

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC and ECOBEE, INC.,
Petitioners,

v.

ECOFACITOR, INC.,
Patent Owner.

IPR2020-01504¹
Patent 8,498,753 B2

Before TREVOR M. JEFFERSON, CHRISTOPHER L. OGDEN, and
SCOTT B. HOWARD, *Administrative Patent Judges*.

HOWARD, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
Dismissing Petitioner's Motion to Exclude Evidence
35 U.S.C. § 318(a)

¹ ecobee, Inc. was joined as a party to this proceeding via a Motion for Joinder in IPR2021-00792.

INTRODUCTION

A. *Background and Summary*

Google LLC (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–20 of U.S. Patent No. 8,498,753 B2 (Ex. 1001, “the ’753 patent”). 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 ’753 patent on the ground of unpatentability alleged in the Petition. Paper 6 (“Institution Decision” or “Inst. Dec.”).

After institution of trial, Patent Owner filed a Response (Paper 13, “PO Resp.”), Petitioner filed a Reply (Paper 20, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 22, “PO Sur-reply”).

After the end of regular briefing but before the Oral Hearing, we issued an Order with a proposed construction of the preamble of the challenged claims and ordered the parties to address that claim construction. Paper 28. Petitioner and Patent Owner each submitted a supplemental claim construction brief. Paper 31; Paper 32.

An oral hearing was held on December 7, 2021, and the record contains a transcript of this hearing. Paper 41 (“Tr.”).

Following the hearing, we requested additional briefing from the parties in light of *Kyocera Senco Indus. Tools Inc. v. ITC*, 2022 WL 189822 (Fed. Cir. Jan. 21, 2022). Paper 43, 2 (Order Inviting Supplemental Briefing). Petitioner filed Supplemental Briefing Regarding Dr. Palmer’s Testimony. Paper 44 (“Pet. Supp. Br.”). Patent Owner responded. Paper 45.

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 not shown by a preponderance of the evidence that claims 1–20 of the ’753 patent are unpatentable.

B. Real Parties in Interest

Petitioner identifies Google LLC as the real party in interest. Pet. 5. ecobee, Inc. identifies ecobee, Inc. and ecobee Ltd. as the real parties in interest. *ecobee, Inc. v. EcoFactor, Inc.*, IPR2021-00792, Paper 1, 1.

Patent Owner identified EcoFactor, Inc. as the real party in interest. Paper 3, 1.

C. Related Matters

The parties identify the following proceedings in which the ’753 patent has been asserted: *EcoFactor, Inc. v. Google LLC*, 1-19-cv-12322 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Alarm.com Inc.*, 1-19-cv-12323 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Daikin Industries, Ltd.*, 1-19-cv-12324 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Ecobee, Inc.*, 1-19-cv-12325 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Schneider Electric USA, Inc.*, 1-19-cv-12326 (D. Mass. Nov. 12, 2019); *EcoFactor, Inc. v. Vivint, Inc.*, 1-19-cv-12327 (D. Mass. Nov. 12, 2019); and *In re Smart HVAC Systems, and Components Thereof*, 337-TA-1185 (ITC).² Pet. 5–6; Paper 5, 2.

D. The ’753 Patent

The ’753 patent is entitled “System, Method and Apparatus for Just-In-Time Conditioning Using a Thermostat” and is directed to “reducing the cycling time of a climate control system.” Ex. 1001, codes (54), (57).

² Petitioner asserts that the ALJ granted Patent Owner’s request to terminate the ITC proceeding with respect to the ’753 patent. See Ex. 3001.

The '753 patent describes a prior art thermostat in which the user can set the thermostat to change the setpoint—the temperature one has set the thermostat to maintain—at different times. *See* Ex. 1001, 1:18–44. “[F]or example, if the homeowner gets out of bed at 7 AM, setting the thermostat to change from the overnight setpoint of 64 degrees to 70 at 6 AM can make the house comfortable when the consumer gets up.” *Id.* at 1:38–41.

However, the '753 patent describes problems with this approach: “First, the amount of preconditioning required will vary with outside temperature. . . . Second, the amount of preconditioning required will vary depending on the relationship between the capacity of the HVAC system and the thermal characteristics of the structure.” Ex. 1001, 1:45–55. According to the '753 patent, it would therefore “be advantageous to have a means for controlling the HVAC system that is capable of taking into account both outside weather conditions and the thermal characteristics of individual homes in order to improve the ability to dynamically achieve the best possible balance between comfort and energy savings.” *Id.* at 2:1–6.

Figure 7 of the '753 patent, not reproduced, “shows a flow chart for a high level version of the process of calculating the appropriate turn-on time in a given home.” Ex. 1001, 2:25–27. The steps shown in Figure 7 are as follows:

In step 1002, the server determines whether a specific thermostat 108 is scheduled to run the preconditioning program. If not, the program terminates. If it so scheduled, then in step 1004 the server retrieves the predetermined target time when the preconditioning is intended to have been completed (TT). Using TT as an input, in step 1006 the server then determines the time at which the computational steps required to program the preconditioning event will be performed (ST). In step 1008, performed at start time ST, the server begins the process of actually calculating the required parameters, as discussed in

greater detail below. Then in 1010 specific setpoint changes are transmitted to the thermostat so that the temperature inside the home may be appropriately changed as intended.

Id. at 5:37–51.

Figure 8, not reproduced, shows “a more detailed flowchart of the process.” Ex. 1001, 5:52. As shown in Figure 8, in step 1102, the server retrieves input parameters—such as “the maximum time allowed for a [just-in-time] event for thermostat 108 (MTI); the target time the system is intended to hit the desired temperature (TT); and the desired inside temperature at TT (TempTT)”—used to create a just-in-time event. *Id.* at 5:52–57.

In step 1104, the server retrieves a set of algorithmic learning data (ALD), including “historic readings from the thermostat, together with associated weather data, such as outside temperature, solar radiation, humidity, wind speed and direction, etc[.]; together with weather forecast data [(WFD)] for the subject location for the period when the algorithm is scheduled to run,” which is used to calculate the appropriate start time. Ex. 1001, 5:62–6:3.

“In step 1106, the server uses the ALD and the WFD to create prediction tables that determine the expected rate of change or slope of inside temperature for each minute of HVAC cycle time (ΔT) for the relevant range of possible pre-existing inside temperatures and outside climatic conditions.” Ex. 1001, 6:10–15.

In step 1108, the servers use the prediction table, TT, and Temp (TT) “to determine the time at which slope ΔT intersects with predicted initial temperature PT. The time between PT and TT is the key calculated parameter: the preconditioning time interval, or PTI.” Ex. 1001, 6:17–22.

“In step 1110, the server checks to confirm that the time required to execute the pre-conditioning event PTI does not exceed the maximum parameter MTI. If PTI exceeds MTI, the scheduling routine concludes and no ramping setpoints are transmitted to the thermostat.” Ex. 1001, 6:23–27. However, “if MTI is greater than PTI, then in step 1112 the server calculates the schedule of intermediate setpoints and time intervals to be transmitted to the thermostat.” *Id.* at 6:56–58.

Finally, “[i]n step 1114, the server schedules setpoint changes calculated in step 1112 for execution by the thermostat.” Ex. 1001, 7:13–14.

Figures 9A through 9D of the ’753 patent “show[] the steps shown in the flowchart in FIG. 8 in the form of a graph of temperature and time.” Ex. 1001, 2:31–32. Figure 9A is reproduced below.

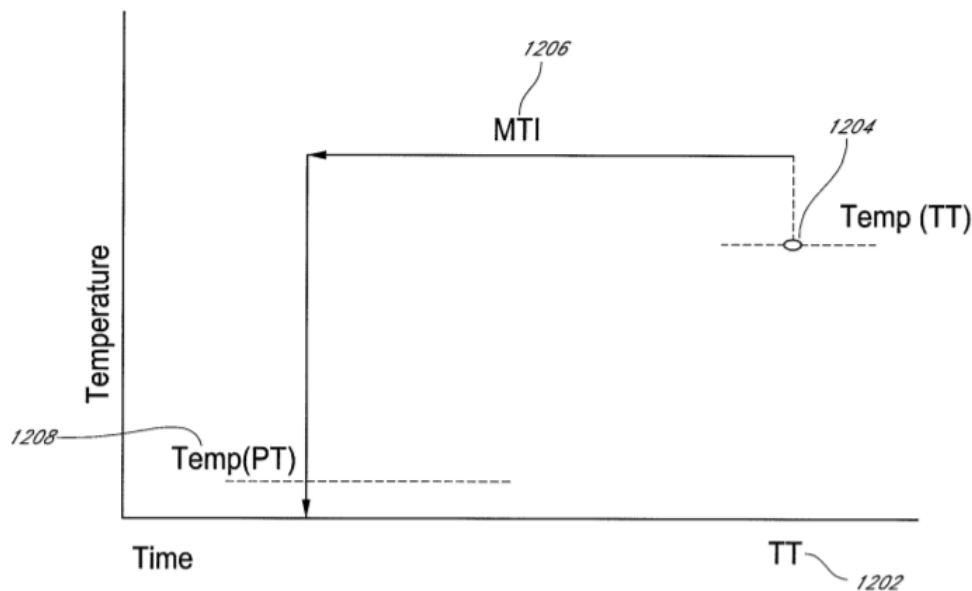


FIG. 9A

Figure 9A “shows step 1102, in which inputs target time TT 1202, target temperature Temp(TT) 1204, maximum conditioning interval MTI 1206 and

the predicted inside temperature during the period of time the preconditioning event is likely to begin Temp(TT) 1204 are retrieved.” *Id.* at 87:26–31.

Figure 9B is reproduced below.

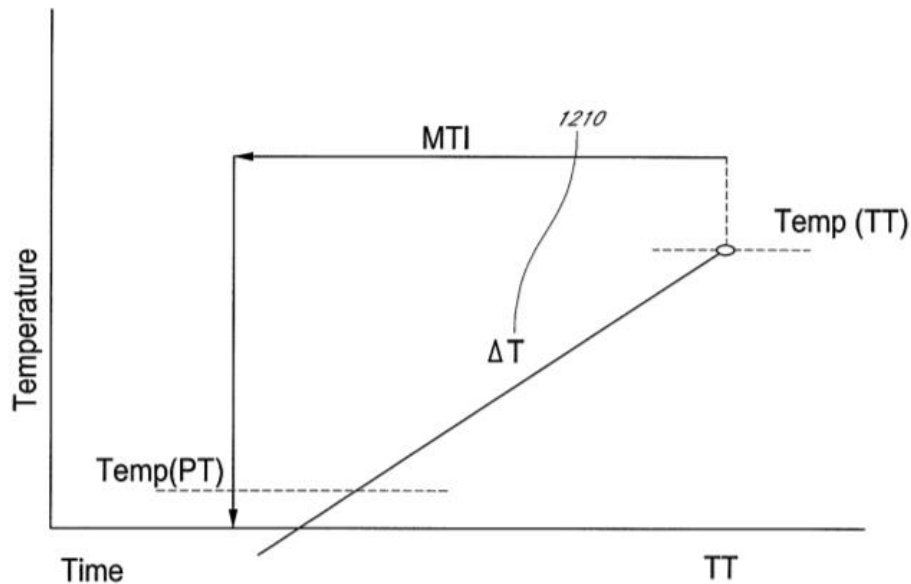


FIG. 9B

Figure 9B “shows the initial calculations performed in step 1108, in which expected rate of change in temperature ΔT 1210 inside the home is generated from the ALD and WFD using Temp(TT) 1204 at time TT 1202 as the endpoint.” Ex. 1001, 7:32–35.

Figure 9C is reproduced below.

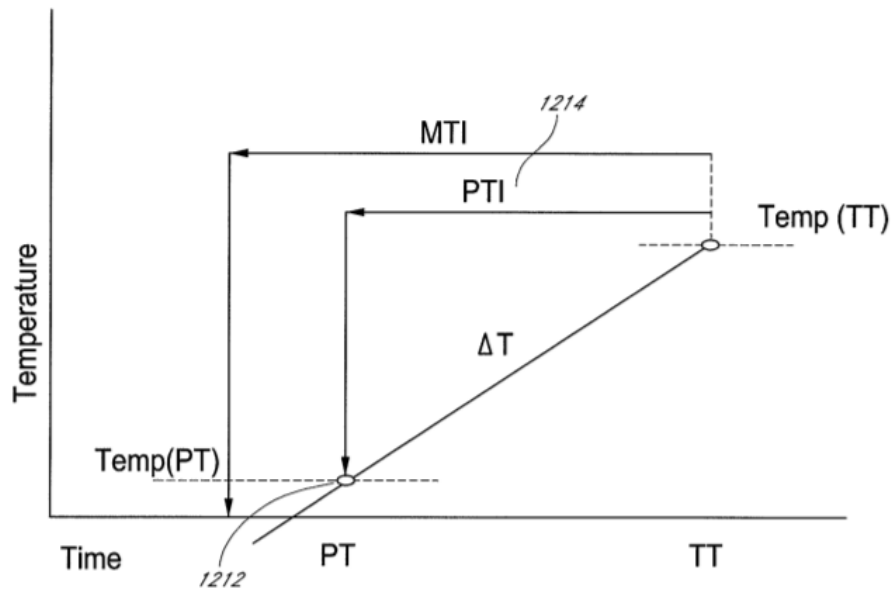


FIG. 9C

Figure 9C “shows how in step 1108 ΔT 1210 is used to determine start time PT 1212 and preconditioning time interval PTI 1214. It also shows how in step 1110 the server can compare PTI with MTI to determine whether or not to instantiate the pre-conditioning program for the thermostat.” Ex. 1001, 7:36–40.

Figure 9D is reproduced below.

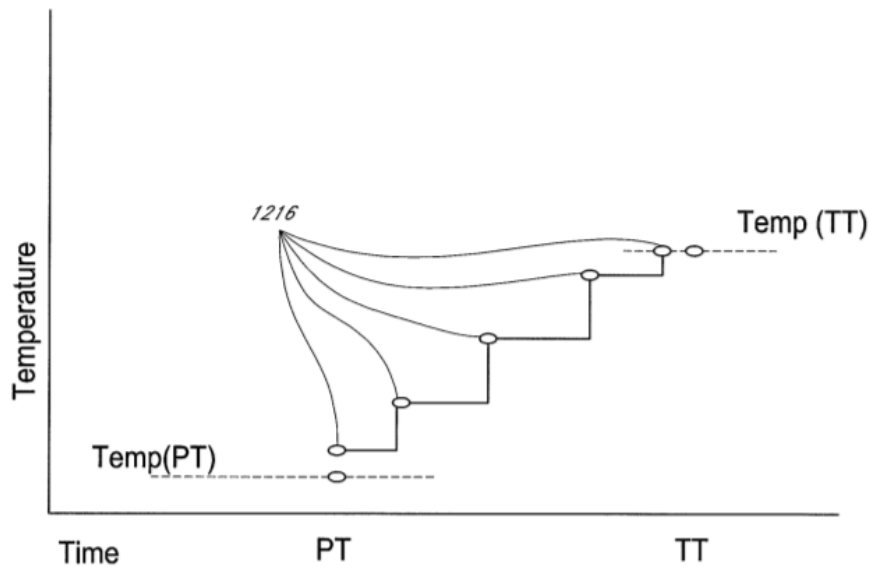


FIG. 9D

Figure 9D “shows step 1112, in which specific ramped setpoints 1216 are generated.” Ex. 1001, 7:41–42; *see also* Ex. 1002 ¶ 39 (“Ramping involved changing the temperature of a space by automatically changing the thermostat setpoint in small increments, for example, by one degree Fahrenheit at a time.”).

E. Illustrative Claim

Claim 1, 9, and 15 are independent claims. Claim 1 is illustrative and reads as follows:

1. [1a] A method for reducing the cycling time of a climate control system, said method comprising:

[1b] accessing stored data comprising a plurality of historic internal temperature readings taken within a structure and a plurality of measurements relating to a plurality of historic external temperatures outside said structure during at least one selected time period;

[1c] determining one or more thermal performance values of said structure [1d] by correlating at least one of the plurality

of historic internal temperatures with at least one of the plurality of historic external temperatures that both occur at a first time during the at least one selected time period, and by correlating at least one of the plurality of historic internal temperatures with at least one of the plurality of historic external temperatures that both occur at a second time during the at least one selected time period, [1e] wherein said one or more thermal performance values indicate a rate of change of temperature in said structure in response to changes in outside temperatures;

[1f] storing said one or more thermal performance values of said structure;

[1g] retrieving a target time at which said structure is desired to reach a target temperature;

[1h] acquiring at least a first internal temperature inside said structure at a third time prior to said target time;

[1i] acquiring at least a first external temperature relating to a temperature outside said structure at the third time prior to said target time;

[1j] obtaining at least one forecasted temperature forecasted to occur outside the structure at the target time;

[1k] retrieving at least said one or more thermal performance values of said structure that indicate said rate of change of temperature in said structure in response to changes in outside temperatures;

[1l] retrieving at least one performance characteristic of said climate control system;

[1m] determining a first time prior to said target time at which said climate control system should turn on to reach the target temperature by the target time based at least in part on [i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, said [iii] first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature;

[1n] calculating a plurality of intermediate setpoints and a plurality of setpoint target times that occur between the first time

and the target time based at least in part on [i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, [iii] said first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature,

[1o] wherein the plurality of intermediate setpoints direct a thermostatic controller to change the actual temperature inside the structure to the target temperature in a series of intermediate steps;

[1p] transmitting the plurality of intermediate setpoints to the thermostatic controller; and

[1q] setting the thermostatic controller with the plurality of intermediate setpoints to control said climate control system.

Ex. 1001, 9:9–10:3.

F. Prior Art and Asserted Ground

Petitioner asserts that claims 1–20 are unpatentable on the following ground:

Claim(s) Challenged	35 U.S.C. §³	Reference(s)/Basis
1–20	103(a)	Wedekind, ⁴ Ehlers ⁵

Petitioner also relies on the Declaration of Rajendra Shah. Ex. 1002. Patent Owner relies on the Declaration of John A. Palmer, Ph.D. Ex. 2002.

³ 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 ’753 patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability. See Ex. 1001, code (22) (non-provisional application filed April 10, 2009).

⁴ US 5,197,666, issued Mar. 30, 1993 (Ex. 1006).

⁵ US 6,216,956 B1, issued Apr. 17, 2001 (Ex. 1008).

ANALYSIS

A. *Legal Standard*

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 obviousness or 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).

We note that, with respect to the fourth *Graham* factor, neither party has presented argument or evidence directed to secondary considerations of obviousness or nonobviousness. *See* Pet.; PO Resp. Therefore, the analysis below addresses the first three *Graham* factors.

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 of ordinary skill in the art” is a hypothetical construct, from whose vantage point

obviousness is assessed. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). “This legal construct is akin to the ‘reasonable person’ used as a reference in negligence determinations” and “also presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

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, 696–697 (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 argues that a person having ordinary skill in the art would have had “a (1) Bachelor’s degree in engineering, computer science, or a comparable field of study, and (2) at least five years of (i) professional experience in building energy management and controls, or (ii) relevant industry experience. Additional relevant industry experience may compensate for lack of formal education or vice versa.” Pet. 26 (citing Ex. 1002 ¶¶ 26–27).

Patent Owner argues

that a person of ordinary skill in the arts at the time of the invention would have had a (a) bachelor’s degree in engineering, computer science, or a comparable field of study, and (b) at least 2 years of professional experience in electronic thermostats,

HVAC controls, building energy management and controls or other similarly relevant industry experience. Additional relevant industry experience may compensate for lack of formal education or vice versa.

PO Resp. 5–6.

We are persuaded that Petitioner’s formulation, except for the qualifier “at least,” is correct.⁶ On the one hand, Patent Owner’s formulation is attorney argument without any supporting evidence. *See* PO Resp. 5–6. It is well settled that mere attorney arguments and conclusory statements, which are unsupported by factual evidence, are entitled to no probative value. *See Johnston v. IVAC Corp.*, 885 F.2d 1574, 1581 (Fed. Cir. 1989) (“Attorney’s argument is no substitute for evidence.”); *In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) (attorney argument is not evidence).

On the other hand, Petitioner’s proposal is supported by Mr. Shah’s testimony. *See* Pet. 26 (citing Ex. 1002 ¶¶ 26–27). Because Mr. Shah’s testimony is based on his years of experience, we give it some weight. *See* Ex. 1002 ¶¶ 2–10.

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). Under the *Phillips* standard, the “words of a claim are generally given their ordinary and customary meaning,” which

⁶ We eliminate the qualifier because it expands the range indefinitely without an upper bound, and thus precludes a meaningful indication of the level of ordinary skill in the art.

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 proposes a construction for the term “heating, ventilation, and air conditioning system.” Pet. 15.

Patent Owner’s Response incorporates by reference constructions contained in other documents: “Proposed claim constructions relevant to the ’753 patent are shown in Ex. 1007; Ex. 2002 at ¶ 25.” PO Resp. 6.

However, we do not consider arguments that are incorporated by reference from other documents. 37 C.F.R. § 42.6(a)(3) (“Arguments must not be incorporated by reference from one document into another document.”).

After briefing, we issued an order inviting supplemental briefing of the preambles of the challenged claims. Paper 28. In the Order, we proposed that the preamble of each of the challenged claims was not limiting. *Id.* at 2–3. In supplemental briefing, both Petitioner and Patent Owner agreed with that construction. Paper 31, 1; Paper 32, 5.

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) (holding 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. Obviousness in View of Wedekind and Ehlers

Petitioner argues that claims 1–20 would have been obvious over Wedekind and Ehlers. Pet. 15–75. Based on the current record and for the reasons that follow, we are not persuaded that Petitioner has shown by a preponderance of the evidence that claims 1–20 are unpatentable.

1. *Summary of Wedekind*

Wedekind is entitled “Method and Apparatus for Estimation of Thermal Parameter for Climate Control” and is directed to “adaptive electronic energy management thermostats having the ability to measure the parameters of a building, its climate control system and its surrounding environment and to optimize the efficiency of energy consumption as a function of these parameters.” Ex. 1006, code (54), 1:13–18. Wedekind describes a methodology for how measured values such as temperatures, times, and flowrates “are used by enclosure parameter and the climate control system parameter estimating means 66 and 69, respectively, to determine the various thermal and thermodynamic parameters.” *Id.* at 12:43–53. Those parameters are used “by the non-linear efficiency model to correctly determine the most efficient way to maintain the occupancy comfort schedule 39 which was input by the operator.” *Id.*; *see also id.* at 12:54–21:12 (providing details).

Wedekind Figure 2, not reproduced, “is a graph representing temperature of the air in a conditioned space as a function of time and average energy as a function of time during a typical thermostat setback.”⁷ Ex. 1006, 3:6–9 (footnote added). More specifically, Wedekind Figure 2

⁷ A thermostat is set to a setpoint or target temperatures. Pet. 7 (citing Ex. 1001, 1:18–44; Ex. 1002 ¶ 30). Setback refers to a setpoint that is an uncomfortable, but less costly, temperature when the user is away from the premises or asleep. *See* Pet. 8–9. For example, “a home user in winter might want the temperature at 70° F between 7 and 9 AM and between 5 PM and 11 PM, but 58° F otherwise.” *Id.* at 9. “The uncomfortable temperature (the ‘setback temperature’—in this case, 58° F), saves energy by preventing the furnace from cycling ‘on.’” *Id.*

shows a comfort temperature of T_f' (72 °F) and a setback temperature of T_i' .
Id. at Fig. 2, 6:1–7:18.

[O]ccupancy comfort time domains, t_0 – t_1 and t_4 – t_5 , represent the times in which the occupants of the enclosure 30 are using the enclosure 30 and want it comfortable. The thermostat setback time domain, t_1 – t_4 , represents the time in which the occupants of the enclosure 30 are not present in the case of commercial or residential enclosures 30, or asleep in the case of residential enclosures 30.

Id. at 5:58–65. Wedekind Figure 2 shows that it takes some time (the interval t_1 – t_2) for the temperature to reach the setback temperature. Wedekind Figure 2 further shows that at time t_3 the thermostat turns on so that the temperature returns to the original temperature T_f' by the end of the setback period at time t_4 .⁸ *Id.* at 6:31–7:18.

2. Summary of Ehlers

Ehlers is entitled “Environmental Condition Control and Energy Management System and Method” and is directed “to a system that controls internal environmental conditions to optimize comfort and minimize energy consumption and/or energy cost, based on user-defined parameters.”

Ex. 1008, code (54), 1:11–14. Ehlers teaches, *inter alia*, receiving and using weather information to predict heating and cooling times for a building. *Id.* at 2:52–65, 9:49–63, 35:13–28. Ehlers further teaches minimizing energy consumption—and thus energy costs—by using energy ramping when setpoints changes are made that would require operating the HVAC system. *Id.* at 19:27–20:3.

⁸ The period t_3 – t_4 is sometimes called a recovery period. Pet. 19–20. The recovery period refers to a period of time in which the setback is reversed. *Id.* at 9.

3. *Analysis of Claim 1*

a) “*Determining a First Time Prior to Said Target Time. . .*”

Claim 1 recites:

[1h] *acquiring at least a first internal temperature* inside said structure at a third time prior to said target time;

. . . .

[1m] *determining a first time prior to said target time* at which said climate control system should turn on to reach the target temperature by the target time *based at least in part on* [i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, [iii] *said first internal temperature*, [iv] said first external temperature, and [v] the forecasted temperature.

Ex. 1001, 9:34–54 (emphases added). This limitation focuses on the acquisition and use of a “first internal temperature” in determining a first time prior to said target time.

(1) *Petitioner’s Arguments*

Petitioner argues that Wedekind teaches “acquiring . . . a first internal temperature” and then “determining a first time prior to said target time . . . based at last in part on . . . said first internal temperature.” See Pet. 42, 52–54.

Specifically, Petitioner argues that Wedekind teaches the “continuous measurement of various air temperatures.” Pet. 42 (quoting Ex. 1006, code (57)). According to Petitioner, “[a]mong these temperatures are the **internal temperature inside the structure.**” *Id.* (citing Ex. 1006, 3:59–62, 4:38–5:1, 7:41–68, 17:53–63, Fig. 3; Ex. 1002 ¶ 97). Petitioner also argues that “[t]he continuous measurement of temperatures includes measurement of a first a [sic] **internal temperature inside said structure** at or before time t_3 in Fig. 2, which is the **third time prior to said target time.**” *Id.*; see also

Pet. Reply 19 (arguing that “the ‘first internal temperature’ at a ‘third time’ is met by Wedekind’s continual collection of inside temperatures.”).

Petitioner further argues that because the first internal temperature is used to determine the performance value of said structure,⁹ Wedekind determines the “first time prior to said target time” based on the first internal temperature:

Furthermore, in predicting t_3 , the **thermal performance values of said structure** (as explained under element [1k]) and **characteristic of said climate control system** (as explained above under element [1l]) are used in the non-linear efficiency model. (Ex. 1006, 19:50-20:2)(Ex. 1002, ¶120). The **thermal performance values of said structure** (as explained under element [1d]) are based on the **first internal temperature and the first external temperature**. Thus, the determining of the time t_3 is **based at least in part on all five factors [i] – [v]** above. (Ex. 1002, ¶120).

Pet. 54.

Petitioner further argues that that the first internal temperature does not have to be used directly to calculate the start time. Pet. Reply 20–21. Specifically, Petitioner argues that “claim 1 only requires that start time and intervals be ‘*based at least in part on*’ the ‘first internal temperature’, not that they must be ‘directly calculated from’ the ‘first internal temperature.’” *Id.* at 21. Petitioner also argues that “[t]here is no negative limitation that would prevent the ‘first temperature’ ‘acquired at a third time’ from having also been used in the calculation of thermal performance values.” *Id.*

⁹ Petitioner maps the “[a]verage energy rate, E_s , delivered to the conditioned space during a typical climate control system cycle,” the “[n]on-linear climate control efficiency” (η_s), and the “[i]nput energy rate of the climate control system” (E_g) to the thermal parameters of the climate control system. Pet. 51 (discussing limitation [1k]).

Petitioner further argues that even if Wedekind uses the setpoint instead of a measured temperature, that still would satisfy the claim limitation. Pet. Reply 20. Specifically, Petitioner argues that a setpoint “is a good estimate for the temperature (Ex. 1014, 19:23–21:3), and the claims do not require a *measured* ‘first internal temperature’, merely one that is ‘acquired.’” *Id.* Petitioner also argues that using a setpoint is consistent with the ’753 patent, which “works in exactly the same way, namely by using a ‘predicted initial temperature PT’ as the temperature at the beginning of the recovery period.” *Id.* (citing Ex. 1001, 6:17–22; Ex. 1014, 55:25–58:4).

(2) Patent Owner’s Arguments

Patent Owner argues Wedekind does not teach “determining a first time” based, at least in part, on a “first internal temperature” as recited in claim 1. PO Resp. 22–30; PO Sur-reply 19–22.

Patent Owner argues that “Wedekind does not acquire a **‘first internal temperature’** at a **‘third time’** that is used to determine the start time of a recovery period, and instead it bases the computation on the setback temperature setpoint T_i .” PO Resp. 23 (citing Ex. 1006, 19:59–64); *see also* PO Sur-reply 8–9. Patent Owner also argues that “the Petition itself never argued that ‘acquiring’ an internal temperature measurement at a third time should be construed to mean obtaining a temperature setpoint that is scheduled to occur instead of acquiring new temperature measurements.” PO Sur-reply 9.

Patent Owner further argues that the claim requires an internal temperature separate from any of the historical internal temperatures used to determine the thermal performance value or performance characteristics. PO Resp. 30–37. According to Patent Owner, a person having ordinary skill

in the art “would understand that the ‘**first internal temperature**’ at a ‘**third time**’ must be different from one of the ‘**historic**’ **indoor temperatures** from a ‘**first and second time**’ used to determine thermal performance values for element [1c] and [1d].” *Id.* at 31 (citing Ex. 2002 ¶ 79); *see also id.* at 31–32 (arguing Petitioner improperly “assert[s] that the ‘**historic internal temperatures**’ used to calculate the ‘**thermal performance values**’ can also qualify as the ‘**first internal temperature**’ that is acquired at a ‘**third time**.’”). Patent Owner further argues that Petitioner “never assert[ed] or reference[d] a disclosure in Wedekind for calculating the recovery time t_r or the time to commence the recovery t_3 using a newly acquired indoor air temperature separately from using the thermal performance values of element [1d].” *Id.* at 33–34.

Patent Owner further argues that Petitioner’s argument that the ’753 patent using the setpoint temperature instead of a measured temperature is wrong. PO Sur-reply 10. According to Patent Owner, the ’753 patent “describe[s] an embodiment where actual temperature is used that is consistent with claim 1.” *Id.* (citing Ex. 1001, 8:58–64).

Patent Owner further argues that “Wedekind’s model predicts that the temperature will need to change from the setback temperature setpoint T_i to the occupancy comfort setpoint T_f without acquiring a new indoor air temperature at or immediately before the start of the recovery period at time t_3 .” PO Resp. 23 (citing Ex. 1006, 7:19–30. Ex. 2002 ¶ 63). That is, according to Patent Owner, Wedekind does not teach using a “newly acquired” temperature measurement. *Id.* at 23–26. Patent Owner also argues that it would not have been obvious to modify Wedekind to use a newly acquired internal temperature measurement. *Id.* at 27–30.

(3) *Our Analysis*

We begin by addressing an argument Petitioner first made in the Reply: that the first internal temperature is acquired using the setpoint. *See* Pet. Reply 20. The Consolidated Trial Practice Guide states that a “Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g. to make out a prima facie case of unpatentability.” Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019)¹⁰ 73. Although “a reply . . . may . . . respond to arguments raised in the preceding brief,” “[r]espond . . . does not mean proceed in a new direction with a new approach as compared to the positions taken in a prior filing.” *Id.* at 74. As discussed below, we find Petitioner improperly shifted its position in the Reply by advocating a new approach.

In the Petition, Petitioner argues that Wedekind teaches “acquiring at least a first internal temperature inside said structure at a third time prior to said target time” by the “continuous measurement of various air temperatures” including the internal temperature inside the structure. Pet. 42 (quoting Ex. 1006, code (57) and citing Ex. 1002 ¶ 97). According to Petitioner, “[t]he continuous measurement of temperatures includes measurement of a first **a [sic] internal temperature inside said structure** at or before time t3 in Fig. 2, which is the **third time prior to said target time.**” *Id.* (citing Ex. 1002 ¶ 98). Petitioner argues that “[e]ven during times of steady-state temperature, the temperature is being continuously measured to check against the current temperature setpoint.” *Id.* Nowhere does Petitioner mention acquiring a temperature by using the setpoint

¹⁰ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

temperature as opposed to a measured temperature. *See* Pet.; PO Sur-reply 9.

In its Reply, Petitioner alternatively argues that the claim limitation is satisfied even if Wedekind uses the setback/setpoint¹¹ temperature:

Even Wedekind's parameter T_i , however, would still meet the claim language. EcoFactor principally argues that T_i is not a measured temperature, but rather just a setpoint. A setpoint, according to EcoFactor, is at best a "predict[ion] [of] air temperature at or before time t_3 ". To this there are three responses. First, EcoFactor simply assumes that the "setback temperature" is a setpoint, but Wedekind refers to it in the relevant passage as "the setback **temperature** which exists at time, t_3 ". (Ex. 1006, 19:61)(Emphasis added). The phrase "setback temperature setpoint", as used by EcoFactor, does not actually occur in Wedekind. Second, even if the setback temperature were a setpoint, the setpoint is a good estimate for the temperature (Ex. 1014, 19:23-21:3), and the claims do not require a *measured* "first internal temperature", merely one that is "acquired". Finally, even if the setback temperature of Wedekind were a predicted temperature, the '753 patent works in exactly the same way, namely by using a "predicted initial temperature PT" as the temperature at the beginning of the recovery period. (Ex. 1001, 6:17-22)(Ex. 1014, 55:25-58:4). Thus, even if EcoFactor had made an express claim construction argument, the "first internal temperature" would not have been construed to exclude predicted temperatures.

Pet. Reply. 20 (underlining added, other emphasis in original). That is, Petitioner argues that the setpoint temperature is an acquired first internal temperature. *Id.* Petitioner had not mapped the setpoint temperature to the acquired first internal temperature in the Petition. *See* Pet. 42. Because Petitioner shifted from a measured temperature to using the stored setpoint temperature, under the facts of this case Petitioner changed its theory in the

¹¹ A setback temperature is a specific type of setpoint temperature. Pet. 8.

Reply. Accordingly, we do not consider Petitioner's new argument that using the setpoint temperature satisfies this claim limitation.

We now turn to the substance of Petitioner's argument and Patent Owner's opposition. We agree with Petitioner, to an extent. Specifically, we agree with Petitioner that there is no requirement that the first internal temperature must be used to directly determine the "first time prior to said target time." See Pet. Reply 20–21. Claim 1 simply recites that that "first time prior to said target time" is "based at least in part" on a number of inputs including the "first internal temperature. Ex. 1001, 47–54. Claim 1 is similar to a black box which simply recites what inputs must be used, not how they are used. *Id.*; see also Tr. 52:5–53:12 (Patent Owner's counsel agreeing that the determining step does not recite how the inputs are used). Because claim 1 does not recite that the inputs are used directly, we agree with Petitioner that the inputs can be used indirectly.

We also agree with Petitioner that there is no requirement that the first internal temperature be newly acquired. Claim 1 recites at least seven distinct times: a first time (for the measurement of historical temperatures), a second time (also for the measurement of historical temperatures), a third time (for the measurement of the first internal and external temperatures), a target time (the time the structure should reach a given temperature), a first time prior to said target time (the time the climate control system should turn on), and a plurality of intermediate setpoint target times¹² (used for ramping with intermediate setpoints). Ex. 1001, 9:9–10:3. However, the claims

¹² The plurality of intermediate setpoint target times requires at least two times. The analysis does not turn on the number of intermediate setpoint target times.

impose very few restrictions on when those times are. For example, because claim 1 recites using a plurality of historical temperatures, the first time and the second time—when the historical temperatures are taken—must be different. *See id.* at 9:17–29. Likewise, based on the language of the claims, the plurality of intermediate setpoint target times must fall between the first time prior to the target time and the target time. *See id.* at 9:55–61.

Claim 1 recites only a single limitation on the third time: because the first internal and external temperatures (which are acquired at the third time) are used to determine the “first time prior said target time,” the only requirement is that the third time is some time before the “first time prior said target time.” *See* Ex. 1001, 9:9–10:3. Nothing in the language of claim 1 requires that the third time be “newly acquired” or immediately before the “first time prior said target time.” *See id.*

But it is there that our agreement with Petitioner ends. The “determining a first time prior to said target time” limitation recites five distinct inputs upon which the time is based at least in part: “[i] said one or more thermal performance values of said structure, [ii] said performance characteristic of said climate control system, [iii] said first internal temperature, [iv] said first external temperature, and [v] the forecasted temperature.” By setting forth five inputs, claim 1 requires that each of those inputs be a distinct component of the calculation of the “first time prior to said target time.”

“Where a claim lists elements separately, ‘the clear implication of the claim language’ is that those elements are ‘distinct component[s]’ of the patented invention.” *Becton Dickinson & Co. v. Tyco Healthcare Group, LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) (quoting *Gaus v. Conair Corp.*, 363 F.3d 1284, 1288 (Fed. Cir. 2004); *Engel Indus., Inc. v. Lockformer Co.*,

96 F.3d 1398, 1404–05 (Fed. Cir. 1996) (concluding that where a claim provides for two separate elements, a “second portion” and a “return portion,” these two elements “logically cannot be one and the same”). There is nothing in the asserted claims to suggest that one piece of data can be used to satisfy multiple inputs. *See CAE Screenplates, Inc. v. Heinrich Fiedler GmbH & Co.*, 224 F.3d 1308, 1317 (Fed. Cir. 2000) (“In the absence of any evidence to the contrary, we must presume that the use of . . . different terms in the claims connotes different meanings.”).

However, Petitioner’s theory does not use each of the five distinct inputs. According to Petitioner, Wedekind bases t_3 —which Petitioner maps to the first time prior to said target time—on the first internal temperature because the first internal temperature is used to determine the thermal performance values of said structure. Pet. 54 (“Furthermore, in predicting t_3 , the **thermal performance values of said structure** (as explained under element [1k]) and **characteristic of said climate control system** (as explained above under element [1l]) are used in the non-linear efficiency model. (Ex. 1006, 19:50-20:2)(Ex. 1002, ¶120). The **thermal performance values of said structure** (as explained under element [1d]) are based on the **first internal temperature and the first external temperature.**”); *see also* Tr. 21:13–22:17 (Petitioner conceding that it is “using the first internal temperature because it’s used to create -- determine the thermal performance value”). Doing so effectively ignores a claim limitation by double counting the “one or more thermal performance values of said structure.” That is, Petitioner uses the “one or more thermal performance values of said structure” to satisfy both inputs [i] and [iii]. Although, as discussed above, claim 1 allows the indirect use of an input, it still must be used distinctly

from the other listed input. Petitioner's theory does not do that. *See* Pet. 54; Tr. 21:13–22:17.

Accordingly, Petitioner has not shown, based on the theory set forth in the Petition, that Wedekind teaches the disputed limitation.¹³

b) Conclusion

Because Petitioner has not shown that one of the limitations was taught by the prior art, we conclude that Petitioner has failed to show by preponderance of the evidence that claim 1 would have been obvious to a person having ordinary skill in the art.

4. Analysis of Claims 2–8

Petitioner contends that the combination of Wedekind and Ehlers would have rendered the subject matter of claims 2–8 obvious to one of ordinary skill in the art. Pet. 61–65. Claims 2–8 depend from claim 1 and, therefore, recites the “determining a first time prior to said target time . . .” limitation. Accordingly, for the same reasons discussed with respect to claim 1, Petitioner's analysis of these claims suffers from the same deficiency and Petitioner has failed to show by preponderance of the

¹³ Petitioner also states that Ehlers teaches the limitation. Pet. 54. The entirety of Petitioner's statement follows: “Ehlers also teaches this limitation. (Ex. 1008, 29:23-36, 39:44-51, 19:39-40, 37:25-27. 11:53-63, 32:66-33:13, 36:27-38).” *Id.* Because Petitioner simply states Ehlers teaches the limitation and supplies a string citation without any explanation or supporting testimony, we do not consider Petitioner's statement regarding Ehlers adequately explained or supported. *See DeSilva v. DiLeonardi*, 181 F.3d 865, 867 (7th Cir. 1999) (“[A] brief must make all arguments accessible to the judges, rather than ask them to play archaeologist with the record.”). Despite being warned in the Institution Decision that we would not consider such conclusory arguments (Inst. Dec. 16–17 n.10), Petitioner did not argue in its Reply that we should consider it or provide any additional evidence or argument (*see* Pet. Reply).

evidence that claims 2–8 would have been obvious to a person having ordinary skill in the art.

5. *Analysis of claims 9–20.*

Independent claims 9 and 15 each recite similar limitations which recited substantially the same step as the “acquiring at least a first internal temperature . . .” and the “determining a first time prior to said target time . . .” limitations recited in claim 1. Claim 9 recites

[9h] *acquiring a first internal temperature inside said structure at a third time* prior to said target time . . .

. . . .

[9m] *calculating at least a first setpoint and a second setpoint* that occur between the first time and the target time, *wherein the first and second setpoints direct a thermostatic controller to change the actual temperature* inside the structure to the target temperature in a series of intermediate steps *based at least in part on* said one or more thermal performance values of said structure, said at least one performance characteristic of the climate control system, *said first internal temperature* and said first external temperature, and the forecasted temperature. . . .

Ex. 1001, 10:22–11:16 (emphases added). Similarly, claim 15 recites

[15h] *acquiring a first internal temperature inside said structure at a third time* prior to said target time . . .

. . . .

[15m] *calculating at least a first setpoint and a second setpoint* that occur between the first time and the target time, *wherein the first and second setpoints direct a thermostatic controller to change the actual temperature* inside the structure to the target temperature in a series of intermediate steps *based at least in part on* said one or more thermal performance values of said structure, said at least one performance characteristic of the climate control system, *said first internal temperature* and

said first external temperature, and the forecasted temperature. . . .

Ex. 1001, 11:30–12:39 (emphases added).

Claims 10–14 depend from claim 9 and claims 16–20 depend from claim 15. *See* Ex. 1001, 11:17–29, 12:40–52.

As with claim 1, both independent claims 8 and 15 require acquiring a first internal temperature and using that first internal temperature to determine intermediate setpoints.¹⁴ For those limitation, Petitioner refers back to its analysis of claim 1. Pet. 66–68 (claim 9 analysis referring back to claim 1), 72 (“Claim 15 has a scope similar to that of claim 9, with a few minor differences, and was obvious for largely the same reasons as claim 9.”). Accordingly, for the same reasons discussed above with respect to claim 1, Petitioner’s analysis of independent claims 9 and 15, along with dependent claims 10–14 and 16–20 suffers from the same deficiency and Petitioner has failed to show by preponderance of the evidence that claims 9–20 would have been obvious to a person having ordinary skill in the art.

E. Petitioner’s Motion to Exclude the Testimony of Dr. Palmer

Petitioner argues that we should give more weight to its expert’s opinions than those of Patent Owner’s expert on issues such as whether there was a motivation to combine Edekind and Wehlers and whether there would have been a reasonable expectation of success, because Petitioner’s expert

¹⁴ Unlike claim 1, which requires an indeterminate plurality of setpoints, claims 9 and 15 recite calculating two intermediate setpoints. Petitioner states that “[t]his difference is not believed to be material, because a “plurality” would include at least first and second setpoints.” Pet. 68.

has more relevant experience. Pet. Reply 4–5; Pet. Supp. Br. 4–5. Petitioner further moves¹⁵ to exclude Dr. Palmer’s testimony. Pet. Supp. Br. 5.

As our analysis does not rely on Dr. Palmer’s testimony, we dismiss Petitioner’s motion as moot.

CONCLUSION

For the foregoing reasons, we conclude that Petitioner has not demonstrated by a preponderance of the evidence the unpatentability of claims 1–20 of the ’753 patent. Specifically, Petitioner has not demonstrated by a preponderance of the evidence that claims 1–20 would have been obvious under 35 U.S.C. § 103(a) in view of Wedekind and Ehlers.

ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has not shown by a preponderance of the evidence that claims 1–20 of the ’753 patent are unpatentable;

FURTHER ORDERED that Petitioner’s motion to exclude the testimony of Dr. Palmer is *dismissed as moot*; and

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,

¹⁵ Although not styled as a motion to exclude, we treat Petitioner’s request as a motion. See 37 C.F.R. §§ 42.20(a) (“Relief, other than a petition requesting the institution of a trial, must be requested in the form of a motion.”), 42.64(c) (motion to exclude).

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–20	103(a)	Wedekind, Ehlers		1–20

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