 also recites “[1f] wherein said one or more processors compares an inside temperature recorded inside the first structure with said estimation for the rate of change in inside temperature of said first structure to determine whether the operational efficiency of the HVAC system has decreased over time.” Ex. 1001, 13:40–44. Petitioner argues that the combination of Hildebrand and Van Ostrand teach that limitation. Pet. 33–36. Specifically, Petitioner argues that Hildebrand teaches “checking efficiency values **to determine whether the operational efficiency of the HVAC system has decreased over time**” (Pet. 33–34 (citing Ex. 1004, 6:12–16, 6:29–41, 6:44–46, 6:56–58, 7:18–33; Ex. 1002 ¶¶ 87–89)) and that “it would have been obvious to a [person of ordinary skill in the art] that the efficiency value could have easily been used as its reciprocal, which would also have been an expression of an estimate of a rate of change in inside temperature” (*id.* at 34 (citing Ex. 1002 ¶ 90)).

Petitioner also argues that “it would have been obvious to use the technique of Van Ostrand in Hildebrand’s system (including forming and storing rates of change by stage) . . . [where] Van Ostrand teaches comparing rates of change in inside temperature to determine whether the operational efficiency of the HVAC system has decreased over time.” Pet. 34–36 (citing Ex. 1007 ¶¶ 7, 29–33, claim 12; Ex. ¶¶ 91–92).

Claim 1 also recites “[1g] wherein if said operational efficiency has decreased, said one or more processors analyzes the changes in the operational efficiency over time to suggest a cause of degradation.” Ex. 1001, 13:46–49. Petitioner argues that the combination of Hildebrand and Van Ostrand teach that limitation. Pet. 36–38. In particular, Petitioner

relies on Hildebrand’s disclosure of “captur[ing] temperature versus time data, and calculat[ing] a ratio of elapsed time to temperature change” (*id.* at 36 (citing Ex. 1004, 6:44–46, 6:56–58; Ex. 1002 ¶ 94)) and on “Van Ostrand teach[ing] using heating and cooling rates to diagnose the source of lowered capacity” where it “detects a lower heating or cooling rate . . . [and] infer[s] whether a stage of the heating or cooling appliance has failed” (*id.* at 36–37 (citing Ex. 1007 ¶¶ 7, 29–33; Ex. 1002 ¶¶ 94–95)). Petitioner further argues that “Van Ostrand and Hildebrand render obvious **suggest[ing] a cause of degradation** in three ways, namely by identifying the cause of the degradation, by communicating the cause to the staging controller, and by suggesting the cause to the human operator.” *Id.* at 37–38 (citing Ex. 1007 ¶¶ 29–30, 33; Ex. 1002 ¶ 96).

Based on the undisputed evidence before us and the reasons set forth in the Petition, including the Shah Declaration, which are not addressed by Patent Owner (*see* PO Resp.), we find that the combination of Hildebrand and Van Ostrand teaches undisputed limitations [1a], [1b], [1d], [1f], and [1g].

b) Limitation [1c]: “One or More Processors That Receive Measurements of Outside Temperatures from at Least One Source Other Than Said HVAC System”

Claim 1 also recites “[1c] one or more processors that receive measurements of outside temperatures from at least one source other than said HVAC system.” Ex. 1001, 13:28–30.

Petitioner argues that the combination of Hildebrand and Rosen teach that limitation. Pet. 26–28, 49. Specifically, Petitioner relies on its arguments from Ground 1, discussed in section II.E.3(a), *supra*, “with the exception that the outside temperature measurements . . . come from an

Internet weather data source.” *Id.* at 49 (citing Ex. 1009, 4:40–59, Fig. 6; Ex. 1002 ¶ 123).

As for the outside temperature measurements, Petitioner argues it would have been obvious that the outside temperature measurement come from an Internet weather data source. Pet. 49 (citing Ex. 1009, 4:40–59, Fig. 6; Ex. 1002 ¶ 123). Petitioner further argues that “[s]uch outdoor temperature data would obviously have been a measurement, and would have been from a source other than the HVAC system.” Pet. 49 (citing Ex. 1002 ¶123).

Although Patent Owner disputes that Petitioner sufficiently shows a reason to combine Hildebrand, Van Ostrand, and Rosen, Patent Owner does not dispute that Petitioner has sufficiently shown (1) that the combination of Hildebrand and Rosen teach limitation [1c] and (2) that a person having ordinary skill in the art would have had a reasonable expectation of success in combining the relevant teachings of Hildebrand and Rosen. *See* PO Resp. 17–18, 29, PO Sur-reply 14–15.

Accordingly, based on the undisputed evidence before us and the reasons set forth in the Petition, including the Shah Declaration, which are not addressed by Patent Owner, we find that the combination of Hildebrand and Rosen teach limitation [1c].¹⁶

¹⁶ We address all of the parties’ arguments regarding the reason to combine below in section II.F.2.d, *supra*.

c) *Limitation [1e]: “One or More Databases That Store at Least Said Temperature Measurements Obtained from Said First Structure over Time”*

(1) The Parties’ Arguments

Claim 1 recites “[1e] one or more databases that store at least said temperature measurements obtained from said first structure over time.” Ex. 1001, 13:37–39.

Petitioner argues that Hildebrand teaches storing the temperature measurement in memory 10. Pet. 31–32 (citing Ex. 1004, 5:12–17; Ex. 1002 ¶ 85). Petitioner further argues that “‘data’ including the inside temperature T_{start} [(the sensed internal temperature)], ‘can be collected and plotted over a period of time and made available for display or hard copy printout. Historical readings can be made on a periodic basis.’” Pet. 31 (quoting Ex. 1004, 1:58–2:9, 6:12–16; Ex. 1002 ¶ 85). Petitioner further argues that because data stored in memory 10 can be stored in a table structure and indexed, memory 10 is a database. Pet. 32–33 (citing Ex. 1004, 6:65–7:4, 9:35–39; Ex. 1002 ¶ 86); *see also* Pet. Reply 13 (arguing that Dr. Palmer “admits that storing data in a table or using indexing is an organized form of storing data.” (citing Ex. 1019, 22:2–22)).

Petitioner also argues that although Hildebrand teaches storing multiple internal temperature readings at the same time, there is no support for Patent Owner’s argument that the claim language requires storing multiple temperatures. Pet. Reply 14.

Petitioner also argues that “[t]he ITC has previously found an identical limitation of the related ’322 patent to be disclosed by Hildebrand.” Pet. 33 (Ex. 1010, 477). According to Petitioner, neither Patent Owner nor

Dr. Palmer contested that issue in that proceeding. Pet. Reply 13 (citing Ex. 1010, 477; Ex. 1015).

Patent Owner argues that Petitioner bears the burden of proof and that Petitioner “provides no evidence or definition of what a ‘database’ would mean to a PHOSITA.” PO Sur-reply 6, 7.

Patent Owner also argues that Mr. Shah stated in his deposition that “not all memories are databases” and that a database “needs to have data in some form of organized -- organized way, like -- like a table or a structure that is there.” PO Resp. 19 (quoting Ex. 2004, 57:4–10, 57:12–13); *see also* PO Sur-reply 7 (citing 2004, 57:12–13). Patent Owner further argues that “[t]here is no disclosure in Hildebrand that the memory is a database.” PO Resp. 19 (citing Ex. 2002 ¶ 61); *see also* PO Sur-reply 7 (arguing that “some memories with tables, indexing or other organization are not databases”). Instead, according to Patent Owner, the temperature is stored in “an active memory register which is used in the computational processing.” PO Resp. 19 (citing Ex. 1004, 5:12–14; Ex. 2002 ¶ 62). Moreover, Patent Owner argues, that it is a singular temperature, not the plural temperatures required by the claim. PO Resp. 19–20 (citing Ex. 2002 ¶ 62); PO Sur-reply 7–8 (citing Ex. 1001, 13:37–38). Patent Owner further argues that although Hildebrand shows some C++ programming with pointers to temperature measurements, “there is nothing in Hildebrand that inherently requires these inside and outside temperature measurements to be stored in a database.” POP Resp. 20 (citing Ex. 2002 ¶ 63).

Patent Owner also argues that it is efficiency values in Hildebrand, not temperatures, that can be collected and plotted over time and that efficiency values are not temperatures. PO Resp. 20 (citing Ex. 1004, 1:59–2:9, 6:65–67; Ex. 2002 ¶ 64; Ex. 2004, 59:20–60:16). According to Patent Owner,

“Hildebrand, at best, discloses the efficiency values being stored in a table.”
PO Resp. 21 (citing Ex. 2002 ¶64).

With regard to the ITC proceeding, Patent Owner argues there is no legal support for any argument that Patent Owner somehow forfeited its argument. PO Sur-reply 6. Instead, Patent Owner argues, parties make strategic decisions during legal proceedings and not making an argument in one proceeding “does not mean that it could not have, or that it in anyway conceded that Hildebrand taught this limitation.” *Id.* at 6.

(2) *Our Analysis*

As a preliminary matter, we address the finding in the ITC that Hildebrand teaches a database. We do not find that determination to be persuasive or binding in this matter. First, Petitioner has not cited any cases supporting the proposition that a party forfeits an argument by not raising it in an ITC proceeding. Second, “Congress did not intend decisions of the ITC on patent issues to have preclusive effect.” *Tex. Instruments Inc. v. Cypress Semiconductor Corp.*, 90 F.3d 1558, 1569 (Fed. Cir. 1996); *see also Tandon Corp. v. U.S. Int’l Trade Comm’n*, 831 F.2d 1017, 1019 (Fed. Cir. 1987) (“[O]ur appellate treatment of decisions of the Commission does not estop fresh consideration by other tribunals.”). Thus, we are not bound by issue preclusion. Third, because the factual records are different, including Patent Owner’s arguments and evidence, we do not find the ITC finding persuasive. Different records can lead to different results.¹⁷

As for the merits, we do not agree with Patent Owner’s argument that the record is devoid of a sufficient definition of a “database.” Mr. Shah

¹⁷ This reasoning applies to all of the parties’ arguments regarding the ITC determinations.

testifies that because Hildebrand teaches “data stored in a table structure and indexed,” Hildebrand teaches using the claimed database. Ex. 1002 ¶ 86. Implicit in that testimony is the definition of a database: “data in a table structure and indexed.” *See id.* Consistent with that definition, Dr. Palmer testifies that storing data in a table or using indexing is an organized form of storing data:

Q. What does it mean for data to be stored in a table structure?

A. It just means that it has a – an organizational format of rows and columns that could be referenced so that they -- an element of a particular row can be determined based on what column it is.

Q. So in your opinion, is data which is stored in a table structure organized?

A. I would say that, in general, there is some organization, if it’s organized in a tabular format.

Q. What does it mean for stored data to be indexed in memory?

A. It’s a similar concept, that the point of reference or a group of data is associated with a particular element of that data and sequenced by that data.

Q. And is data which is stored in an index form organized, in your opinion?

A. I would say that generally it would be.

Ex. 1019, 22:2–22. Although Patent Owner argues that “some memories with tables, indexing or other organization are not databases,” that argument lacks any evidentiary support. It is well settled that mere attorney arguments and conclusory statements, which are unsupported by factual evidence, are entitled to little probative value. *See Johnston v. IVAC Corp.*, 885 F.2d 1574, 1581 (Fed. Cir. 1989) (“Attorney’s argument is no substitute for

evidence.”); *Elbit Systems of America, LLC v. Thales Visionix, Inc.*, 881 F.3d 1354, 1359 (Fed. Cir. 2018) (“‘[a]ttorney argument is not evidence’ and cannot rebut other admitted evidence” (Quoting *Icon Health & Fitness, Inc. v. Strava, Inc.*, 849 F.3d 1034, 1043 (Fed. Cir. 2017))). Accordingly, based on the evidentiary record, Petitioner has sufficiently shown that a database encompasses data that is stored in a table structure and indexed.

Consistent with that definition, we agree with Patent Owner’s argument that not all memory is a database. For example, software can be stored in memory and that is not a database. *See* Ex. 2004, 57:4-10. Thus, in determining whether the prior art teaches this limitation, we are cognizant that just storing data in memory is not sufficient to show that it is stored in a database.

With that definition and limitation in mind, Petitioner has sufficiently shown that Hildebrand teaches or suggests limitation [1e]. Hildebrand teaches that memory 10 is used to store data in an indexed table:

After a first efficiency value has been calculated, it is stored in the table of efficiency values retained in memory 10. The value is stored in correspondence with the value of the sensed at least one ambient condition. That is, in the preferred embodiment the table is indexed by T_{out} so that the calculated efficiency value is stored at the index corresponding to the actually sensed T_{out} .

Ex. 1004, 6:65–7:4. That is, because the efficiency data is “stored in correspondence with” another value and indexed, it is stored in a table and indexed. Ex. 1002 ¶ 86; *see also* Ex. 1004, 1:63–66 (“This information also includes a *table of efficiency values* which are calculated and stored during

performance of the method as subsequently described.” (emphasis added)).¹⁸
Because the data is stored in an indexed table, it is stored in a database.

Hildebrand further teaches storing the output of temperature sensor 20—which measures the temperature obtained for the first structure—in memory 10. Ex. 1004, 5:12–17. The data—temperature T_{start} —is used in the program listing shown in Hildebrand column 9. Ex. 1004, col. 9; Ex. 1002 ¶ 86. Although Hildebrand does not explicitly say that the internal temperature measurements are being stored in a database, Hildebrand’s teaching that memory 10 contains a database and that the internal temperature readings are stored in memory 10 at a minimum suggests, to a person having ordinary skill in the art, storing the internal temperatures in a database. *See* Ex. 1002 ¶¶ 85–86.

Patent Owner’s argument that efficiency values are not temperatures is inapposite. Although it is a true statement, we do not base our findings on the efficiency values being stored in indexed tables. Instead, we simply rely on those indexed tables to show that memory 10 contains a database.

We also do not agree with Patent Owner’s argument that Hildebrand only stores a single internal temperature. Mr. Shah testifies that Hildebrand teaches storing multiple internal temperature readings and his testimony is supported by and consistent with the cited sections of Hildebrand. *See* Ex. 1002 ¶¶ 85–86 (citing Ex. 1004, 1:58–2:9, 5:12–17, 6:12–16, 6:65–7:4, col. 9). Moreover, although the plain language of the claims requires multiple internal temperature measurements to be stored in a database “over

¹⁸ We agree with Patent Owner’s argument that Petitioner overstates the teaching of Hildebrand 1:59–2:9. Nothing in that section states that inside temperatures are stored or printed. Although we rely on the section for its teaching of database, that is all that we rely on it for.

time,” the plain and ordinary meaning of the limitation does not state that multiple internal temperature measurements have to be stored in the databased *at the same time*. See Ex. 1001, 13:37–39.

Accordingly, Petitioner has sufficiently shown that Hildebrand teaches or suggests limitation [1e].

d) Reason to Combine Hildebrand, Van Ostrand, and Rosen

(1) Petitioner’s Arguments

Petitioner argues that a person having ordinary skill in the art would have combined the teachings of Hildebrand and Van Ostrand. Pet. 18–20; Pet. Reply 9–11. Specifically, Petitioner argues that “[i]t would have been obvious to use Van Ostrand’s technique—diagnosing the failure of HVAC components by using rates of change—in Hildebrand” so that it would work in a typical system with multiple stages. *Id.* at 18, 19–20 (citing Ex. 1002 ¶¶ 60, 62). Petitioner further argues that “it would have been obvious to modify Hildebrand to form and store, correlated to outside temperature, an efficiency value (rate of change) for each stage, in order to implement the method taught by Van Ostrand, which expressly teaches to “learn” the capacity of each state of the system.” *Id.* at 20 (quoting Ex. 1007 ¶ 33) (citing Ex. 1002 ¶ 62). Petitioner further argues that “Van Ostrand’s technique represents a known method that can be used to improve a known system ready for improvement (Hildebrand) in a predictable way, without unexpected results.” *Id.* (citing Ex. 1002 ¶ 63).

Petitioner does not agree with Patent Owner’s argument that Hildebrand is limited to single stage systems and Van Ostrand is limited to multi-stage systems. Pet. Reply 9–11. Specifically, Petitioner argues that Patent Owner has not explained why the teachings are dependent on the number of stages. *Id.* at 10. Petitioner further argues that the teachings do

not depend on the number of stages; instead, Petitioner argues that “it would be obvious to use a ‘typical’ multi-stage system in Hildebrand.” *Id.* (citing Ex. 1002 ¶ 62). Petitioner further argues that “Van Ostrand’s method would also work in a system with a single stage and its teachings are in no way limited to systems having only multiple stages.” *Id.* at 11 (citing Ex. 1002 ¶ 62). According to Petitioner, “[a]ny number of stages’ of course includes ‘one’ stage.” *Id.* (citing Ex. 1019, 18:8-19:15).

With respect to Rosen, Petitioner argues that “[i]t would have been obvious to a PHOSITA to obtain outdoor temperatures for a geographic region, as taught by Rosen, in Hildebrand.” Pet. 48 (citing Ex. 1002 ¶ 119). More specifically, Petitioner argues that “[a] PHOSITA would have seen an advantage in avoiding the expense of obtaining, wiring and servicing an extra outside temperature sensor by obtaining weather information from the Internet.” *Id.* (citing Ex. 1002 ¶ 120). Petitioner further argues that “using the Internet to obtain outdoor temperatures, per Rosen, was a known technique that could have been substituted for the technique of measuring temperature with home sensors, with no unexpected results” and that there was a reasonable expectation of success. *Id.* at 48–49 (citing Ex. 1002 ¶¶ 120–121).

Petitioner also argues that when combined with the arguments in ground 1, Petitioner demonstrates why a person having ordinary skill in the art would have combined Hildebrand, Van Ostrand, and Rosen. Pet. Reply 22 (“Mr. Shah demonstrates in Ground 1 that a PHOSITA would be motivated to and have a reasonable expectation of success in modifying Hildebrand in view of Van Ostrand, and further demonstrates in Ground 2 why a PHOSITA would be motivated to and have a reasonable expectation

of success in further modifying Hildebrand in view of Rosen.” (citing Ex. 1002 ¶¶ 64–65, 113, 115, 119–120)).

(2) Patent Owner’s Arguments

Patent Owner argues that Petitioner “ignores that Hildebrand only discloses a single stage HVAC system while Van Ostrand is directed toward multiple-stage HVAC systems.” PO Resp. 15 (citing Ex. 2002 ¶ 54). Specifically, Patent Owner argues that “Mr. Shah specifically testifies that Hildebrand does not explicitly mention or in fact is even talking about a multistage HVAC system.” *Id.* at 15–16 (citing Ex. 2004, 46:22–47:12); *see also* PO Sur-reply 3–4 (arguing Hildebrand is a single stage system).

In contrast, Patent Owner argues that Van Ostrand is directed to a multiple stage system. PO Resp. 16 (citing Ex. 1002 ¶ 54); *see also* PO Sur-reply 4 (arguing that, read in context, “any number of stages” does not include one). According to Patent Owner, “the PHOSITA would recognize that there are distinct differences in the nature of multi-stage controllers such as are featured in the Van Ostrand reference as contrasted with those that control the much simpler single temperature modification device systems.” PO Resp. 16 (citing Ex. 2002 ¶ 55); *see also id.* at 16–17 (arguing that “Mr. Shah does not explain how [adding additional stages to Hildebrand] would be accomplished, or even why a PHOSITA would want to modify Hildebrand in that manner”); PO Sur-reply 2–3 (discussing Van Ostrand’s multiple stage system).

Patent Owner also argues that “Mr. Shah’s analysis also fails because he does not demonstrate that a PHOSITA would have had a reasonable expectation of success in combining Hildebrand, Van Ostrand and Rosen.” PO Resp. 29 (citing Ex. 2002 ¶ 87). According to Patent Owner, Petitioner and Mr. Shah only discuss the combination of Hildebrand and Rosen, not

Hildebrand, Van Ostrand, and Rosen. PO Resp. 29 (“Nowhere does Mr. Shah explain whether or not a PHOSITA would have been motivated to combine all three of these references, or whether that POSITA would have a reasonable expectation of success.”); *see also* PO Sur-reply 14–15.

(3) Our Analysis

Petitioner has sufficiently shown that a person having ordinary skill in the art would have combined the relevant teachings of Hildebrand and Van Ostrand with a reasonable expectation of success. As discussed above, Hildebrand is directed to a system for monitoring the efficiency of an HVAC system to determine when there is a fault. *See* Section II.E.1, *supra*; Ex. 1002 ¶ 60. Using much of the same data as Hildebrand, Van Ostrand teaches a method to determine which stage in a multiple stage HVAC system failed. *See* Section II.E.2; Ex. 1002 ¶¶ 60–61. Van Ostrand further teaches that the “[typical] HVAC system include[s] multiple stages of heating and/or cooling capacity.” Ex. 1007 ¶ 4. Because Hildebrand is silent as to which stage of the typical system—which has multiple stages—has failed, a person having ordinary skill in the art would have turned to Van Ostrand for that determination. Ex. 1002 ¶¶ 61–62. This modification would allow the Hildebrand system to detect which specific stage has failed. *See* Ex. 1007 ¶¶ 29–33. And because Van Ostrand represents a known method of detecting fault, it would have been obvious to use it to improve Hildebrand in a predictable way with a reasonable expectation of success. Ex. 1002 ¶ 63; *see also* *KSR*, 550 U.S. 398, 416–21.

Petitioner has also sufficiently shown that a person having ordinary skill in the art would have added Rosen’s use of internet weather to the Hildebrand-Van Ostrand combination. *See* Ex. 1002 ¶ 115 (“Hildebrand and Van Ostrand are applied as I describe above with respect to Ground 1, with

the exception that Rosen teaches the ability to obtain measurements of outside temperature over the Internet from a weather data provider. In my opinion, it would have been obvious to obtain outside temperature measurements from the Internet, thus replacing Hildebrand’s use of outside temperature sensors.”). Specifically, a person having ordinary skill in the art would have seen an advantage in avoiding the expense of obtaining, wiring and servicing an extra outside temperature sensor by obtaining weather information from the Internet as taught by Rosen. Ex. 1002 ¶ 120; *see also* Section II.F.1 (describing Rosen). Because it is undisputed that Rosen teaches using computer programming and network communications that were well-known and established at the relevant time period, there was a reasonable expectation of success. *See* Ex. 1002 ¶¶ 120–121.

We do not agree with Patent Owner’s arguments. First, it is of no moment whether Hildebrand is limited to single stage systems. Although a multiple stage system is not “mentioned explicitly in Hildebrand,” (Ex. 2004, 46:22–47:4), Petitioner’s theory is not premised on Hildebrand having multiple stages; instead, as discussed above, Petitioner’s theory is based on it being obvious to use “typical multiple stage systems in Hildebrand.” Pet. 19–20 (citing Ex. 1002 ¶ 62). “The question in an obviousness inquiry is whether it would have been obvious to a person of ordinary skill in the art to combine the relevant disclosures of the two references, not whether each individual reference discloses all of the necessary elements.” *Game & Tech Co. v. Wargaming Grp. Ltd.*, 942 F.3d 1343, 1352 (Fed. Cir. 2019) (citing *Cohesive Techs., Inc. v. Waters Corp.*, 543 F.3d 1351, 1364 (Fed. Cir. 2008)).

Second, Petitioner sufficiently addresses the combination of Hildebrand, Van Ostrand, and Rosen. When discussing Ground 1—

Hildebrand and Van Ostrand—Petitioner explains why a person having ordinary skill in the art would have combined Hildebrand with Van Ostrand with a reasonable expectation of success. Pet. 18–20. When discussing Ground 2—Hildebrand, Van Ostrand, and Rosen—Petitioner also explains why a person having ordinary skill in the art would have replaced one element of Hildebrand (which was not related to the reasons to combine Hildebrand and Van Ostrand) with Rosen’s use of Internet weather. Pet. 48–49. Given that Petitioner explicitly referenced its arguments from Ground 1 in Ground 2, there was no reason for Petitioner to repeat its arguments on the reason to combine Hildebrand and Van Ostrand. *See* Pet. 45 (“Claims 1–3, 5–7, 15–17, and 19–20 are obvious under 35 U.S.C. §103(a) over **Hildebrand and Van Ostrand** (*cited in Ground 1*), in further view of U.S. Pat. No. 6,789,739 (“**Rosen**”)(Ex. 1009).” (bold in original, italics added)), 46 (“*Hildebrand and Van Ostrand are applied as in Ground 1*, with the exception that Rosen teaches the ability to obtain measurements of outside temperature over the Internet from a weather data provider.” (emphasis added)), 49 (“Independent claims 1 and 15, and their respective dependent claims 7 and 20, *are obvious in the same manner discussed in Ground 1*, with the exception that the outside temperature measurements, first recited in claim elements [1c] and [15c], come from an Internet weather data source. (Ex. 1009, 4:40–59, Fig. 6)(Ex. 1002, ¶123).” (emphasis added)); Ex. 1002 ¶ 115 (“*Hildebrand and Van Ostrand are applied as I describe above with respect to Ground 1*, with the exception that Rosen teaches the ability to obtain measurements of outside temperature over the Internet from a weather data provider.” (emphasis added)). Those repeated references to applying Ground 1 include both where the elements are found and the reason to combine the references.

By focusing solely what is located in the sections entitled “Motivation (Rationale) for the Combination” and “Reasonable Expectation of Success”—which do not mention Van Ostrand—Patent Owner places form over substance. But we do not. Petitioner has sufficiently shown that the combination of Hildebrand and Van Ostrand will work for their intended purpose with a reasonable expectation of success (Ground 1) and that replacing one element in Hildebrand with Rosen will work for its intended purpose with a reasonable expectation of success (Ground 2). Given the incorporation of the arguments in Ground 1, no more is required.

e) Conclusion Regarding Claim 1

We have considered the evidence and arguments submitted by the parties and determine that Petitioner has shown by a preponderance of the evidence that claim 1 of the ’567 patent would have been obvious over Hildebrand, Van Ostrand, and Rosen.

3. Analysis of Claims 2, 3, and 7

Petitioner argues that the combination of Hildebrand, Van Ostrand, and Rosen teaches the limitations recited in claims 2, 3, and 7 and that a person having ordinary skill in the art would have combined the teachings with a reasonable expectation of success. Pet. 40, 49–50.

Besides the challenges discussed above with regard to claim 1, Patent Owner does not dispute in this proceeding Petitioner’s argument regarding dependent claims 2, 3, and 7. See PO Resp. 27–29

Based on the evidence and arguments presented in the Petition, which are not otherwise disputed by Patent Owner, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 2, 3, and 7 would have been obvious over the combined teachings of Hildebrand, Van Ostrand, and Rosen.

4. *Analysis of Claims 5 and 6*

In its heading and listing for Ground 2, Petitioner identifies, *inter alia*, claims 5 and 6. *See* Pet. 7 (listing of grounds), 45 (Ground 2 heading). However, the “Claim Mapping” section only discusses claims 1–3, 7, 15–17, and 20. Pet. 49–50. We noted this lack of mapping in the Institution Decision. Inst. Dec. 20.

In its Reply, Petitioner argues as follows:

The Institution Decision states “that the Petition omits any particular mapping for claim 5, 6, and 19” in the context of this Ground. (*See* Institution Decision, 20). Petitioner respectfully submits that the Petition makes clear that the claim mapping for these dependent claims is the same as in Ground 1, “with the exception that the outside temperature measurements, first recited in claim elements [1c] and [15c], come from an Internet weather data source.” (*See* Pet., 49).

Pet. Reply 21–22 n.3. However, the Petition does not support that argument. Instead, page 49 of the Petition—which is all Petitioner cites to—does not mention claims 5 and 6. Instead, the page Petitioner cites shows that Petitioner misleadingly cropped the quotation. The full quotation below shows that page 49 of the Petition does not list claims 5 and 6:

CLAIMS 1, 7, 15 AND 20

Independent claims 1 and 15, and their respective dependent claims 7 and 20, are obvious in the same manner discussed in Ground 1, with the exception that the outside temperature measurements, first recited in claim elements [1c] and [15c], come from an Internet weather data source.

Pet. 49 (bold in original) (italics added to emphasize cropped language).

Our rules require that “[t]he petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon.” 37 C.F.R. § 42.104(b)(4). Petitioner did not do that with respect to

claims 5 and 6 and Ground 2.¹⁹ Accordingly, Petitioner has not shown by a preponderance of the evidence that claims 5 and 6 of the '567 patent would have been obvious over Hildebrand, Van Ostrand, and Rosen. *Cf. Apple Inc. v. MPH Techs. OY*, 2022 WL 4103286, *6–8 (Fed. Cir. Sept. 8, 2022) (holding the Board did not err in not correcting Petitioner's mistake regarding identification of prior art and claims); *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1355 (2018) ([I]n an inter partes review the petitioner is master of its complaint and normally entitled to judgment on . . . the *claims it raises*, not just those the decisionmaker might wish to address." (emphasis added)).

G. Obviousness over Hildebrand and Van Ostrand (Claims 15, 16, 19, and 20)

Petitioner challenges claims 15, 16, 19, and 20 as unpatentable for obviousness over Hildebrand in view of Van Ostrand. Pet. 10–38, 40–45.

1. Analysis of Claim 15

a) Preamble [15a]: A Method for Evaluating Changes in the Operational Efficiency of an HVAC System over Time

Claim 15 recites “[15a] [a] method for evaluating changes in the operational efficiency of an HVAC system over time comprising.” Ex. 1001, 14:55–56. Petitioner argues Hildebrand teaches that limitation. Pet. 40–41; *see also* Section II.F.2.a (setting forth arguments). Petitioner further argues that “[t]he system of Hildebrand and Van Ostrand also teaches a **method**.” Pet. 40–45.

Patent Owner does not address limitation [15a]. *See* PO Resp.

¹⁹ Although Mr. Shah's testimony discusses claims 5 and 6 (*see* Ex. 1002 ¶ 123, our rules expressly prohibit incorporation by reference. 37 C.F.R. § 6(a)(3)).

For the reasons set forth in section II.F.2.a, *supra*, we find that Petitioner has sufficiently shown that Hildebrand teaches preamble [15a].

b) Limitation [15b]: Storing Temperature Measurements from at Least a First Structure Conditioned by an HVAC System.

Claim 15 further recites “storing temperature measurements from at least a first structure conditioned by an HVAC system.” Ex. 1001, 14:57–58. Petitioner and Patent Owner each incorporate the arguments and evidence regarding limitations [1b] and [1e]. Pet. 41; PO Resp. 28; *see also* Section II.F.2.a and II.F.2.c.1–2 (setting forth arguments).

For the reasons set forth in section II.F.2.a and II.F.2.c(2), *supra*, we find Petitioner has sufficiently shown that Hildebrand teaches limitation [15b].

c) Limitation [15c]: Comparing with One or More Processors Said Temperature Measurements from Said First Structure with Outside Temperature Measurements over Time to Derive Expected Temperature Measurements of a Rate of Change in Inside Temperature of Said First Structure When the HVAC System Is in a First State of Repair

Claim 1 further recites “comparing with one or more processors said temperature measurements from said first structure with outside temperature measurements over time to derive expected temperature measurements of a rate of change in inside temperature of said first structure when the HVAC system is in a first state of repair.” Ex. 1001, 14:59–64.

Petitioner relies on its arguments for claim limitation [1d], discussed previously. Pet. 41; *see also* Section II.F.2.a (setting forth arguments).

Additionally, the Petitioner argues that limitation [15c] also recites “to derive expected temperature measurements of a rate of change” and that additional requirement is taught by Hildebrand as modified by “Van Ostrand’s method to diagnose the failure of specific components of an

HVAC system.”²⁰ Pet. 41–42 (citing Ex. 1002 ¶ 105). Specifically, Petitioner argues that, as shown in Van Ostrand Figures 4 and 5, “Van Ostrand can diagnose the failure of an HVAC system stage by observing a time versus inside temperature curve, and comparing the slope of that curve with the expected slope (rate of change) of the curve under similar conditions.” Pet. 42 (citing Ex. 1007 ¶ 33, Figs. 4, 5; Ex. 1002 ¶ 105).

Patent Owner argues that “there is no disclosure in Hildebrand of comparing inside and outside temperatures over time.” PO Resp. 24. However, Patent Owner does not address Petitioner’s theory based on Van Ostrand. *Id.* at 23–24 (addressing Hildebrand alone); *see also* Pet. Reply 18 (“[Patent Owner] provides no response to this second contention” based on Van Ostrand.); PO Sur-reply 10–11 (addressing Hildebrand alone).

Patent Owner’s argument regarding whether Hildebrand teaches the limitation is inapposite. “The question in an obviousness inquiry is whether it would have been obvious to a person of ordinary skill in the art to combine the relevant disclosures of the two references, not whether each individual reference discloses all of the necessary elements.” *Game*, 942 F.3d at 1352. Because Petitioner relies on Van Ostrand, not Hildebrand, for this limitation, it is of no moment whether Hildebrand teaches it.

Accordingly, based on the undisputed evidence regarding Van Ostrand before us and the reasons set forth in the Petition, including the Shah Declaration, which are not addressed by Patent Owner (*see above*), we

²⁰ Petitioner also argues that Hildebrand alone teaches this limitation. Pet. 41–43. However, because the combination of Hildebrand and Van Ostrand teaches the limitation, that argument is moot and we do not address that argument here.

find that Petitioner has sufficiently shown that the combination of Hildebrand and Van Ostrand teaches limitation [15c].

d) Limitation [15d]: Wherein the Expected Temperature Measurements Are Based at Least in Part upon Past Temperature Measurements and Based at Least in Part on Outside Temperature Measurements

Claim 15 further recites “[15d] wherein the expected temperature measurements are based at least in part upon past temperature measurements and based at least in part on outside temperature measurements.” Ex. 1001, 14:64–67.

Petitioner relies on its arguments for claim limitations [15c] and limitation [1d]. Pet. 43–44; *see also* Sections II.F.2.a and II.G.1.c (setting forth arguments). According to Petitioner, as discussed in those sections, “the expected rates of change calculated by Hildebrand are correlated to outside temperature, so that the proper rate of change can be used for the prevailing conditions.” Pet. 43 (citing Ex. 1002 ¶ 107).

Accordingly, for the reasons set forth in Sections II.F.2.a (limitation [1d]) and II.G.1.c (limitation [15c]), along with the additional argument set forth above, which is not disputed (*see* PO Resp.), we find that Petitioner has sufficiently shown that the combination of Hildebrand and Van Ostrand teaches limitations [15d].

e) Limitation [15e]: Wherein Said One or More Processors Compares an Inside Temperature Recorded Inside the First Structure with Said Expected Temperature Measurements to Determine Whether the Operational Efficiency of the HVAC System Has Decreased

Claim 1 further recites “wherein said one or more processors compares an inside temperature recorded inside the first structure with said

expected temperature measurements to determine whether the operational efficiency of the HVAC system has decreased.” Ex. 1001, 15:1–5.

Petitioner relies on its arguments for claim limitations [15d] and limitation [1f]. Pet. 44. Additionally, Petitioner argues that “Van Ostrand teaches comparing the expected time versus temperature curve with the measured time versus temperature curve.” *Id.* (citing Ex. 1007, ¶¶ 29–33, Figs. 4-5). According to Petitioner, “[t]he measured time versus temperature curve would obviously be formed from **inside temperature recorded inside the first structure.**” *Id.* (citing Ex. 1002 ¶ 109).

Although Patent Owner argues that Hildebrand does not teach this limitation, Patent Owner does not address Petitioner’s argument based on Van Ostrand. *See* PO Resp. 25–27; PO Sur-reply 11–13.

Patent Owner’s argument regarding whether Hildebrand teaches the limitation is inapposite. “The question in an obviousness inquiry is whether it would have been obvious to a person of ordinary skill in the art to combine the relevant disclosures of the two references, not whether each individual reference discloses all of the necessary elements.” *Game*, 942 F.3d at 1352. Because Petitioner relies on Van Ostrand, not Hildebrand, for this limitation, it is of no moment whether Hildebrand teaches it.

Accordingly, for the reasons set forth in Sections II.F.2.a (limitation [1f]) and II.G.1.d (limitation [15d]) and based on the undisputed evidence regarding Van Ostrand before us and the reasons set forth in the Petition, including the Shah Declaration, which are not addressed by Patent Owner (*see above*), we find Petitioner has sufficiently shown that the combination of Hildebrand and Van Ostrand teaches limitation [15e].

f) Conclusion Regarding Claim 15

We have considered the evidence and arguments submitted by the parties and determine that Petitioner has shown by a preponderance of the evidence that claim 15 of the '567 patent would have been obvious over Hildebrand and Van Ostrand.

2. Analysis of Claim 16.

Claim 16 recites “wherein said outside temperature measurements are for geographic regions such as ZIP codes from sources other than said HVAC system.” Ex. 1001, 15:6–8.

Petitioner argues that Hildebrand teaches that limitation. Pet. 38–39, 45. Specifically, Petitioner argues that “[a] measurement of temperature from a sensor located outside is a temperature **for geographic regions**, because the measured air temperature at a location outside will approximate the air temperature around the sensor within a certain geographic region.” Pet. 38–39 (citing Ex. 1002 ¶ 97). According to Petitioner, “[t]he language ‘such as ZIP codes’ does not limit the claim.” *Id.* at 39 (citing *Catalina Mktg. Int’l v. Coolsavings.com, Inc.*, 289 F.3d 801, 812 (Fed. Cir. 2002)).

Patent Owner argues that Petitioner fails to show that the combination of Hildebrand and Van Ostrand teach the limitation for the same reasons discussed above for claim 1. PO Resp. 21, 27. Patent Owner further argues that “a PHOSITA would not consider a temperature sensor at a house to be a measurement for ‘geographic regions.’” *Id.* at 21–22, 27 (citing Ex. 2002 ¶ 67).

Like claim 1, claim 16 recites that the outside temperature measurements are “from sources other than said HVAC system.” Ex. 1001, 15:6–8. Accordingly, for the same reasons discussed above for claim 1,

Petitioner has not sufficiently shown that the combination of Hildebrand and Van Ostrand teach this limitation. *See* Section II.E.3.b.

3. *Analysis of Claims 19, and 20*

Petitioner argues that the combination of Hildebrand and Van Ostrand teaches the limitations recited in claims 19 and 20 and that a person having ordinary skill in the art would have combined the teachings with a reasonable expectation of success. Pet. 45.

Besides the challenges discussed above with regard to claim 1, the Patent Owner does not dispute Petitioner’s argument regarding dependent claims 19 and 20. *See* PO Resp. 27.

Based on the evidence and arguments presented in the Petition, which are not otherwise argued by Patent Owner, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 19 and 20 would have been obvious over the combined teachings of Hildebrand and Van Ostrand.

H. *Obviousness over Hildebrand, Van Ostrand, and Rosen (Claims 15–17, 19, and 20)*

1. *Claim 15, 19, and 20*

Because we determine that claims 15, 19, and 20 would have been obvious under 35 U.S.C. § 103(a) in view of Hildebrand and Van Ostrand, we do not address the parties’ arguments regarding the combination of Hildebrand, Van Ostrand, and Rosen. *See Boston Scientific Scimed, Inc. v. Cook Gp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (“We agree that the Board need not address issues that are not necessary to the resolution of the proceeding.”).

2. *Claims 16 and 17*

Petitioner and Patent Owner each relies on the same arguments and evidence discussed above in Sections II.F.2.b(1) and II.F.3 for claims 1, 2 and 3. *See* Pet. 49–50; PO Resp. 27–29. For the same reasons discussed above in section II.F.2.b(2) and II.F.3, Petitioner has demonstrated by a preponderance of the evidence that claims 16 and 17 would have been obvious over the combined teachings of Hildebrand, Van Ostrand, and Rosen.²¹

I. *Obviousness over Hildebrand, Van Ostrand, and Ehlers (Claims 4 and 18)*

Petitioner challenges claims 4 and 18 as unpatentable for obviousness over Hildebrand in view of Van Ostrand and Ehlers. Pet. 51–54.

1. *Ehlers*

Ehlers is entitled “System and Method for Controlling Usage of a Commodity” and is directed to “a system and method for managing the delivery and usage of a commodity such as electricity, natural gas, steam, water, chilled or heated water, or potable or recycled water.” Ex. 1013, code (54), ¶ 2.

Ehlers Figure 1B is reproduced below.

²¹ To the extent necessary, we also incorporate our findings and conclusions regarding the reason to combine and reasonable expectation of success. *See* Section II.F.2.d.(3).

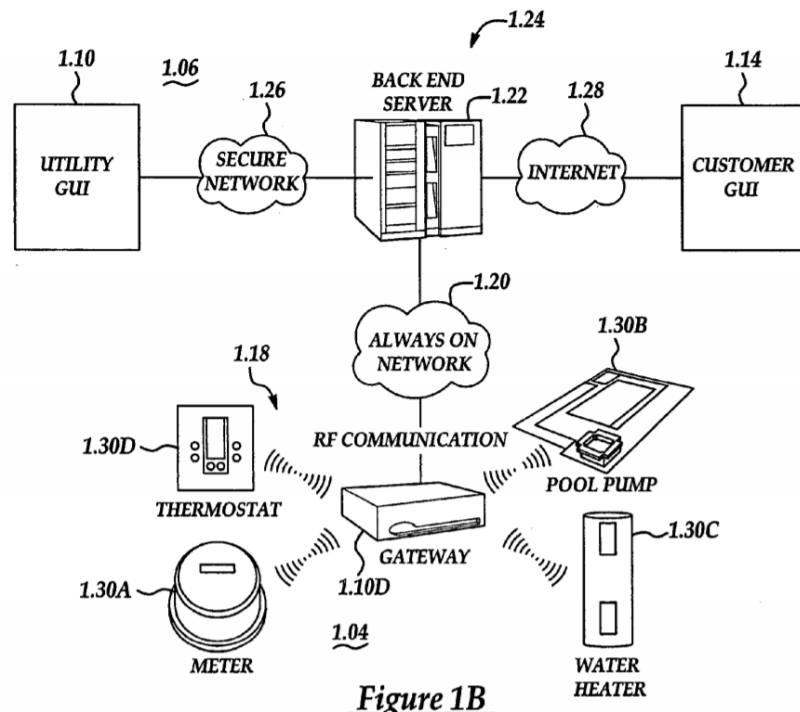


Figure 1B

Ehlers Figure 1B “is a diagrammatic illustration of one implementation of the energy management system.” Ex. 1013 ¶ 20. As shown in Ehlers Figure 1B, “the customer site 1.04 includes a metered device 1.30A, shown as an electric meter, a controlled device 1.30B, shown as a pool pump (illustrated graphically as a pool), and a metered and controlled device 1.30C, shown as a water heater.” *Id.* ¶ 76.

2. Claim 4

Claim 4 recites the system of claim 1 “in which said processors communicate with said HVAC system using a network that includes an electricity meter.” Ex. 1001, 14:57–59. Petitioner argues that Ehlers teaches the additional limitation recited in claim 4 and that a person having ordinary skill in the art would have combined the references. Pet. 52–54.

Patent Owner argues that the addition of Ehlers does not address the deficiency regarding ground 1.²² PO Resp. 30.

We agree with Patent Owner. Claim 4 depends from claim 1. Ex. 1001, 14:57–59. Petitioner has not argued how Ehlers teaches limitation [1c]. *See* Pet. 52–54. Accordingly, for the same reasons as set forth in section II.E.3.b, Petitioner has not demonstrated by a preponderance of the evidence that claim 4 is unpatentable over Hildebrand, Van Ostrand, and Ehlers.

3. *Claim 18*

Claim 18 depends from claim 15 and recites “communicating with said HVAC system using a network that includes an electricity meter.” Ex. 1001, 16:1–3.

Petitioner argues that “Ehlers teaches a networked electricity meter 1.30A, as shown in Fig. 1B” and that “[t]he meter ‘communicates with the gateway node or gateway 1.10D.’” Pet. 53 (quoting Ex. 1013 ¶ 76) (citing Ex. 1013 ¶¶ 76, 117, 163–164, Fig. 1B; Ex. 1002 ¶ 131). According to Petitioner, “[t]he meter and gateway are part of a network, to which the processing computers of the Ehlers system are also connected.” *Id.* (citing Ex. 1013 ¶¶ 62, 71–72, 110, Fig. 1B; Ex. 1002 ¶ 131). Based on the undisputed evidence before us and the reasons set forth in the Petition, including the Shah Declaration, which are not addressed by Patent Owner (*see* PO Resp. 29–31), we find that the combination of Hildebrand, Van Ostrand, and Ehlers teaches the additional limitation set forth in claim 18.

²² The Patent Owner Response refers to Ground 2, not Ground 1. We are treating this as a typographical error as the Petition adds Ehlers to the references set forth in Ground 1, not Ground 2.

Petitioner further argues that “[i]t would have been obvious to provide communications between the HVAC control system of Hildebrand and an electric meter associated either with the building or the HVAC system via a network connection, as taught by Ehlers.” Pet. 53. According to Petitioner, such a network connection would have provided the advantages taught by Ehlers. *Id.* Petitioner further argues that “it was a well-known technique to connect utility meters to communication networks, and this could have been performed with a reasonable expectation of success and no unexpected results.” *Id.* at 54 (citing Ex. 1002 ¶ 133; *KSR*, 550 U.S. at 416-421); *see also* Pet. Reply 22–23 (“Mr. Shah demonstrates in Ground 1 that a PHOSITA would be motivated to and have a reasonable expectation of success in modifying Hildebrand in view of Van Ostrand, and further demonstrates in Ground 3 why a PHOSITA would be motivated to and have a reasonable expectation of success in further modifying Hildebrand in view of Ehlers.” (citing Ex. 1002 ¶¶ 60–65, 126, 131–133)).

Patent Owner argues that Mr. Shah’s reasonable expectation of success testimony is insufficient because he only testifies about the combination of Hildebrand and Ehlers and not Hildebrand, Van Ostrand, and Ehlers. PO Resp. 30–31; PO Resp. 15–16.

Petitioner has sufficiently shown that a person having ordinary skill in the art would have combined the relevant teachings of Hildebrand and Van Ostrand with a reasonable expectation of success. As discussed above, a person having ordinary skill in the art would have combined the teachings of Hildebrand and Van Ostrand. *See* Section II.F.2.d(3), *supra*.

Petitioner also sufficiently shows that a person having ordinary skill in the art would have added Ehlers’ network and electricity meter to the Hildebrand. *See* Ex. 1002 ¶¶ 132–133. Specifically, a person having

ordinary skill in the art would have seen the advantages of Ehlers' system. Ex. 1002 ¶ 131. And because it is undisputed that Ehlers teaches using a known technique to connect utility meters to communication networks, there was a reasonable expectation of success. *See* Ex. 1002 ¶ 133.

We do not agree with Patent Owner that Petitioner does not sufficiently address the combination of Hildebrand, Van Ostrand, and Ehlers. When discussing Ground 1, Petitioner explains why a person having ordinary skill in the art would have combined Hildebrand with Van Ostrand with a reasonable expectation of success. Pet. 18–20. When discussing Ground 3, Petitioner also explains why a person having ordinary skill in the art would have added elements of Ehlers' system to Hildebrand. Pet. 48–49. Given the fact that Petitioner explicitly referenced its arguments from Ground 1 in Ground 3, there was no reason for Petitioner to repeat its arguments on the reason to combine. *See* Pet. 51 (“Claims 4 and 18 are obvious under 35 U.S.C. §103(a) over Hildebrand and Van Ostrand (*cited in Ground 1*), in further view of U.S. Pat. App. Pub. 2004/0117330” (emphasis added)). That reference to the application of Ground 1 includes both where the elements are found and the reason to combine the references.

Accordingly, Petitioner sufficiently shows that the combination of Hildebrand and Van Ostrand would result in the references working for their intended purposes with a reasonable expectation of success (Ground 1) and that adding an element of Ehlers will work for its intended purpose with a reasonable expectation of success (Ground 3).

J. Obviousness over Spalink (Claims 8, 9, and 13)

Petitioner challenges claims 8, 9, and 13 as unpatentable as obvious over Spalink. Pet. 54–73.

1. Spalink

Spalink is titled “Methods, Systems and Computer Program Products for Controlling a Climate in a Building” and discloses methods and systems for controlling the climate in a building. Ex. 1008, codes (54), (57). Spalink discloses a system involving monitoring and control of HVAC equipment in multiple buildings, as depicted in Figure 2, reproduced below.

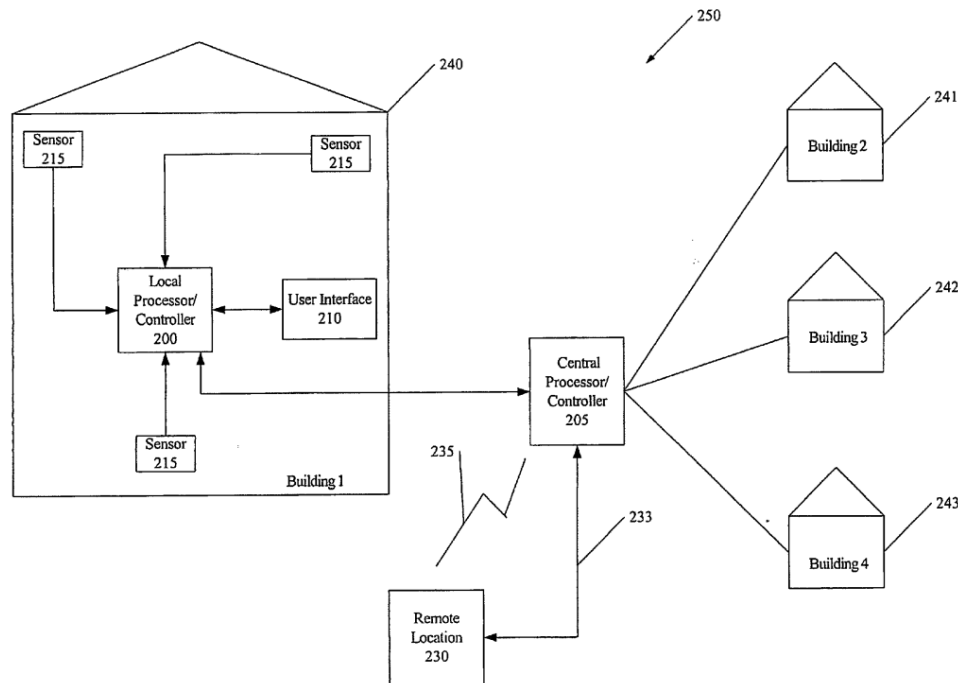
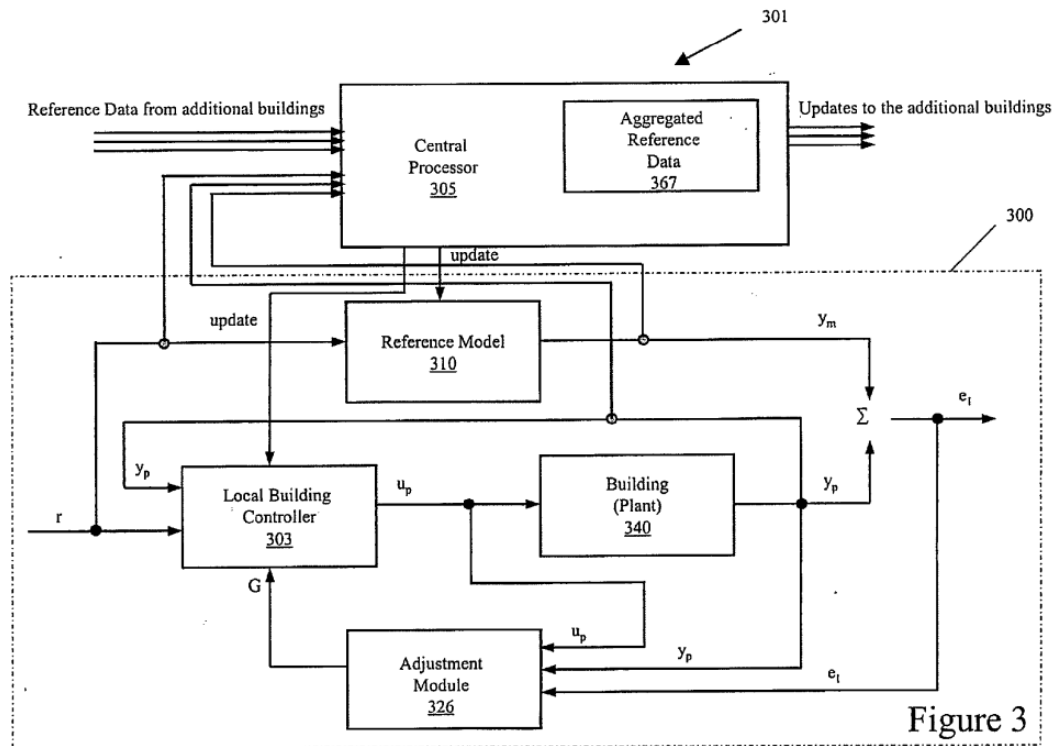


Figure 2

Spalink Figure 2 is a block diagram illustrating an exemplary climate control system 250 that includes first through fourth buildings 240, 241, 242, and 243, central process controller 205, and remote location 230, where building 240 (representing each building) is shown to have located in its user interface 210 and sensors 215 that are connected to local processor/controller 200, which is connected to the central processor controller 205. *Id.* ¶¶ 14, 61–62, 64).

Spalink discloses further aspects of its system in Figure 3, reproduced below.



Spalink Figure 3 is a block diagram illustrating exemplary climate control system 301 that includes: local data processor 300 that includes a reference model 310, a local building controller 303, a building 340, and an adjustment module 326; and a central processor 305 that includes aggregated reference data 367. *Id.* ¶¶ 15, 74.

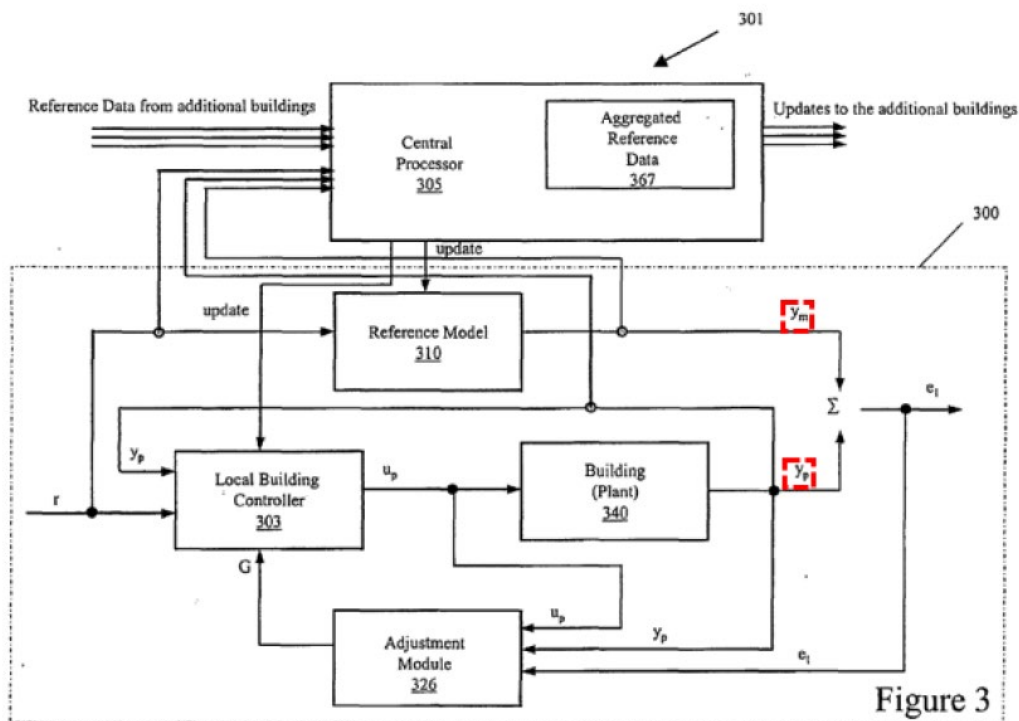
2. Analysis of Claims 8, 9, and 13

a) Petitioner's Arguments

Claim 8 recites, *inter alia*, “[8f] wherein said one or more processors compares the relative efficiency of the first HVAC system and the second HVAC system to determine whether the operational efficiency of the first HVAC system has decreased over time.” Ex. 1001, 14:24–28.

Petitioner argues Spalink teaches that limitation. Pet. 68–70. Specifically, Petitioner argues that “Spalink performs a comparison of

performance metrics as shown via the control system diagram of Fig. 3, reproduced below with added red-dashed boxes:”



Pet. 69 (citing Ex. 1008, Fig. 3), ¶¶ 74–76; Ex. 1002 ¶ 166). Figure 3 has been annotated with red dotted-line boxes around y_m and y_p . *Id.* According to Petitioner, “Spalink compares the output y_p of the plant 340 (the measured conditions of the building, including temperature and the efficiency of the climate control system) with the output of a model of the building y_m .” *Id.* (citing Ex. 1008 ¶¶ 73–76; Ex. 1002 ¶ 167). Petitioner further argues that “by the comparison of the building (plant) and model output parameters, Spalink analyzes whether **the operational efficiency of the first HVAC system has decreased over time.**” *Id.* at 70 (citing Ex. 1002 ¶ 167).

Petitioner further argues that “[b]ecause the reference model is updated with data from other buildings, including in a way so that the ‘output y_m of the reference model (predictive data) reflects the energy efficiency of the other buildings,’ an efficiency comparison can be made

between the respective HVAC systems of different buildings.” *Id.* (citing Ex. 1008 ¶¶ 73–76, Fig. 3). Petitioner further argues that “Spalink explicitly teaches that the ‘performance metrics’ of climate control systems can be ‘compared’ between buildings.” Pet. Reply 23 (citing Ex. 1008 ¶¶ 44, 58); *see also* Pet. 68 (“Spalink teaches this limitation. As discussed above, Spalink first teaches that the ‘performance metrics’ of climate control systems can be compared between buildings.” (citing Ex. 1008 ¶ 44; Ex. 1002 ¶ 165)).

Petitioner also argues that the claims do not require a direct form of measurement. Pet. Reply 24 (citing *Linear Tech. Corp. v. ITC*, 566 F.3d 1049, 1059 (Fed. Cir. 2009) (“[T]he Commission improperly narrowed this claim limitation to exclude indirectly monitoring current through the measurement of voltage. The claim limitation does not state *directly* monitoring current.” (emphasis in original)); *Mitutoyo Corp. v. Cent. Purchasing, LLC*, 499 F.3d 1284, 1289 (Fed. Cir. 2007) (“Neither the stipulated claim construction nor the language of claim 1 require calculation of the phase angle by *direct* comparison of the supply signal and the received signal. Instead, they merely require the phase angle to be calculated based on *some* comparison of those two signals, even an indirect one.” (emphasis in original))).

b) Patent Owner’s Arguments

Patent Owner argues that although y_p is a measurement of sensed data from a building, “ y_m is the ‘output of the reference model 310.’”

PO Resp. 31–32 (citing Ex. 1008 ¶¶ 75; Ex. 2004,²³ 65:9–17; Ex. 2002 ¶ 96); *see also id.* (“When asked ‘would it be accurate to say that y_m is output from a predictive model,’ Mr. Shah testifies ‘That is correct.’” (quoting Ex. 2004, 66:22–24); PO Sur-reply 17 (arguing y_m is a measurement of a model (citing Ex. 2002 ¶ 97)). According to Patent Owner, “[a] predictive model of the first HVAC system is not a second, separate HVAC system. Therefore, Spalink does not teach comparing ‘the relative efficiency of the first HVAC system and the second HVAC system’ as required by claim element [8f].” PO Resp. 32 (citing Ex. 1002 ¶ 97); *see also* PO Sur-reply 16 (arguing that the actual operation of the first HVAC system is compared to a model).

Patent Owner also argues that neither of the cases cited by Petitioner are “applicable, as the predictive model y_m of Spalink does not even permit an indirect comparison of ‘the relative efficiency of the first HVAC system and the second HVAC system.’” PO Sur-reply 17. According to Patent Owner, “any relative efficiency from a second HVAC system is incorporated with the information of the predictive model, which include estimates and actual performance of the first HVAC system.” *Id.* at 18.

c) Our Analysis

We are not persuaded that Petitioner has sufficiently shown that Spalink teaches limitation [8f]. The Petition relies on the comparison of y_m and y_p . Pet. 68–70. There is no dispute that y_p is the actual measurement of a physical building. *See* Pet. 69; PO Resp. 31–32. That is consistent with

²³ Here and elsewhere, Patent Owner cites to Exhibit 2003 for the Shah deposition. The correct reference is Exhibit 2004. The typographical error is corrected in this Decision.

Spalink, which states that “ y_p is the actual plant output vector, represented by the actual sensed data, i.e., actual state of the building.” Ex. 1008 ¶ 75.

There is also no dispute that y_m is the output from a computer model. *See* Pet. 69; PO Resp. 32. Again, that is consistent with Spalink, which defines item 310—which generates y_m —as a reference model. Ex. 1008 Fig. 3; ¶ 75 (describing y_m as the output of the reference model). Thus, there is no meaningful dispute that the comparison shown in Figure 3—which the Petition relies on—is a comparison between a first HVAC system and a model, not a second HVAC system as recited in claim 8. Accordingly, that comparison does not teach or suggest “compar[ing] the relative efficiency of the first HVAC system and the second HVAC system” as recited in claim 8.

Petitioner’s arguments that the data in the reference model comes from other buildings is inapposite. Although Petitioner accurately describes how reference model 310 is based on “data 367 collected from different buildings” (Ex. 1008 ¶ 77), Petitioner has not shown that a computer model is a second HVAC system. Therefore, comparing the output of a building to a model based on buildings does not teach or suggest the necessary comparison between the first HVAC system and the second HVAC system recited in claim 8.

Similarly, we are not persuaded by the cases cited in Petitioner’s Reply. As discussed above, this is not a case where there is an indirect measurement of the efficacy of a second HVAC system. Instead, Spalink teaches using a calculation from a computer model, not a second HVAC system.

Finally, we do not find that Petitioner’s citation to Spalink paragraphs 44 and 58 supports a different result. *See* Pet. 68; Pet. Reply 23, 24. Our rules require that a petition includes fully developed arguments. *See*

37 C.F.R. § 42.22(a)(2) (2019) (the “petition . . . must include . . . [a] full statement of the reasons for the relief requested”); *DeSilva v. DiLeonardi*, 181 F.3d 865, 866–67 (7th Cir. 1999) (“A brief must make all arguments accessible to the judges, rather than ask them to play archeologist with the record.”). By statute, a petition is required to identify “with particularity[] the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge.” 35 U.S.C. § 312(a)(3) (2018). The petition shall also include a “full statement” with “a detailed explanation of the significance of the evidence, including material facts.” 37 C.F.R. § 42.22(a)(2). In that regard, our rules require a petition to include both an adequate explanation of how the claims should be construed, as well as information sufficient to show how and why the properly construed claims are unpatentable over the asserted prior art. 37 C.F.R. § 42.104(b)(3), (b)(4). A petition should also “explain why a person of ordinary skill in the art would have combined elements from specific references in the way the claimed invention does.” *ActiveVideo Networks, Inc. v. Verizon Comm’ns, Inc.*, 694 F.3d 1312, 1328 (Fed. Cir. 2012). Thus, based on our rules, we only consider fully developed arguments set forth in the petition.

The Petition does not include a fully developed argument as required by our rules for Spalink paragraphs 44 and 58. The claim mapping section for limitation [8f] begins as follows: “Spalink teaches this limitation. As discussed above, Spalink first teaches that the ‘performance metrics’ of climate control systems can be compared between buildings.” Pet. 68 (citing Ex. 1008 ¶ 44; Ex. 1002 ¶ 165). Spalink paragraph 58 is not even cited in the Petition.

However, as Petitioner’s counsel conceded, with the exception of that brief, conclusory introduction, the Petition’s argument focuses solely on the comparison with the reference model shown in Figure 3:

JUDGE HOWARD: The Petition cites, just one sentence. It cites just paragraph 44 and then it goes into a whole discussion about Figure 3.

MS. LAUGHTON: Yes.

Tr. 14:7–9; *see also* Pet. 68–70. That is, after making a passing and conclusory statement about paragraph 44, Petitioner devotes all of its argument to describing Figure 3 and the comparison with the reference model. Pet. 68–70; *see also id.* at 70 (“Thus, by the comparison of the *building (plant) and model output parameters*, Spalink analyzes whether **the operational efficiency of the first HVAC system has decreased over time.**” (citing Ex. 1002 ¶ 167), 70 (“Thus, Spalink teaches that **said one or more processors** (local and central processors) **compare the relative efficiency of the *first HVAC system and the second HVAC system* (by comparing reference model parameters) to determine whether the operational efficiency of the first HVAC system has decreased over time.**” (bold in original, italics added) (citing Ex. 1008 ¶¶ 57, 72, 73, 75, 76, code (57); Ex. 1002 ¶ 169)). At most, Petitioner’s passing reference to paragraphs 44 and 58 is a conclusory, undeveloped statement²⁴ and not, under our rules, a sufficient argument. *Cf. Smithkline Beecham Corp. v. Apotex Corp.*, 439 F.3d 1312, 1320 (Fed. Cir. 2006) (refusing to consider “statement and disagreements” which “do not amount to a developed

²⁴ Although Mr. Shah’s testimony adds quotations from Spalink, it is otherwise substantially the same as the argument made in the Petition. *Compare* Pet. 68–70, *with* Ex. 1002 ¶¶ 165–169.

argument”).²⁵ Thus, our analysis above properly focuses on the developed arguments regarding Figure 3 and the comparison with the reference model.

Accordingly, Petitioner has not demonstrated by a preponderance of the evidence that claim 8, or dependent claims 9 and 13 which depend from claim 8, are unpatentable over Spalink.

K. Obviousness over Spalink and Rosen (Claims 8–10 and 12–14)

Petitioner argues that claims 8–10 and 12–14 would have been obvious over Spalink and Rosen. Pet. 73–76. Specifically, with regard to claim 8, Petitioner relies on Spalink for all of the limitations of claim 8 except for limitation [8c], for which Petitioner relies on Rosen for getting the weather over the internet. *Id.* at 74. Because Petitioner does not rely on Rosen for limitation [8f], for the reasons discussed above in Section II.J.2.c, Petitioner has not demonstrated by a preponderance of the evidence that claim 8, or dependent claims 9, 10 and 12–14 which depend from claim 8, are unpatentable over Spalink and Rosen.

L. Obviousness over Spalink and Ehlers (Claim 11)

Petitioner argues that claim 11 would have been obvious over Spalink and Ehlers. Pet. 76–77. Specifically, Petitioner relies on Ehlers for the additional limitation recited in claim 11. *Id.* Because Petitioner does not rely on Ehlers for limitation [8f], for the reasons discussed above in Section II.J.2.c, Petitioner has not demonstrated by a preponderance of the evidence that claim 11 is unpatentable over Spalink and Rosen.

²⁵ Petitioner’s reply is no different. It makes a brief, conclusory reference to paragraphs 44 and 58 before discussing the substance of the Figure 3 embodiment. *See* Pet. Reply 23.

III. CONCLUSION²⁶

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence the unpatentability of claims 1–3, 7, and 15–20 of the ’567 patent. Specifically, Petitioner has demonstrated by a preponderance of the evidence that (1) claims 15, 19, and 20 are unpatentable over Hildebrand and Van Ostrand, (2) claims 1–3, 7, 16, and 17 are unpatentable over Hildebrand, Van Ostrand, and Rosen and (3) claim 18 is unpatentable over Hildebrand, Van Ostrand, and Ehlers. Petitioner has not demonstrated by a preponderance of the evidence that (1) claims 1, 2, 5–7, and 16 are unpatentable over Hildebrand and Van Ostrand, (2) claims 5 and 6 are unpatentable over Hildebrand, Van Ostrand, and Rosen, (3) claim 4 is unpatentable over Hildebrand, Van Ostrand, and Ehlers, (4) claims 8, 9, and 12 are unpatentable over Spalink, (5) claims 8–10 and 12–14 are unpatentable over Spalink and Rosen, and (6) claim 11 is unpatentable over Spalink and Ehlers.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, Petitioner has not shown by a preponderance of the evidence that claims 4–6 and 8–14 of the ’567 patent are unpatentable;

²⁶ 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).

FURTHER ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–3, 7, and 15–20 are unpatentable;

FURTHER ORDERED that because this is a Final Written Decision, 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.

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1, 2, 5–7, 15, 16, 19, 20	103(a)	Hildebrand, Van Ostrand	15, 19, 20	1, 2, 5–7, 16
1–3, 5–7, 15–17, 19, 20	103(a) ²⁷	Hildebrand, Van Ostrand, Rosen	1–3, 7, 16, 17	5, 6
4, 18	103(a)	Hildebrand, Van Ostrand, Ehlers	18	4
8, 9, 12	103(a)	Spalink		8, 9, 12
8–10, 12–14	103(a)	Spalink, Rosen		8–10, 12–14
11	103(a)	Spalink, Ehlers		11
Overall Outcome			1–3, 7, 15–20	4–6, 8–14

²⁷ As explained above, because we determine that claims 15, 19, and 20 are unpatentable in light of Hildebrand and Van Ostrand, we decline to address those claims on this ground.

IPR2021-01218
Patent 8,019,567 B2

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