

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORPORATION,
Petitioner,

v.

GENERAL ELECTRIC COMPANY,
Patent Owner.

IPR2019-00014
Patent 8,118,237 B2

Before MICHAEL W. KIM, LYNNE H. BROWNE, and
AMANDA F. WIEKER, *Administrative Patent Judges*.

WIEKER, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Toyota Motor Corporation (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–23 (“the challenged claims”) of U.S. Patent No. 8,118,237 B2 (Ex. 1001, “the ’237 patent”). Paper 2 (“Pet.”). General Electric Company (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). We instituted an *inter partes* review of challenged claims 1–23 on all grounds of unpatentability, pursuant to 35 U.S.C. § 314. Paper 7 (“Dec. on Inst.”).

After institution, Patent Owner filed a Response (Paper 14, “PO Resp.”), Petitioner filed a Reply (Paper 18, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 29, “PO Sur-reply”). An oral hearing was held on January 22, 2020, and a transcript of the hearing is included in the record. Paper 32 (“Tr.”).

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. This Final Written Decision is issued concurrently with a Final Written Decision for IPR2019-00012, which also challenges the patentability of claims 1–23 of the ’237 patent. For the reasons set forth below, Petitioner has met its burden of showing, by a preponderance of the evidence, that challenged claims 1–10, 12, 22, and 23 of the ’237 patent are unpatentable, but has not met its burden of showing that challenged claims 11 and 13–21 are unpatentable.

B. Related Proceedings

The parties represent that there are no related litigation matters involving the ’237 patent. Pet. 4; Paper 4, 1.

Petitioner filed concurrently a petition in IPR2019-00012, also regarding the '237 patent. Paper 4, 1.

C. The '237 Patent

The '237 patent is titled “System and Method for Vehicle Temperature Control,” and issued on February 21, 2012, from U.S. Patent Application No. 12/371,675, filed February 16, 2009. Ex. 1001, codes (21), (22), (45), (54).

The '237 patent explains that the battery of an electric or plug-in hybrid vehicle typically is re-charged by connecting the vehicle to an electrical power grid when the vehicle is not in use, e.g., overnight. *Id.* at 1:22–28. During subsequent use, when disconnected from the power grid, heating or cooling of the vehicle cabin drains the vehicle’s battery and “reduces the range of the vehicle and/or the power available for traction in the electric motor.” *Id.* at 1:32–39. To avoid this problem, the '237 patent discloses pre-heating or pre-cooling the vehicle cabin by drawing power from the electrical power grid when the vehicle is not in use. *Id.* at 1:42–62, Abstr.

To this end, the '237 patent discloses electric or plug-in hybrid vehicle 10, with energy storage system 18 (e.g., battery), power connector 14 for connecting to electrical power grid receptacle 16, and temperature control system 12. *Id.* at 3:17–29, Fig. 1. Temperature control system 12 includes control loop 22, controller 24, heating and cooling system 26, internal cabin temperature sensor 28, and external ambient temperature sensor 30. *Id.* at 3:57–4:14, Fig. 1. “As the temperature control system 12 uses grid power from the electrical power grid . . . , no power is

drawn from on-board energy storage system 18 to run the temperature control system 12.” *Id.* at 3:45–49.

In operation, and when connected to the electrical power grid for re-charging of energy storage system 18, controller 24 receives a plurality of input signals, specifically, first input signal 32, reflecting the desired time for vehicle start-up;¹ second input signal 34, reflecting both the desired vehicle cabin temperature and the actual cabin temperature (measured by sensor 28); and, optionally, third input signal 36, reflecting the actual ambient temperature outside the vehicle (measured by sensor 30). *Id.* at 4:17–26, 4:31–33, 4:65–5:10, 5:28–32, 6:27–33, Fig. 2. Controller 24 uses these inputs “to determine an optimal time at which temperature control loop 22 is to be activated prior to the desired time for start-up and use of the vehicle 10,” which is a period of time sufficient to pre-heat or pre-cool the vehicle before use. *Id.* at 5:11–15; *see also id.* at 4:26–30. At the determined activation time, controller 24 transmits an activation signal to temperature control loop 22, which activates heating/cooling system 26 to begin heating or cooling the vehicle. *Id.* at 5:44–49. Heating or cooling ends when either (1) the desired vehicle cabin temperature is reached, or (2) a predetermined period of time has passed after the designated vehicle start-up time (e.g., five minutes after the desired vehicle start-up time), if the vehicle has not been started. *Id.* at 5:52–6:3.

¹ The desired time may be input to programmable timer 33, provided by remote control 35, or generated by controller 24 based on a pattern of prior vehicle use (e.g., weekdays at 7:00 AM). *Id.* at 4:34–62.

D. Illustrative Claims

The '237 patent includes 23 claims, all of which are challenged. Claims 1, 13, 18, 22, and 23 are independent claims. Claims 1 and 13 are illustrative and are reproduced below.

1. A vehicle comprising:
 - a power connector configured to mate with an electrical power grid receptacle and receive a grid power therefrom;
 - a heating and cooling system electrically connected to the power connector to receive grid power therefrom and configured to modify a temperature in a cabin of the vehicle;
 - a temperature control loop configured to selectively activate and control the heating and cooling system; and
 - a controller configured to:
 - receive a first input signal comprising a desired vehicle activation time;
 - receive a second input signal comprising a starting vehicle cabin temperature and a desired vehicle cabin temperature;
 - determine a temperature control loop activation time based on the first and second input signals, the temperature control loop activation time being a time prior to the desired vehicle activation time;
 - transmit an activation signal to the temperature control loop at the temperature control loop activation time to activate the heating and cooling system;
 - determine if the vehicle is activated at the desired vehicle activation time or within a pre-determined time thereafter; and
 - if the vehicle is not activated at the desired vehicle activation time or within the pre-determined time thereafter, then transmit a deactivation signal to the temperature control loop to deactivate the heating and cooling system.

13. A method for controlled temperature modification comprising:

inputting a planned use for a vehicle into a temperature control system, the planned use comprising a future time at which the vehicle is started;

measuring a vehicle cabin temperature;

comparing the measured vehicle cabin temperature to a desired vehicle cabin temperature;

determining an activation time for the temperature control system based on the planned vehicle use, the measured vehicle cabin temperature, and the desired vehicle cabin temperature;

modifying the determined activation time based on a planned duration of vehicle use; and

activating the temperature control system at the determined activation time to modify the vehicle cabin temperature.

Ex. 1001, 9:22–52, 10:34–49.

E. Applied References

Petitioner relies upon the following references (Pet. 12):

Hirokazu et al., Japanese Laid-Open Patent Application No. 2007-269161, filed Mar. 31, 2006, published Oct. 18, 2007 (Ex. 1008,² “Hirokazu”);

Hotta et al., U.S. Patent No. 5,330,385, filed Dec. 1, 1992, issued July 19, 1994 (Ex. 1006, “Hotta”);

Gerard et al., U.S. Patent Application No. 2006/0080007 A1, filed Oct. 12, 2004, published Apr. 13, 2006 (Ex. 1009, “Gerard”); and

Heinle, U.S. Patent Application No. 2005/0109051 A1, filed Nov. 24, 2004, published May 26, 2005 (Ex. 1010, “Heinle”).

² We cite to the English translation, provided as Exhibit 1008. *See* Ex. 1008, 1 (certificate of translation). The original Japanese-language publication was filed as Exhibit 1007.

Petitioner submits the Declaration of Mahdi Shahbakhti, Ph.D. (Ex. 1003), the Supplemental Declaration of Mahdi Shahbakhti, Ph.D. (Ex. 1016), the Reply Declaration of Mahdi Shahbakhti, Ph.D. (Ex. 1018), and the October 24, 2019, deposition of Jay B. Ross (Ex. 1017).

Patent Owner submits the July 18, 2019, deposition of Mahdi Shahbakhti, Ph.D. (Ex. 2004), and the December 3, 2019, deposition of Mahdi Shahbakhti, Ph.D. (Ex. 2009).

F. Asserted Grounds of Unpatentability

We instituted an *inter partes* review based on the following grounds (Dec. on Inst. 7, 29):

Claim(s) Challenged	35 U.S.C. §³	Reference(s)/Basis
1–5, 7, 9, 10	103	Hotta
6, 11, 13–22	103	Hotta, Hirokazu
8	103	Hotta, Gerard
12, 23	103	Hotta, Heinle

II. DISCUSSION

A. Claim Construction

The Petition was filed October 31, 2018, prior to the effective date of the rule change that replaced the broadest reasonable interpretation standard. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg.

³ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the application from which the ’237 patent issued was filed before March 16, 2013, the effective date of the relevant amendment, the pre-AIA version of § 103 applies.

51,340 (Oct. 11, 2018). We, therefore, apply the broadest reasonable interpretation standard in this proceeding. As such, the claim terms of the '237 patent are given their broadest reasonable interpretation in light of the specification. 37 C.F.R. § 42.100(b) (2018). “Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history.” *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016).

We determine that no claim term requires express construction for purposes of this Decision. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))); see Pet. 13–14 (“Petitioner does not believe any limitations of the '237 patent require construction.”); PO Resp. 1 (“Patent Owner does not take a position on claim construction in this proceeding.”).

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103(a) if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of

nonobviousness.⁴ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must support its challenge by a preponderance of the evidence. 35 U.S.C. § 316(e) (2012); 37 C.F.R. § 42.1(d).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

Petitioner cites the testimony of Dr. Shahbakhti to support its contention that a person of ordinary skill in the art would have had “at least a bachelor’s degree in mechanical or controls engineering and 1–2 years [of] work experience with air-conditioning control engineering or equivalent graduate study,” and would “have taken classes or work experience in thermodynamics and control-system design” such that the ordinarily skilled

⁴ No objective evidence of nonobviousness has been introduced into the record in this proceeding.

artisan would have understood the “interplay between air temperature, heat transfer, and control systems at play in the air-conditioning systems described in the ’237 patent and the prior art.” Pet. 13 (citing Ex. 1003 ¶ 47; quoting Ex. 1003 ¶ 48).

“Patent Owner does not take a position” as to the appropriate level of skill in the art and instead, “[f]or purposes of this proceeding, Patent Owner adopts Dr. Shahbakhti’s definition.” PO Resp. 1–2.

We agree with and adopt Petitioner’s identification of the appropriate level of skill in the art, which is consistent with the level of ordinary skill in the art reflected in the prior art of record and the testimony of Dr. Shahbakhti. Ex. 1003 ¶¶ 47–48.

D. Obviousness over Hotta

Petitioner contends that claims 1–5, 7, 9, and 10 of the ’237 patent would have been obvious over Hotta. Pet. 15–36. Patent Owner disagrees. PO Resp. 2–8.

1. Overview of Hotta (Ex. 1006)

Hotta is titled “Air Conditioning System Suitable for Use in an Electric Vehicle,” which discloses a “pre-air con” system for “adjusting the temperature or humidity or the like in the [electric vehicle’s cabin] in advance by using an external power supply or the like before a driver or a passenger enters the vehicle.” Ex. 1006, code (54), 6:19–24, 14:52–54 (pre-air con occurs during charging). Hotta’s electric vehicle includes, *inter alia*, a cabin “room temperature sensor 56,” “an outside air or atmospheric temperature sensor 60,” and “a CPU 62.” *Id.* at 5:44–55, Fig. 2.

Hotta’s Figure 4 is reproduced below.

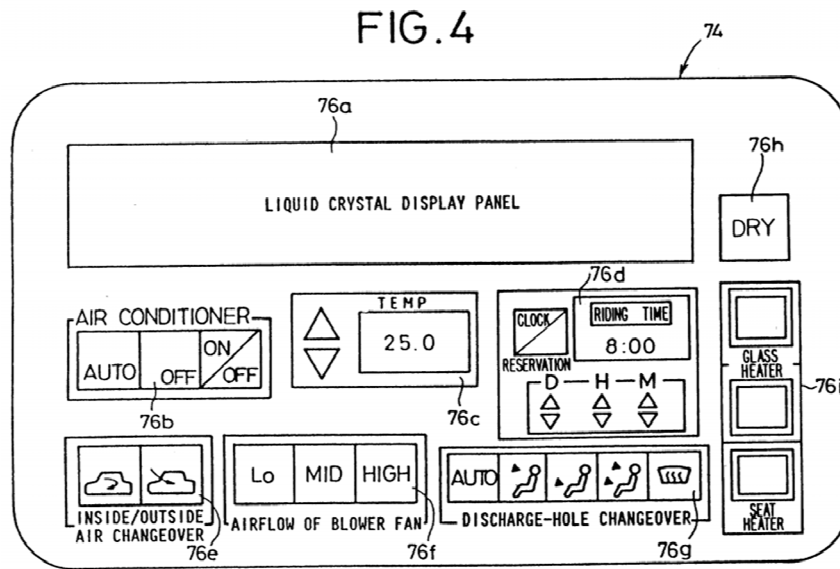


Figure 4 depicts a control panel for Hotta's electric vehicle. *Id.* at 3:3–4. As shown in Figure 4, Hotta discloses control switches 76b for controlling operation of an air conditioner, including a “pre-A/C switch [that] is used as an ON/OFF switch” for pre-air con. *Id.* at 6:13–24. Switch 76c is used to set the desired cabin temperature. *Id.* at 6:25–26. Section 76d displays the riding hour or time, wherein the expected start of the riding time can be changed by setting the desired date, hour, and minute. *Id.* at 7:33–41.

According to Hotta, pre-air conditioning normally occurs during a period of charging, e.g., overnight and when connected to external power. *Id.* at 14:52–63. Hotta explains that CPU 62 reads the expected driving time (set in 76d) and the desired cabin temperature (set in 76c). *Id.* at 15:21–34, Fig. 20 (S164). Next, the time at which charging of the battery will be completed is calculated. *Id.* at 15:65–16:13, Fig. 20 (S166–168). If the battery will be fully charged before the expected driving time (*id.* at Fig. 20 (S170)), the outputs of, *inter alia*, sensors 56, 60 will be read and the pre-air conditioning operation time will be set. *Id.* at 16:13–27, Fig. 3, Fig. 20 (S171–173), Fig. 25 (S345–356). CPU 62 then determines if the set time is

reached and, if so, CPU 62 effects pre-air conditioning. *Id.* at 16:31–68, Figs. 18–19. Hotta explains that pre-air conditioning will stop when the difference between the vehicle cabin temperature and the desired temperature is equal to, or less than, two degrees. *Id.* at 20:23–30.

2. Independent Claim 1

Petitioner contends that claim 1 would have been obvious over Hotta. Pet. 15–25; Pet. Reply 2–13. Patent Owner argues that Hotta does not disclose or suggest the claimed power connector, temperature control loop, or activation signal. PO Resp. 2–8; PO Sur-reply 1–5.

i. Claim 1: “A vehicle comprising”

Petitioner contends that Hotta teaches the subject matter of the preamble of claim 1. Pet. 15. Patent Owner does not dispute this position. PO Resp. 2–8. We are persuaded by Petitioner’s undisputed contention.⁵ Hotta discloses “an electric vehicle.” Ex. 1006, 1:7–8, Fig. 1.

ii. “a power connector configured to mate with an electrical power grid receptacle and receive a grid power therefrom”

Petitioner contends that Hotta teaches or suggests this limitation of claim 1. Pet. 15–16. Petitioner relies upon Hotta’s disclosure that its vehicle battery is charged “from an unillustrated external power supply.” *Id.* at 15 (quoting Ex. 1006, 4:57–61; citing Ex. 1006, 14:52–54). Petitioner contends,

“[W]hen an unillustrated charger is connected to the battery 48 ([Fig. 16,] Step S162), the charging of the battery 48 by the charger through the external power supply is initiated.” A “charging plug” is inserted to allow vehicle charging. The

⁵ We need not decide whether the claim preamble is limiting because Petitioner has shown that it is satisfied by the prior art.

charger would mate with an electric power grid receptacle to receive grid power.

Id. at 15–16 (citing Ex. 1006, 14:59–63, 17:63–68; Ex. 1003 ¶ 68).

Petitioner also relies upon Dr. Shahbakhti’s testimony that supplying grid power was well known and that “[i]t would be obvious for the charger to provide electricity via a ‘power connector configured to mate with an electrical power grid receptacle.’” *Id.* at 16 (citing Ex. 1003 ¶¶ 67–70).

Patent Owner disagrees. PO Resp. 2–3. Patent Owner argues that “Hotta’s charger is external to the vehicle . . . [and] therefore cannot be the recited power connector, because the claims require a ‘vehicle comprising . . . a power connector.’ Whether Hotta’s charger is configured to mate with an electrical power grid receptacle is therefore irrelevant.” PO Resp. 2–3.

In its Reply, Petitioner argues that “nothing in the ’237 patent or the claims or specification requires that the power connector be permanently connected to the vehicle [T]he vehicle components must simply receive grid power, regardless of whether it is through a permanent or removable connector.” *Id.* at 5. Thus, according to Petitioner, “[d]uring charging, Hotta’s charger is part of the vehicle” and performs the claimed functions. *Id.* at 6 (citing Ex. 1006, 14:59–63).

In its Sur-reply, Patent Owner argues that Dr. Shahbakhti testified at his deposition that Hotta’s system determines whether the charger is connected to the vehicle, which demonstrates that the charger is not part of the vehicle. PO Sur-reply 1 (citing Ex. 2004, 35:18–36:1). According to

Patent Owner, it is inconsistent for Petitioner now to argue that the charger is part of the vehicle during vehicle charging. *Id.* at 2.⁶

We have considered the parties' arguments and cited evidence, and we are persuaded by Petitioner's contentions. In its Response and Sur-Reply, Patent Owner does not dispute that Hotta's external power supply includes an electrical power grid receptacle. *See generally* PO Resp. 2–3 (asserting only that it is “irrelevant”); PO Sur-reply 1–2; Ex. 1006, 4:58–61. Rather, Patent Owner's sole dispute is that Hotta's “unillustrated charger” (Ex. 1006, 14:60–63) is not the claimed power connector because it is external to the vehicle and must be “connected” to the vehicle prior to charging (*id.*; *see also id.* at 17:63–63 (querying whether a “charging plug is in an inserted state”), Fig. 16 (S162, “is charger connected”)). We do not agree with this argument.

Although claim 1 recites “[a] vehicle comprising a power connector,” Patent Owner does not provide persuasive argument or evidence to demonstrate that this language requires a permanent and non-removable connection or attachment between the vehicle and the power connector. Patent Owner offers no persuasive evidence—whether in the form of declarant testimony, intrinsic evidence, or other extrinsic evidence—to support this position or to rebut Dr. Shabahkti's testimony that “[a] person of ordinary skill in the art would understand [Hotta's] charger would mate with

⁶ Patent Owner also argues that the Reply presents an improper new argument, in arguing that Hotta's charger meets the claimed “electrical power grid receptacle.” PO Resp. 2; Pet. Reply 7. Because we do not rely on this contention, Patent Owner's argument is moot.

an electric power grid receptacle to receive grid power.” PO Resp. 2–3;⁷ Ex. 1003 ¶ 68 (also noting that the charger must be connected to the battery for charging to be initiated). Patent Owner offers only attorney argument.

“In the patent claim context, the term ‘comprising’ is well understood to mean ‘including but not limited to.’” *CIAS, Inc. v. Alliance Gaming Corp.*, 504 F.3d 1356, 1360 (Fed. Cir. 2007); *Genentech, Inc. v. Chiron Corp.*, 112 F.3d 495, 501 (Fed. Cir. 1997) (“‘Comprising’ . . . means that the named elements are essential, but other elements may be added.”). Hotta’s vehicle includes an “unillustrated charger,” and when that charger is “connected to the battery 48, the charging of the battery 48 by the charger through the external power supply is initiated.” Ex. 1006, 14:60–63. As such, we are persuaded that Hotta’s charger is a power connector that mates with an electrical power grid receptacle to receive grid power. Ex. 1003 ¶¶ 67–70. That this power connector may be disconnected from the vehicle demonstrates only that it is removable; it does not show that the vehicle *lacks* a power connector altogether. Additionally, Petitioner asserts, and we agree, that Hotta at least suggests that such a power connector would have been obvious to a person of ordinary skill in the art. *See, e.g.*, Ex. 1003 ¶¶ 67–70; Inst. Dec. 12–14.

For the foregoing reasons, we are persuaded by Petitioner’s contentions that Hotta teaches or suggests this limitation of claim 1.

⁷ Patent Owner cites the deposition Dr. Shahbakhti, in which he confirmed that Step 162 of Hotta’s Figure 16 “ask[s], ‘is charger connected.’” *Id.* at 2 (citing Ex. 2004, 35:18–36:1). However, this testimony merely repeats the express language shown in Hotta’s Figure 16, and does not address whether the claim requires a permanent attachment, as argued.

iii. *“a heating and cooling system electrically connected to the power connector to receive grid power therefrom and configured to modify a temperature in a cabin of the vehicle”*

Petitioner contends that Hotta teaches this limitation of claim 1.

Pet. 16–17. Patent Owner does not dispute this position. PO Resp. 2–8. We are persuaded by Petitioner’s undisputed contention. Hotta discloses that the temperature and/or humidity of the vehicle cabin may be adjusted while the vehicle battery is being charged. Ex. 1006, 6:19–24, 14:52–54; *see also* Ex. 1003 ¶¶ 72–74 (explaining the same).

iv. *“a temperature control loop configured to selectively activate and control the heating and cooling system”*

Petitioner contends that Hotta teaches or suggests this limitation of claim 1. Pet. 17. According to Petitioner, Hotta’s CPU activates and controls the heating and cooling system’s valves, compressor, damper, blower fan, and seat heaters, to effect air conditioning. *Id.* (citing Ex. 1006, 16:59–68, Fig. 19). Relying upon Dr. Shahbakhti’s testimony, Petitioner contends that an ordinarily skilled artisan would have understood that Hotta’s system “include[s] a temperature control loop (software within Hotta’s CPU) that causes the temperature to reach a target temperature.” *Id.* (quoting Ex. 1003 ¶¶ 33–35, 75–77).

Patent Owner disputes Petitioner’s position. PO Resp. 3–5. Patent Owner argues that “Petitioner does not explain, however, *why* such a vehicle air-conditioning system necessarily includes a temperature control loop and that nothing else would work in its place.” *Id.* at 3–4. Patent Owner also argues that Dr. Shahbakhti provides only conclusory testimony that fails to explain *why* a temperature control loop necessarily exists in every vehicle with automatic temperature control. *Id.* at 4–5 (also arguing that it is not

Patent Owner's burden to disprove Petitioner's conclusory assertions); *see also* PO Sur-reply 3–4 (asserting the same).

We have considered the parties' arguments and cited evidence, and we are persuaded by Petitioner's contentions. Patent Owner does not dispute that the functional aspects of this limitation are taught by Hotta, namely, that Hotta's system activates and controls the heating and cooling system. This is consistent with Hotta's disclosure that during "pre-air con," the "temperature and the humidity or the like inside the vehicle room are controlled . . . to thereby set or prepare comfortable room circumstances when the driver rides in his/her vehicle," and that this is achieved by controlling vehicle hardware, such as valves, a compressor, a damper, a blower fan, and glass and seat heaters. Ex. 1006, 14:52–58, 16:57–68, Fig. 19. Rather, the parties' dispute involves whether this function is accomplished by a "temperature control loop."

Although Hotta does not utilize the exact terminology of a temperature control loop, we credit Dr. Shahbakhti's *undisputed* testimony that a person of ordinary skill in the art would have understood that such a loop is necessarily present in Hotta, i.e., it is inherent. Ex. 1003 ¶¶ 75–76. Dr. Shahbakhti explains that temperature control loops were well known and commonly installed before 2009. *Id.* ¶ 33. Dr. Shahbakhti supports this opinion with a 2004 textbook that describes an exemplary "simple closed loop feedback system" for heating and cooling, in which a controller compares current, measured temperatures (from sensors) to a desired cabin temperature (from a temperature control switch), to appropriately heat or cool the vehicle. *Id.* (citing Ex. 1012, 358). Dr. Shahbakhti also explains that a person of ordinary skill in the art would have understood that "any

vehicle air-conditioning system with an automatic temperature-control option *necessarily includes* a temperature control loop” to “selectively activate[] the heating and cooling system components to a desired target temperature.” *Id.* (emphasis added; citing Ex. 1012, 358).

It is with this supporting background that Dr. Shahbakhti testifies that “a person of ordinary skill in the art would understand Hotta to include ‘a temperature control loop’” and “control software (and possibly hardware or firmware) to turn these [vehicle air conditioning] components on and off to reach a desired set temperature.” *Id.* ¶¶ 75–76. Patent Owner does not present declarant testimony to dispute *any* of these positions.

Accordingly, we do not agree with Patent Owner’s criticism that Petitioner and Dr. Shahbakhti fail to explain *why* a temperature control loop necessarily exists. PO Resp. 3–5. Dr. Shahbakhti testifies that Hotta must include a temperature control loop, as do all vehicles with automatic air conditioning capability, in order to bring the vehicle cabin “to a desired set temperature.” Ex. 1003 ¶¶ 75–76; *see also id.* ¶ 33 (similar opinion). In other words, Dr. Shahbakhti testifies that this feature is inherent, in order to achieve the desired cabin temperature. *Cont’l Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991) (“[The] evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.”). Dr. Shahbakhti supports this un rebutted testimony with consistent extrinsic evidence. Ex. 1003 ¶ 33 (citing Ex. 1012, 358).⁸ Patent Owner does not present *any* evidence to dispute this

⁸ Insofar as Patent Owner is asserting that the extrinsic evidence itself does not support an inherency finding, the assertion is irrelevant. The inherency

testimony or to suggest that cabin air temperature is brought to the desired temperature in any other manner. Additionally, Petitioner asserts, and we agree, that Hotta at least suggests that such a temperature control loop would have been obvious to a person of ordinary skill in the art. *See, e.g.*, Ex. 1003 ¶¶ 33–35, 75–77, 97–98; Ex. 1012, 358; Dec. on Inst. 15.

For the foregoing reasons, we are persuaded by Petitioner’s contentions, supported by the unrebutted testimony of Dr. Shahbakhti, that Hotta teaches or suggests this limitation of claim 1.

- v. *“a controller configured to: receive a first input signal comprising a desired vehicle activation time”*

Petitioner contends that Hotta teaches this limitation of claim 1. Pet. 17–19. Patent Owner does not dispute this position. PO Resp. 2–8. We are persuaded by Petitioner’s undisputed contention. Hotta discloses that CPU 62 receives the “expected start of the riding time,” which is input into display section 76d, by date, hour, and minute. Ex. 1006, 6:32–41, 15:21–34, Figs. 3–4, Fig. 16 (S164); *see also* Ex. 1003 ¶¶ 78–82 (asserting the same).

- vi. *“a controller configured to: . . . receive a second input signal comprising a starting vehicle cabin temperature and a desired vehicle cabin temperature”*

Petitioner contends that Hotta teaches this limitation of claim 1. Pet. 19–21. Patent Owner does not dispute this position. PO Resp. 2–8. We are persuaded by Petitioner’s undisputed contention. Hotta discloses that the

finding is based on Dr. Shahbakhti’s unrebutted testimony. The extrinsic evidence is offered as evidentiary support consistent with, but not identical to, that testimony. Although extrinsic evidence identical in scope to the testimony is generally the most persuasive, identity of scope is not required in order to find the testimony credible and adequately supported.

CPU receives a starting cabin temperature, detected by room temperature sensor 56, and receives a desired cabin temperature, input by switch 76c. Ex. 1006, 5:44–55, 15:21–32, (sensor 56), Figs. 3 (CPU 62), 4 (switch 76c), 16 (S171); Ex. 1003 ¶¶ 83–88 (asserting the same).

vii. *“a controller configured to: . . . determine a temperature control loop activation time based on the first and second input signals, the temperature control loop activation time being a time prior to the desired vehicle activation time”*

Petitioner contends that Hotta teaches this limitation of claim 1. Pet. 21–22. Patent Owner does not dispute this position. PO Resp. 2–8. We are persuaded by Petitioner’s undisputed contention. Hotta discloses that the “time for starting the operation of the pre-air conditioning system is set based on the estimated [atmospheric temperature] and [cabin temperature]” at the desired driving time, wherein the process of estimating atmospheric and cabin temperature are based on the expected start of riding time, the desired cabin temperature, the starting cabin temperature, and the atmospheric temperature. Ex. 1006, 16:21–27, 18:17–66, Figs. 16 (S171–173); Ex. 1003 ¶¶ 89–92 (asserting the same).

viii. *“a controller configured to: . . . transmit an activation signal to the temperature control loop at the temperature control loop activation time to activate the heating and cooling system”*

Petitioner contends that Hotta teaches this limitation of claim 1. Pet. 23–24. According to Petitioner, “Hotta’s CPU ‘makes a regular judgment as to whether or not the present time has reached the set time for starting the operation of the air conditioner (Step S175)’” and, if so, activation signals “would be transmitted to the temperature control loop . . . so that the cabin temperature would approach the desired temperature

setting.” *Id.* at 23–24 (citing Ex. 1006, 16:31–36, 16:60–68, Figs. 18–19; Ex. 1003 ¶¶ 93–94).

Patent Owner disputes Petitioner’s position. PO Resp. 5–8. Patent Owner notes that Petitioner contends that CPU 62 transmits the claimed activation signal, but also contends that the claimed “temperature control loop runs as software on CPU 62.” *Id.* at 5–6. Thus, according to Patent Owner:

Petitioner does not explain, however, how Hotta’s CPU software “transmits” activation signals within itself, or how any such transmission would have been considered to have been made “to” a temperature control loop running in the same software. All of Hotta’s software is simply a set of instructions stored in the memory of CPU 62 and executed in order. Neither Hotta nor Petitioner describes any sort of “transmission” from one instruction to another. Rather, the code is simply executed step-by-step in successive order according to the flowcharts. Petitioner does not explain how an “activation signal” could be sent by one portion of the software to another, or how any portion of the software would require an “activation signal” to execute if all of the software’s code residing in CPU 62 memory is to be executed when its turn is reached.

Id. at 6–7 (citing Ex. 1006, 3:44–57, 5:58–59, Figs. 16–19; *see also* PO Sur-reply 4–5 (asserting the same)).

Patent Owner also argues that Petitioner “conflates an activation signal that supposedly would be transmitted to a temperature control loop with the signals sent to components within the air conditioning system.” *Id.* at 7. According to Patent Owner, Petitioner fails to distinguish between the activation signal and the signals sent to system components. *Id.* at 7–8 (citing Ex. 2004, 57:7–10 (deposition testimony of Dr. Shahbakhti)).

In its Reply, Petitioner contends that Patent Owner’s position “rests solely on attorney argument,” as Patent Owner did not offer any contrary declarant testimony. Pet. Reply 10–12. Additionally, Petitioner contends that the claims do not require the temperature control loop software to be separate from the controller, as Patent Owner’s argument presumes. *Id.* at 12. According to Petitioner, Patent Owner fails to demonstrate “that one piece of computer software cannot transmit an activation signal to another piece of computer software.” *Id.* Finally, Petitioner also argues that,

as Dr. Shahbakhti explained, when it is time for starting the air conditioning system, CPU 62 sends activation signals to the temperature control loop, which then activates (and controls) components within the heating and cooling system. That CPU 62 may contain both the controller that sends the activation signal to the temperature control loop and the portions of the temperature control loop that send activation signals to dampers, valves, fans or compressors is of no moment—as Dr. Shahbakhti’s undisputed testimony states, an ordinary artisan would understand that the claimed controller and the claimed temperature control loop may reside in the same computer hardware. The person of ordinary skill in the art would read the ’237 patent to require only that both functions were performed, not physically separate components.

Id. at 12–13 (citing Ex. 1003 ¶¶ 35, 93).

In its Sur-reply, Patent Owner counters that it is irrelevant whether Hotta’s controller and temperature control loop are housed together because, in either circumstance, Petitioner has not explained why the controller must transmit an activation signal to the temperature control loop. PO Sur-reply 4–5.

We have considered the parties’ arguments and cited evidence, and we are persuaded by Petitioner’s contentions. Patent Owner does not

dispute that the functional aspects of this limitation are taught by Hotta, i.e., that, at the activation time, Hotta's air conditioning system is activated by the CPU. This is consistent with Hotta's disclosure that "CPU 62 makes a regular judgment as to whether or not the present time has reached the set time for starting operation of the air conditioner," and if so, "the CPU 62 effects air-conditioning control as shown in FIG. 19, to control" valves 18, 22, 24, 26, compressor 30, dampers 36–46, fans 32, 34, and the seat heater. Ex. 1006, 16:31–68. Rather, the parties' dispute involves whether this function is achieved through the transmission of an activation signal from the controller to the temperature control loop.

Although Hotta does not describe an activation signal explicitly, we credit Dr. Shahbakhti's *undisputed* testimony that activation signals "would be transmitted to the temperature control loop in Hotta's system, so that the cabin temperature would approach the desired temperature setting," through control of the various heating and cooling system components identified in Figure 19. Ex. 1003 ¶ 93; *see also* Ex. 1006, 16:31–68. As discussed above, Dr. Shahbakhti explains that temperature control loops were well known and were necessarily present in "any vehicle air-conditioning system with an automatic temperature-control option," including Hotta, to bring the cabin air temperature to a desired target temperature." Ex. 1003 ¶¶ 33, 76. Dr. Shahbakhti also explains that Hotta's temperature control loop includes software. *Id.* ¶ 76; *see also id.* ¶¶ 34–35 (asserting the same). Patent Owner does not present declarant testimony to dispute any of these positions. In light of this un rebutted testimony regarding the understanding of a person of ordinary skill in the art, we are persuaded by Petitioner's contention that Hotta's CPU unit transmits an activation signal to its temperature control

loop, in order to begin the undisputed function of effecting air conditioning through the control of heating and cooling system components. Pet. 23–24; Ex. 1003 ¶ 93; Ex. 1006, 16:31–68.

We have considered Patent Owner’s argument that “Petitioner does not explain how an ‘activation signal’ could be sent by one portion of the software to another,” because the software simply executes steps in order. PO Resp. 6–7. We do not agree with this argument. Patent Owner does not provide any persuasive evidence or reasoning to dispute that Hotta’s CPU operates as Dr. Shahbakhti testifies, i.e., that the temperature control loop is located in software (Ex. 1003 ¶ 76); that the CPU transmits an activation signal to that temperature control loop (*id.* ¶ 93); or that that temperature control loop activates the heating and cooling system to reach the desired temperature (*id.* ¶¶ 76, 93). Indeed, we discern that the operation of software necessarily involves the transmission of command signals within a microprocessor. Tr. 30:4–31:3. Moreover, we consider Patent Owner’s criticisms in this regard to be mere attorney argument, because Patent Owner does not provide any contrary testimony as to the understanding of a person of skill in the art.

Finally, we disagree with Patent Owner’s argument that Petitioner fails to distinguish between an activation signal and the signals sent to system heating and cooling components. PO Resp. 7–8. The record supports Petitioner’s contentions that “CPU 62 sends activation signals to the temperature control loop, which then activates (and controls) components within the heating and cooling system,” and that the controller and temperature control loop may reside in the same computer software and/or hardware. Pet. Reply 12–13; Ex. 1003 ¶¶ 35, 76, 93. This is

consistent with Hotta's disclosure that, at the activation time, CPU 62 effects air conditioning by controlling the heating and cooling components of the system. Ex. 1006, 16:31–68. Moreover, contrary to Patent Owner's arguments, during his deposition, Dr. Shahbakhti confirmed that the CPU does transmit a signal to the temperature control loop. Ex. 2004, 57:11–19. Patent Owner provides only attorney argument and has not directed us to any persuasive evidence casting doubt on this record evidence.

For the foregoing reasons, we are persuaded by Petitioner's contentions, supported by the unrebutted testimony of Dr. Shahbakhti, that Hotta teaches this limitation of claim 1.

ix. *“a controller configured to: . . . determine if the vehicle is activated at the desired vehicle activation time or within a pre-determined time thereafter; and if the vehicle is not activated at the desired vehicle activation time or within the pre-determined time thereafter, then transmit a deactivation signal to the temperature control loop to deactivate the heating and cooling system”*

Petitioner contends that Hotta teaches this limitation of claim 1. Pet. 24–25. Patent Owner does not dispute this position. PO Resp. 2–8. We are persuaded by Petitioner's undisputed contention. Hotta discloses that if the vehicle is not started within an hour of the expected time, “the operation of the air conditioner is stopped.” Ex. 1006, 17:6–15; *see also* Ex. 1003 ¶¶ 95–98 (asserting the same).

x. *Summary*

For the foregoing reasons, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claim 1 is unpatentable over Hotta.

3. Dependent Claims 2–5, 7, 9, and 10

Dependent claims 2–5, 7, 9, and 10 all depend, directly or indirectly, from claim 1.

- Dependent claim 2 recites, “a first temperature sensor positioned in the vehicle cabin and configured to: measure the starting vehicle cabin temperature; and transmit the starting vehicle cabin temperature to the controller via the second input signal.”
- Dependent claim 3 recites, “a second temperature sensor configured to: measure an ambient temperature outside the vehicle cabin; and transmit the ambient temperature to the controller via a third input signal.”
- Dependent claim 4 recites, “wherein the controller is further configured to determine the temperature control loop activation time based on the first, second, and third input signals.”
- Dependent claim 5 recites, “the temperature control loop is configured to deactivate the heating and cooling system when the starting vehicle cabin temperature reaches the desired vehicle cabin temperature.”
- Dependent claim 7 recites, “a programmable timer configured to generate the first input signal.”
- Dependent claim 9 recites, “wherein the heating and cooling system, the temperature control loop, and the controller are powered by the grid power.”
- Dependent claim 10 recites, “wherein the temperature control loop is configured to: set the desired vehicle cabin temperature; and transmit the desired vehicle cabin temperature to the controller via the second input signal.”

Petitioner contends that Hotta teaches or suggests the claimed subject matter. Pet. 25–36. Patent Owner does not present any arguments directed to these claims beyond its arguments directed to independent claim 1, addressed above. PO Resp. 8.

We are persuaded by Petitioner’s undisputed contentions.

- Regarding dependent claim 2, Hotta teaches room temperature sensor 56, the output of which is sent to CPU 62. Ex. 1006, 5:44–50, 5:58–6:5, 10:16–17, Figs. 2–3; Ex. 1003 ¶¶ 99–104.
- Regarding dependent claim 3, Hotta teaches outside air temperature sensor 60, the output of which is sent to CPU 62 in a third input signal. Ex. 1006, 5:44–53, 5:58–6:5, 10:17–19, Figs. 2–3; Ex. 1003 ¶¶ 106–111.
- Regarding dependent claim 4, Hotta determines the time when cooling or heating should begin based on the desired vehicle drive time, measured cabin air temperature, ambient air temperature, and desired cabin air temperature. Ex. 1006, 16:21–27, 18:37–66, Figs. 16, 22; Ex. 1003 ¶¶ 116–118, 208.
- Regarding dependent claim 5, Hotta teaches that the air conditioning mode is stopped when the cabin temperature reaches within two degrees of the target temperature. Ex. 1006, 20:23–30, Fig. 23 (S315); Ex. 1003 ¶¶ 121–123.
- Regarding dependent claim 7, Hotta teaches control panel 74 with section 76d for setting the desired vehicle drive time. Ex. 1006, 6:32–42, Fig. 4 (76d); Ex. 1003 ¶¶ 136–138.
- Regarding dependent claim 9, Hotta teaches that pre-air conditioning occurs when the vehicle battery is being charged. Ex. 1006, 14:52–54, 16:36–38, 16:59. We credit Dr. Shahbakhti’s testimony that the grid powers the claimed components. Ex. 1003 ¶¶ 149–152; *see supra* II.D.2.ii.
- Regarding dependent claim 10, Hotta teaches that the desired cabin temperature is set with switch 76c and is ready by CPU 62. Ex. 1006, 6:25–32, 15:21–27. We credit Dr. Shahbakhti’s testimony that an ordinarily skilled artisan would have understood “Hotta’s temperature control loop sets the desired cabin temperature based on this switch [76c]” and “would associate these actions with the temperature control loop.” Ex. 1003 ¶¶ 155–156.

For the foregoing reasons, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claims 2–5, 7, 9, and 10 are unpatentable over Hotta.

4. Conclusion

For the reasons detailed above, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claims 1–5, 7, 9, and 10 are unpatentable over Hotta.

E. Obviousness over the Combined Teachings of Hotta and Hirokazu

Petitioner contends that claims 6, 11, and 13–22 of the '237 patent would have been obvious over the combined teachings of Hotta and Hirokazu. Pet. 37–75. Patent Owner disagrees. PO Resp. 9–16.

1. Overview of Hirokazu (Ex. 1008)

Hirokazu is titled “Air conditioner control device,” and discloses an air conditioner that “operates prior to the driver starting to drive, so that the cabin temperature becomes a suitable temperature when driving starts.” Ex. 1008, 3; *see also id.* ¶ 37 (air conditioning operating when connected to a charger or when battery has sufficient capacity). Hirokazu explains that the air conditioner device includes “operation pattern memory means for storing in memory an operation pattern of a vehicle; and setting means for setting a set value indicating the operation time of the air conditioner, on the basis of the operation pattern.” *Id.* ¶ 10. Thus, through “fuzzy controls and learning controls on the weekly driving patterns of each individual driver,” Hirokazu’s device can “change the operating time of the air conditioner in conjunction with the vehicle operation pattern.” *Id.* ¶¶ 11–14. This avoids problems associated with the use of remote controls and timers to set the air conditioning start time. *Id.* ¶ 14; *see also id.* ¶¶ 6–7.

Additionally, Hirokazu explains that once air conditioning is initiated in this manner, the air conditioner will continue to operate without change, as a normal air conditioner, if the vehicle is started within a fixed time of the assumed start-up time. *Id.* ¶ 45. Alternatively, the air conditioner will stop automatically if “driving of the electric vehicle is not accomplished even when the assumed start-up time has passed by a fixed amount.” *Id.* ¶ 46.

2. Claims 6 and 22

Claim 6 depends from claim 1 and further recites that “the controller is further configured to: determine a pattern of past vehicle usage; and generate the first input signal based on the pattern of past vehicle usage.” Ex. 1001, 10:5–9.

Much of independent claim 22 is substantially similar to much of claim 1. *Compare* Ex. 1001, 9:22–32, 35–44 (part of claim 1), *with id.* at 11:50–12:7, 12–21 (similar part of claim 22).⁹ Additionally, claim 22 recites that the controller is configured to “determine a pattern of past vehicle usage” and “generate a first input signal based on the pattern past vehicle usage, the first input signal comprising a desired vehicle activation time,” wherein the controller determines the temperature control loop activation time based, in part, upon this signal. Ex. 1001, 12:7–18.

⁹ Claims 1 and 22 both include limitations of “a power connector,” “a heating and cooling system,” “a temperature control loop,” and “a controller configured to: . . . receive a second input signal . . . ; determine a temperature control loop activation time . . . ; [and] transmit an activation signal” For these limitations, Petitioner makes contentions similar to those discussed above regarding claim 1. For the same reasons discussed in Section II.D.2, we are persuaded by those contentions.

Petitioner contends that Hirokazu teaches the “pattern” subject matter of claims 6 and 22, and that a person of ordinary skill in the art would have been motivated to modify Hotta in view of Hirokazu’s teachings. Pet. 37–39, 70–71, 74. Patent Owner does not present any arguments directed to these claims, beyond those addressed regarding claim 1. PO Resp. 9–10.

We are persuaded by Petitioner’s undisputed contentions. Hirokazu discloses an “air conditioner control device comprising: operation pattern memory means for storing in memory an operation pattern of a vehicle; and setting means for setting a set value indicating the operation time of the air conditioner, on the basis of the operation pattern.” Ex. 1008 ¶¶ 10, 14, claim 1. Petitioner provides persuasive reasoning explaining why a person of ordinary skill in the art would have been motivated to include such features of Hirokazu with Hotta, e.g., to improve user convenience and ease by eliminating the need to manually input expected departure times. Pet. 38–39; Ex. 1003 ¶¶ 130–134.

For the foregoing reasons, we determine that Petitioner has met its burden of demonstrating, by a preponderance of the evidence, that claims 6 and 22 are unpatentable over Hotta and Hirokazu.

3. Claims 11 and 13–17

Claim 11 depends from claim 1 and further recites that “the controller is further configured to modify the temperature control loop activation time based on a planned duration of vehicle use.” Ex. 1001, 10:24–26. Likewise, independent claim 13 recites a method including steps of “determining an activation time . . . ,” “modifying the determined activation time based on a planned duration of vehicle use,” and “activating the temperature control

system at the determined activation time” *Id.* at 10:34–49. Claims 14–17 depend from claim 13. *Id.* at 10:50–11:3.

Petitioner contends that Hotta determines an activation time and activates the air conditioner at the determined activation time. Pet. 44–45, 46–47; *see supra* II.D.2.vii. Petitioner does not contend that Hotta *modifies* that activation time, as required by claims 11 and 13. Pet. 40–41 (claim 11), 45–46 (claim 13). Instead, Petitioner argues that Hirokazu determines an activation time based on the vehicle’s operation pattern, including duration of use, and “sets the operation time of its air conditioning system based on th[is] stored vehicle operation pattern.” *Id.* at 45. Petitioner contends that a person of ordinary skill in the art would have found it obvious to modify Hotta to use this approach. *Id.* According to Petitioner,

Hotta teaches no pre-air conditioning unless the vehicle will be fully charged before the expected ride time. Modifying Hotta’s approach to allow partial charging based on predicted ride length would allow the system to prioritize pre-heating and pre-cooling, enhancing occupant comfort. This feature might be of interest, for example, to drivers who regularly drive for only short distances.

Id. at 40–41, 46 (citing Ex. 1006, 18:17–24; Ex. 1003 ¶¶ 163–165, 194).

In our Institution Decision, we were preliminarily unpersuaded by these contentions. Dec. on Inst. 23–24. We preliminarily determined that although Hirokazu teaches *setting* an activation time based upon a past pattern of vehicle usage, Hirokazu does not disclose *modifying* that set time in any manner. *Id.* at 23; Ex. 1008, claim 1 (“setting a set value indicating the operation time . . . on the basis of the operation pattern”). Moreover, we preliminarily determined that Petitioner had not explained why a skilled artisan “would have been motivated to *modify* a time already set by Hotta, in

view of Hirokazu’s teachings, rather than simply to set Hotta’s activation time as taught by Hirokazu in the first instance.” Dec. on Inst. 23–24.

Patent Owner appears to agree with our preliminary conclusions and argues, in its Response, “[a]t best, Petitioner only alleges that Hirokazu discloses *setting* the activation time based on the vehicle’s operation pattern. However, Petitioner does not even address (much less show) that Hirokazu discloses *modifying* that activation time.” PO Resp. 12. Patent Owner contends that the only way in which Hirokazu changes the start time of air conditioning is to *cancel* it entirely, if battery charge is insufficient. *Id.* at 12–14 (citing Ex. 1008 ¶ 37).

In the Reply, Petitioner provides a new declaration from Dr. Shahbakhti to support its argument that

Hirokazu’s system updates its vehicle operation pattern, including vehicle start time and trip duration, ***each time*** the vehicle is driven. The updated vehicle start time is used to determine an activation time for Hirokazu’s advance air conditioning function. And Hirokazu uses its updated duration of vehicle use to assess whether to begin the advanced air conditioning. Thus, Hirokazu discloses, “changing the operating time of the air conditioner . . . in conjunction with the vehicle operation pattern” each time the vehicle is driven. These disclosures establish that Hotta and Hirokazu, taken together, render obvious “modifying the determined activation time based on a planned duration of vehicle use” and “activating the temperature control system.”

Pet. Reply. 13–14 (citing Ex. 1008 ¶¶ 11, 20, 37; Ex. 1018 ¶¶ 9–11).

According to Petitioner, “‘setting’ Hirokazu’s next air conditioner start time necessarily ‘modifies’ the activation time” because it uses updated data (including the driver’s start time and duration, which is stored each time the

car is driven) to predict when the driver is likely to next drive the car. *Id.* at 15–17 (citing, e.g., Ex. 1008 ¶¶ 28, 41–42, Fig. 3).

In the Reply, Petitioner also contends that Hirokazu “suggests factoring the expected duration of vehicle use into the decision of when to activate the air-conditioning system,” and that this would have been obvious to use in “Hotta’s system by assessing whether battery charge was sufficient for an expected trip duration before beginning advance air conditioning.” *Id.* at 17. Thus, according to Petitioner, this would not cancel air conditioning but rather, “[t]his would modify Step S170 in Hotta, allowing some measure of advance air conditioning.” *Id.* at 17.

In response, Patent Owner argues that this is an improper new reply argument based on new evidence (Ex. 1018; Ex. 1008 ¶¶ 41–43, Fig. 3) and, “[i]n any event, Petitioner does not explain how its new argument amounts to anything more than simply reading the ‘modify,’ [and] ‘modifying’ limitations out of claims 11[and] 13–17.” PO Sur-reply 6.

We have considered all evidence of record and we determine, based on the complete trial record, that Petitioner has not met its burden of demonstrating the unpatentability of claims 11 and 13–17 by a preponderance of the evidence.

These claims require two key aspects. First, an activation time is determined based on the desired vehicle activation time, the starting cabin temperature, and the desired cabin temperature. Ex. 1001, 9:38–39, 10:42–45. Second, *that same activation time* is modified based on a planned duration of vehicle use. *Id.* at 10:25–26 (“modify *the* temperature control loop activation time”), 10:46–47 (“modifying *the* determined activation time”). We agree that Hotta satisfies the first aspect; Hotta’s CPU

determines the time for starting the operation of the pre-air conditioning system, based on the claimed inputs. Ex. 1006, 16:21–27; *see supra* II.D.2.vii. Likewise, Hirokazu determines an operation time of the air conditioner. Ex. 1008 ¶ 10.

Petitioner does not establish, however, that either Hotta or Hirokazu *modifies* that same, already-determined activation time, or that this would have been obvious. First, Petitioner does not rely on Hotta to teach the *modifying* limitation. Pet. 40–41, 45–46. Second, although Hirokazu “sets the operation time of its air[-]conditioning system based on th[is] stored vehicle operation pattern” (Pet. 45), this, again, only addresses the first aspect of the claims—determining an activation time. The Petition does not contend, and certainly does not demonstrate, that Hirokazu then *modifies* the time that was just determined. At best, the combined teachings of Hotta and Hirokazu suggest only that Hotta’s activation time likewise could have been determined based on a stored pattern of past vehicle use, as taught by Hirokazu, at the outset. We are not persuaded that the combined teachings would have suggested that an ordinarily skilled artisan would have *first determined* an activation time, as taught by either Hotta or Hirokazu, and then *modified* that same time based on a planned duration of vehicle use.

Finally, even if we accept that Petitioner’s Reply arguments and evidence are proper,¹⁰ they too are unpersuasive. According to Petitioner,

¹⁰ The issue is moot because we are unpersuaded by Petitioner’s Reply arguments. However, we note that neither the Petition nor Dr. Shahbakhti’s original declaration discussed that Hirokazu’s system updates the stored pattern each time the vehicle is driven, or that each new air conditioner start time is based on this updated data, such that “‘setting’ Hirokazu’s next air conditioner start time necessarily ‘modifies’ the activation time.” *Compare*

“‘setting’ Hirokazu’s next air conditioner start time necessarily ‘modifies’ the activation time” because it uses updated data. Pet. Reply 15. This interpretation ignores that the claim requires two aspects: first, determining an activation time based on the desired vehicle activation time, the starting cabin temperature, and the desired cabin temperature; and second, modifying that same already determined activation time. Petitioner attempts to read one action—setting the *next* air conditioner start time—on both requirements, simply because updated data is used in the “setting” process. However, regardless of what data is used to set the next activation time, the claim requires two aspects. Petitioner has not presented a cogent explanation of how those two aspects of the claim are satisfied by the combined teachings of Hotta and Hirokazu.

For the foregoing reasons, Petitioner has *not* met its burden of demonstrating by a preponderance of the evidence that claims 11 and 13–17 are unpatentable over Hotta and Hirokazu.

4. Claims 18–21

Independent claim 18 and dependent claims 19–21 include subject matter similar to that of claims 11 and 13, i.e., a controller programmed to “determine a temperature modification period based on the desired vehicle

Pet. Reply 13–18, *with* Pet. 40–41; *compare* Ex. 1018 ¶¶ 7–14, *with* Ex. 1003 ¶¶ 44, 159, 161, 163–165, 194. It appears that Petitioner’s Reply improperly “proceed[s] in a new direction with a new approach as compared to the positions taken in a prior filing,” and that this interpretation of the prior art could have been presented earlier. Trial Practice Guide Update (Aug. 2018), 15, <https://go.usa.gov/xU7GP>; *see also* Patent Trial and Appeal Board Consolidated Trial Practice Guide, November 2019, 74 (combining the Trial Practice Guide and updates).

activation time, the starting cabin air temperature . . . , and the desired cabin air temperature,” and “change a length of the temperature modification period based on a planned duration of vehicle use.” Ex. 1001, 11:4–26.

Petitioner’s contentions regarding independent claim 18, both in the Petition and in the Reply, are substantially similar to those made regarding claims 11 and 13. Pet. 54–68; Pet. Reply 18–19. Likewise, Patent Owner makes arguments substantially similar to those presented regarding claims 11 and 13. PO Resp. 15–16; PO Sur-reply 6.

For the same reasons discussed above regarding substantially similar claims 11 and 13, we are not persuaded by Petitioner’s contentions regarding the “determine a temperature modification period” and “change a length of the temperature modification period” limitations. For the foregoing reasons, Petitioner has *not* met its burden of demonstrating by a preponderance of the evidence that claims 18–21 are unpatentable over Hotta and Hirokazu.

5. Conclusion

For the reasons detailed above, we determine that Petitioner has met its burden of demonstrating by a preponderance of the evidence that claims 6 and 22 are unpatentable over Hotta and Hirokazu. However, for the reasons detailed above, we determine that Petitioner has *not* met its burden of demonstrating by a preponderance of the evidence that claims 11 and 13–21 are unpatentable over Hotta and Hirokazu.

F. Obviousness over the Combined Teachings of Hotta and Gerard

Petitioner contends that claim 8 of the ’237 patent would have been obvious over the combined teachings of Hotta and Gerard. Pet. 75–77.

Patent Owner disagrees, relying upon the same arguments discussed above regarding claim 1 in view of Hotta. PO Resp. 16–17.

1. Overview of Gerard (Ex. 1009)

Gerard is titled “Scheduling Remote Starting of Vehicle,” and discloses a method for scheduling the remote start of a vehicle engine. Ex. 1009, codes (54), (57). Gerard discloses that a user defines a schedule of desired engine start times and vehicle controls, e.g., operation of a defroster, seat warmer, or heating, ventilation, or air conditioning (HVAC) system. *Id.* ¶ 18. The schedule is established with a “remote programming device, such as a user’s cellular radiotelephone 20,” or a “computer 54 with a wireless IP address for Internet access.” *Id.* The schedule and vehicle settings are transmitted from the remote device over a communication system, such as a local area network, a wide area network, a cellular communication network, or the Internet. *Id.* ¶ 19.

2. Dependent Claim 8

Claim 8 depends from claim 1 and further recites, “the first input signal comprises one of a wireless signal, an internet-based protocol, and a controller-area network (CAN) bus based protocol transmitted from a remote device.” Ex. 1001, 10:12–15. Petitioner relies upon Gerard as teaching the claimed subject matter, and also contends that a person of ordinary skill in the art would have been motivated to modify Hotta in view of Gerard’s teachings. Pet. 75–77. Patent Owner does not present any arguments directed to claim 8, beyond those addressed regarding claim 1. PO Resp. 16–17.

We are persuaded by Petitioner’s undisputed contentions. Gerard teaches that a “schedule and vehicle settings can be transmitted from a remote device (20, 54) over a communication system (22, 24, 26, 28) to the communication device 10 of the vehicle 32,” including over “a local area network 24, wide area network 26, cellular communication network 22, or Internet 28.” Ex. 1009 ¶¶ 18–19. We credit Dr. Shahbakhti’s testimony that an ordinarily skilled artisan would have found it obvious to incorporate this teaching “into the design of a vehicle’s air-conditioning control system,” such as Hotta, in order to allow a user to specify the desired vehicle departure time even when far away from the vehicle. Ex. 1003 ¶¶ 145–148.

For the foregoing reasons, Petitioner has met its burden of demonstrating by a preponderance of the evidence that claim 8 is unpatentable over Hotta and Gerard.

*G. Obviousness over the Combined Teachings of
Hotta and Heinle*

Petitioner contends that claims 12 and 23 of the ’237 patent would have been obvious over the combined teachings of Hotta and Heinle. Pet. 78–90. Patent Owner disagrees, relying upon the same arguments discussed above regarding claim 1 in view of Hotta. PO Resp. 17.

1. Overview of Heinle (Ex. 1010)

Heinle is titled “Motor Vehicle Air-Conditioning System Having Standstill Air-Conditioning,” and discloses a vehicle with a standstill air-conditioning mode of operation, in which 230 volt AC electrical power is supplied to generator 7, which acts as electric motor 7' to drive compressor 3 of air-conditioning system 1 and secondary units, such as a fan, to control

the temperature of the vehicle cabin when the vehicle is standing still.

Ex. 1010, codes (54), (57), ¶ 19, Fig. 2.

2. Claims 12 and 23

Claim 12 depends from claim 1 and further recites, the vehicle comprises “an internal combustion engine (ICE) based vehicle, and wherein the grid power is received solely for powering the heating and cooling system, the temperature control loop, and the controller, such that the grid power is supplied thereto without limitations associated with re-charging of a vehicle on-board energy storage system.” Ex. 1001, 10:27–33.

Much of independent claim 23 is identical to much of claim 1. *Compare* Ex. 1001, 9:22–44 (part of claim 1), *with id.* at 12:22–44 (identical part of claim 23).¹¹ Additionally, claim 23 further includes the limitation recited in claim 12, which is not included in claim 1. *Id.* at 12:45–51.

Petitioner relies upon Heinle as teaching the “internal combustion engine” limitations of claims 12 and 23, and also contends that a person of ordinary skill in the art would have been motivated to modify Hotta in view of Heinle’s teachings. Pet. 78–80, 90. Patent Owner does not present any arguments directed to claims 12 or 23, beyond those addressed regarding claim 1. PO Resp. 17.

¹¹ Claims 1 and 23 both include the limitations of “a power connector,” “a heating and cooling system,” “a temperature control loop,” and “a controller configured to: receive a first input signal . . . ; receive a second input signal . . . ; determine a temperature control loop activation time . . . ; [and] transmit an activation signal” For these limitations, Petitioner makes contentions similar to those discussed above regarding claim 1. For the same reasons discussed in Section II.D.2, we are persuaded by those contentions.

We are persuaded by Petitioner’s undisputed contentions. Heinle teaches a motor vehicle air-conditioning mode that operates “in the event that the motor vehicle engine is at a standstill, using an auxiliary power supply.” Ex. 1010, code (57). Heinle teaches that if an external power supply is provided, such as “a 230 V AC source,” then electrical power is used to “drive[] the compressor 2 of the air-conditioning system 1 via the (in this case) inactive auxiliary power unit 5 so as to ensure the cooling function of said air-conditioning system 1 when at a standstill.” *Id.* ¶ 19 (also disclosing voltage conversion). We credit Dr. Shahbakhti’s testimony that an ordinarily skilled artisan would have recognized the benefits of using grid power to power air-conditioning and heating systems in conventional vehicles with internal combustion engines, as taught by Heinle, to improve driver comfort and conserve fuel. Ex. 1003 ¶¶ 175–177.

For the foregoing reasons, Petitioner has met its burden of demonstrating by a preponderance of the evidence that claims 12 and 23 are unpatentable over Hotta and Heinle.

III. CONCLUSION

In summary:¹²

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–5, 7, 9, 10	103	Hotta	1–5, 7, 9, 10	
6, 11, 13–22	103	Hotta, Hirokazu,	6, 22	11, 13–21
8	103	Hotta, Gerard	8	
12, 23	103	Hotta, Heinle	12, 23	
Overall Outcome			1–10, 12, 22, 23	11, 13–21

IV. ORDER

Upon consideration of the record before us, it is:

ORDERED that claims 1–10, 12, 22, and 23 of the '237 patent have been shown to be unpatentable;

FURTHER ORDERED that claims 11 and 13–21 of the '237 patent have not been shown to be unpatentable; and

¹² 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, 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.

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