Trials@uspto.gov
571-272-7822

Paper 7
Entered: May 3, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORPORATION,
Petitioner,

v.

GE HYBRID TECHNOLOGIES, LLC,
Patent Owner.

Case IPR2019-00009
Patent 6,555,991 B1

Before JONI Y. CHANG, MICHAEL W. KIM, and AMANDA F. WIEKER, *Administrative Patent Judges*.

CHANG, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Toyota Motor Corporation ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–9, 13−18, 20, 26−34, 38−44, 46, and 50−55 ("the challenged claims") of U.S. Patent No. 6,555,991 B1 (Ex. 1001, "the '991 patent"). Paper 1 ("Pet."). GE Hybrid Technologies, LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp.").

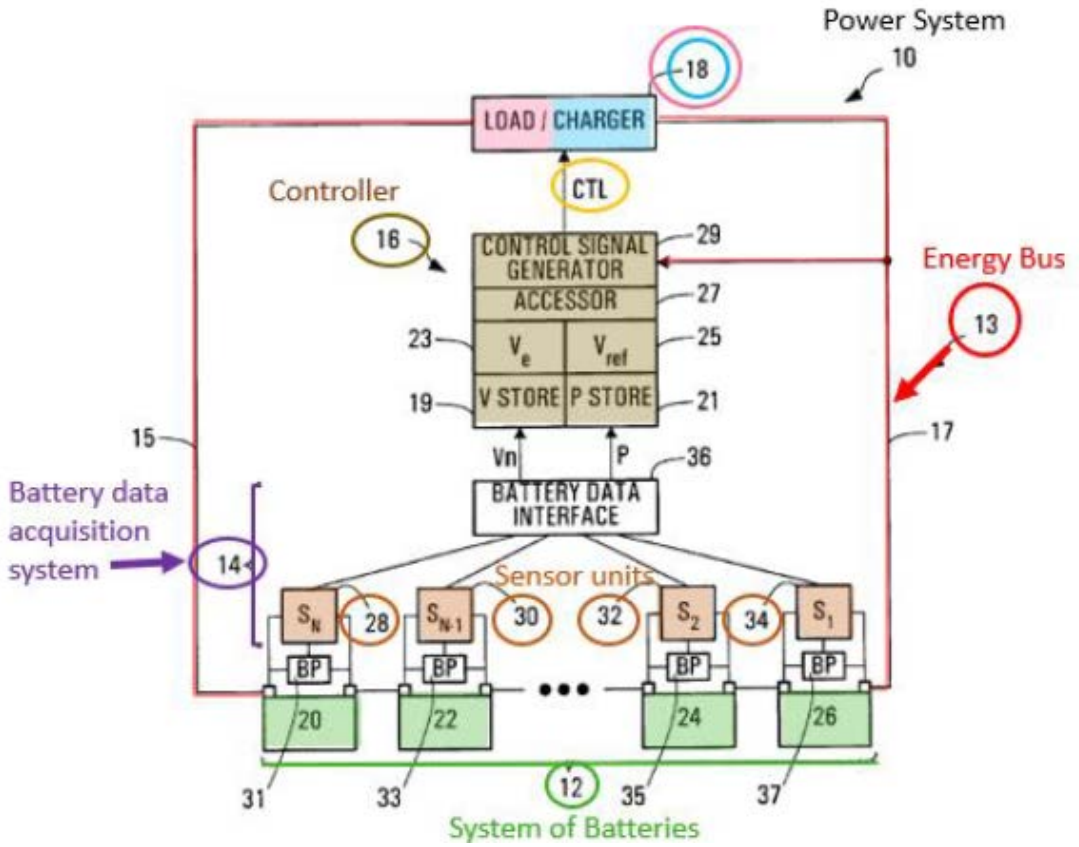
Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless the information presented in the petition "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." For the reasons stated below, we determine that Petitioner has not established a reasonable likelihood that it would prevail with respect to any of the challenged claims. We hereby decline to institute an *inter partes* review in this proceeding.

A. Related Matters

The parties indicate that they are unaware of any other proceedings involving the '991 patent. Pet. 3; Paper 3, 1.

B. The '991 Patent

The '991 patent discloses a method and apparatus for controlling energy transfer between an energy bus and a system of batteries. Ex. 1001, Abstract. Figure 1 of the '991 patent is reproduced below with annotations added by Petitioner (Pet. 7).



Annotated Figure 1 above illustrates a battery-powered system. Specifically, power system 10 includes load/charger device 18 (pink/light blue), system of batteries 12 (green), battery data acquisition system 14 (purple), controller 16 (brown), and energy bus 13 (red). *Id*. at 4:26–5:5. According to the '991 patent, load/charge device 18 may be a combination of a controller, motor, and generator unit capable of receiving data words representing control parameters for adjusting field current of the generator to control the amount of power drawn or provided to battery system 12. *Id*.

System of batteries 12 may operate in a supply mode, in which it supplies energy to energy bus 13 (red) for conduction to load/charger device 18, or alternatively, in a charge mode, in which it receives energy from

energy bus 13 that is supplied by load/charger device 18. *Id*.

Battery data acquisition system 14 includes sensor units 28, 30, 32, 34 (orange) and battery data interface 36 that provides a representation of voltage V_n and a representation of battery operating parameter P (e.g., temperature) for each battery 20, 22, 24, 26 (green) in battery system 12, to controller 16 (brown). *Id*. at 4:60−5:5, 5:44−61, 6:13−18. Controller 16 stores these representations in respective arrays 19, 21. *Id*. at 6:13−18. "The representations may be in the form of data 'words' or 'bytes.'" *Id*.

Controller 16 also includes functional blocks V_e 23 and V_{ref} 25, accessor 27, and control signal generator 29. *Id*. at 6:19−38. Functional block 23 acts as a voltage extremity (V_e) processor to produce a representation of an extreme voltage, the highest or lowest voltage among the voltages of all of the batteries in battery system 12. *Id*. at 5:62−6:38. Functional block 25 acts as a reference voltage (V_{ref}) processor to produce a representation of a reference voltage derived from an operating parameter associated with the battery exhibiting the extreme voltage. *Id.* Accessor 27 accesses the extreme voltage representation and the reference voltage representation, and then passes them to control signal generator 29. *Id*. Control signal generator 29 produces control signal CTL (yellow) for use by load/charge device 18, in changing the amount of energy transfer between energy bus 13 and battery system 12 in response to the representation of the voltage extremity and the representation of the reference voltage. *Id*.

C. Illustrative Claim

Of the challenged claims, claims 1, 27, and 52−55 are independent. Claim 1 is illustrative:

> 1. A method of controlling energy transfer between an energy bus and a system of batteries, the method comprising:
>
> producing a *control signal* for use in changing the amount of energy transfer between the energy bus and the system of batteries *in response to*:
>
> a representation of a *reference voltage* determined from an operating parameter of a battery exhibiting a voltage extremity in the system of batteries; and
>
> a representation of said *voltage extremity*.

Ex. 1001, 13:35−44 (emphases added).

D. Prior Art Relied Upon

Petitioner relies upon the references listed below. Pet. 4−5.

Takahashi	US 5,625,272	Apr. 29, 1997	(Ex. 1003)
Hoffman	US 5,869,950	Feb. 9, 1999	(Ex. 1005)
Bourbeau	US 5,666,040	Sept. 9, 1997	(Ex. 1006)
Aranovich	US 6,111,389	Aug. 29, 2000	(Ex. 1007)

E. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability (Pet. 5)[1]:

Claims	Basis	Reference(s)
1−8, 13−18, 20, 27−33, 38−44, 46, and 52−55	§ 103	Takahashi
6 and 29−31	§ 103	Takahashi and Hoffman
9 and 34	§ 103	Takahashi and Aranovich
26, 50, and 51	§ 103	Takahashi and Bourbeau

II. ANALYSIS

A. Claim Construction

The instant Petition was filed prior to the effective date of the rule change that replaces the broadest reasonable interpretation ("BRI") standard. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,340 (Oct. 11, 2018) (final rule) ("This rule is effective on November 13, 2018 and applies to all IPR, PGR and CBM petitions filed on or after the effective date."). We, therefore, apply the BRI standard in this proceeding. Under this standard, claim terms in an unexpired patent are

[1] Because the claims at issue have a filing date prior to March 16, 2013, the effective date of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), we apply the pre-AIA version of 35 U.S.C. § 103 in this Decision.

given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2018).

The parties propose constructions for several claim terms. Pet. 9–12; Prelim. Resp. 4–6, 13–15. For purposes of this Decision, we find it necessary to construe only the claim terms identified below. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (noting that only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy).

"producing a control signal . . . in response to: a representation of a reference voltage . . . and a representation of [a] voltage extremity"

Each challenged claim requires a control signal to be produced *in response to* a reference voltage representation *and* a voltage extremity representation of a battery. Ex. 1001, 13:35–44, 15:5–9, 16:43–48, 52–58, 61–67, 18:4–8. For example, claim 1 recites:

> producing a *control signal* for use in changing the amount of energy transfer between the energy bus and the system of batteries *in response to*:
>
> *a representation of a reference voltage* determined from an operating parameter *of a battery exhibiting a voltage extremity* in the system of batteries; *and*
>
> *a representation of said voltage extremity*.

Id. at 13:37–44 (emphases added) (hereafter the "in response to" limitation). Independent claims 27 and 52–55 each recite a similar limitation. By virtue of their dependency, dependent claims 2–9, 13–18, 20, 26, 28–34, 38–44, 46, 50, and 51 also require this limitation. Petitioner proffers no claim construction as to this limitation. Pet. 8–12.

Patent Owner asserts that this limitation requires a control signal to be produced in response to *both* a reference voltage representation *and* a voltage extremity representation. Prelim. Resp. 13−15. Patent Owner also asserts that, in the context of the '991 patent, the term "voltage extremity" refers to the highest or lowest voltage among a group of *measured* voltages, not voltages derived from calculations. *Id*. at 4−6 (citing Ex. 1001, 5:62−6:12, 9:45−67, 11:7−15, 13:13−16). Patent Owner further avers that the term "representation of" a voltage refers to the form in which the voltage value is used, such as "in the form of data 'words' or 'bytes,'" and the '991 patent uses "representation" and "value" interchangeably. *Id*. at 4, 15 (citing Ex. 1001, 6:17−18, 8:64−65, 9:13; Ex. 1002, 102).

We agree with Patent Owner. And we address each of Patent Owner's claim construction contentions in turn.

1. The word "and" conjoins two separate and distinct voltage representations that are associated with the same battery

We first note that the "in response to" limitation recites two separate elements, and uses the term "and" to conjoin the elements. *See, e.g.*, Ex. 1001, 13:35−44. The U.S. Court of Appeals for the Federal Circuit has held that the term "and" should be given its plain and ordinary meaning, interpreting "and" to mean "and," rather than to mean "or," when the written description does not compel a disjunctive construction for "and." *Medgraph, Inc. v. Medtronic, Inc.*, 843 F.3d 942, 950 (Fed. Cir. 2016).

Here, the specification of the '991 patent does not compel a disjunctive construction for the claim term "and." Notably, the specification repeatedly and consistently describes producing a control signal in response

to *both* voltage representations recited in the independent claims. *Id*. at Abstract, 1:53−62, 2:2−6, 2:21−26, 6:29−38, 10:48−55, 11:36−46, 13:17−19. Moreover, the prosecution history confirms that the claim term "and" means "and," rather than "or." For example, during prosecution, Applicant explained that "[t]he accessor gets [both] the extreme voltage representation and the reference voltage representation and provides *them* to the control signal generator which *generates a control signal in response to these two representations*." Ex. 1002, 106 (emphases added). Therefore, we construe the claim term "and" to mean "and," instead of "or," consistent with its plain and ordinary meaning, the specification, and the prosecution history of the '991 patent.

In addition, the specification confirms that the reference voltage representation and the voltage extremity representation are two separate and distinct elements. Figure 6 of the '991 patent is reproduced below.

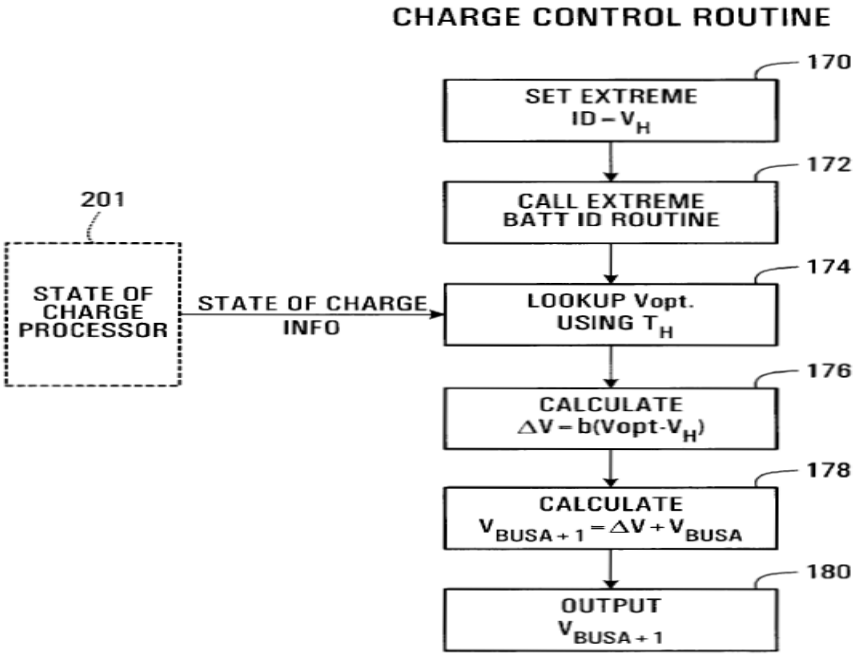


Figure 6 above depicts a flow chart of a charging control routine. At step 170, the extreme ID flag is set to *the highest measured voltage* in the system of batteries as the extreme voltage value. *Id*. at 11:7−11. At step 172, the processor obtains and stores the extreme voltage representation and the output parameter representation. *Id*. at 11:12−17.

At step 174, the processor finds *the optimal charging voltage value* V_{opt} (i.e., the reference voltage) using the operating parameter value. *Id*. at 11:23−32. Specifically, the processor uses the optimum voltage versus temperature table to find a corresponding optimal voltage value V_{opt}, using the operating parameter value (temperature) as an index to the table. *Id*.

At step 176, the processor is directed to produce a control signal in response to *both* the extreme voltage representation *and* the optimal charging voltage value V_{opt}, by calculating a voltage change value as a function of the difference between the optimal voltage value V_{opt} and the extreme voltage value. *Id*. at 11:36−55. The specification clearly indicates that the reference voltage representation (the optimal charging voltage value V_{opt}) is distinct from the extreme voltage representation.

Therefore, the claims and specification of the '991 patent make clear that the control signal is produced in response to two separate and distinct components. *See Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) ("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."). Furthermore, we note that the claim language "a representation of *a reference voltage* determined from an operating parameter of *a battery*

exhibiting a voltage extremity in the system of batteries" require both voltage representations to be associated with the *same battery*, i.e., "a battery," in the system of batteries.

For these reasons, we interpret the aforementioned "in response to" limitation to require a control signal to be produced in response to *both separately recited elements*: (1) a reference voltage representation, and (2) a voltage extremity representation, that are associated with the same battery.

2. "voltage extremity"

Patent Owner asserts that, in the context of the '991 patent, the term "voltage extremity" refers to the highest or lowest voltage among a group of *measured* voltages, not voltages derived from calculations. Prelim. Resp. 4–6 (citing Ex. 1001, 5:62–6:12, 9:45–67, 11:7–15, 13:13–16).

Patent Owner's proposed claim construction is consistent with the claim language (e.g., "a battery *exhibiting* a voltage extremity in the system of batteries"[2]), as well as the specification of the '991 patent. "Apart from the claim language itself, the specification is the single best guide to the meaning of a claim term." *AIA Eng'g Ltd. v. Magotteaux Int'l S/A*, 657 F.3d 1264, 1272 (Fed. Cir. 2011) (internal quotations and citation omitted). "[T]he protocol of giving claims their broadest reasonable interpretation . . . does not include giving claims a legally incorrect interpretation" "divorced from the specification and the record evidence." *Microsoft Corp. v.*

[2] The plain and ordinary meaning of "exhibit" includes "to show or display outwardly esp. by visible signs or actions." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY, 11TH ED. (2007) (Ex. 3001, 3).

Proxyconn, Inc., 789 F.3d 1292, 1298 (Fed. Cir. 2015) (citations and internal quotation marks omitted); *see also PPC Broadband, Inc. v. Corning Optical Commc'ns RF, LLC*, 815 F.3d 747, 751–53 (Fed. Cir. 2016).

Significantly, the specification consistently uses "voltage extremity" to refer to the highest or lowest among a set of *measured* voltages. Ex. 1001, 5:62−6:12, 9:50−67, 11:7−11. The specification explains that each battery in the system may *operate* at a different voltage, and normally, "one battery will have a higher voltage than all the rest and one battery will have a lower voltage than all the rest." *Id*. at 5:62−6:12. "This higher voltage and this lower voltage may be referred to as voltage extremities, or extreme voltages among the voltages of all of the batteries in the battery system 12." *Id*. Furthermore, the specification discloses that "the lowest voltage *measured* across any battery of the battery system 12 shown in FIG. 1 is to be taken as the extreme voltage for use in calculations," and the battery associated with the lowest *measured* voltage value is the battery exhibiting the extreme voltage value. *Id*. at 9:50−67 (emphasis added). Similarly, "the highest voltage *measured* across any battery in the system is to be taken as the extreme voltage value." *Id*. at 11:10−11 (emphasis added).

Therefore, we adopt Patent Owner's claim construction, interpreting the claim term "voltage extremity" as "the highest or lowest voltage among a group of measured voltages," consistent with the specification. *See In re Smith Int'l, Inc.*, 871 F.3d 1375, 1382−83 (Fed. Cir. 2017) (noting that "[t]he correct inquiry in giving a claim term its broadest reasonable interpretation in light of the specification . . . is an interpretation that corresponds with

what and how the inventor describes his invention in the specification, *i.e.*, an interpretation that is consistent with the specification") (citation and internal quotation marks omitted).

3. "representation of" a voltage

Patent Owner avers that the term "representation of" a voltage refers to the form in which the voltage value is used, such as "in the form of data 'words' or 'bytes,'" and the '991 patent uses "representation" and "value" interchangeably. Prelim. Resp., 4, 15 (citing Ex. 1001, 6:17−18, 8:64−65, 9:13; Ex. 1002, 102).

Patent Owner's proposed construction is consistent with the specification and prosecution history of the '991 patent. Notably, the specification discloses that "the controller 16 is operable to receive from the data acquisition system 14 representations of voltage and representations of at least one operating parameter for each battery," and "[t]he representations may be in the form of data 'words' or 'bytes.'" Ex. 1001, 6:13−18. During prosecution, Applicant cited to this disclosure to explain the term "representations." Ex. 1002, 101, 102. Moreover, the specification uses "representation" and "value" interchangeably. Ex. 1001, 8:64−65, 9:13, 11:7−65.

Accordingly, we adopt Patent Owner's claim construction, interpreting the term "representation of" a voltage as "the form in which the voltage value is used," such as "in the form of data 'words' or 'bytes,'" consistent with the specification and prosecution history of the '991 patent.

B. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness.[3] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

C. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). Petitioner asserts that a person with ordinary skill in the art would have had either (1) a degree in mechanical or electrical engineering, or a related field, and at least two years of experience (or the academic equivalent) in the field of battery energy control system design and

[3] Neither party presents evidence or arguments regarding objective evidence of nonobviousness in the instant proceeding at this time.

analysis; or (2) seven or ten years of experience (or the academic equivalent) in the field of battery energy control system design and analysis. Pet. 9 (citing Ex. 1004 ¶ 37). Patent Owner does not dispute Petitioner's assessment. *See generally* Prelim. Resp.

For purposes of this Decision, we apply Petitioner's assessment regarding the general knowledge of a person with ordinary skill in the art. We further note that the prior art of record in the instant proceeding reflects the appropriate level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (often "the prior art itself reflects an appropriate level" of ordinary skill in the art).

D. Asserted Grounds Based on Takahashi

Petitioner asserts that claims 1−8, 13−18, 20, 27−33, 38−44, 46, and 52−55 are unpatentable under § 103(a) as obvious over Takahashi. Pet. 12–60. Petitioner also asserts that claims 6 and 29−31 are obvious over Takahashi and Hoffman; claims 9 and 34 are obvious over Takahashi and Aranovich; and claims 26, 50, and 51 are obvious over Takahashi and Bourbeau. *Id*. at 61−74. To support its contentions, Petitioner cites to Dr. John Miller's Declaration. Ex. 1004.

Patent Owner counters that Petitioner fails to show that (1) Takahashi's calculated V_{Tmax} or V_{Tmin} meets the claimed "voltage extremity"; and (2) Takahashi produces a control signal "in response to" a representation of a reference voltage, and a representation of a voltage extremity, as required by each challenged claim. Prelim. Resp. 1−21. We agree with Patent Owner.

For the reasons provided below, we determine that Petitioner has not demonstrated a reasonable likelihood of prevailing on its assertion that claims 1−8, 13−18, 20, 27−33, 38−44, 46, and 52−55 are unpatentable.

Takahashi

Takahashi discloses a method for controlling charge or discharge of a battery for an electric vehicle. Ex. 1003, Abstract. Figure 2 of Takahashi is reproduced below with annotations added by Petitioner (Pet. 16).

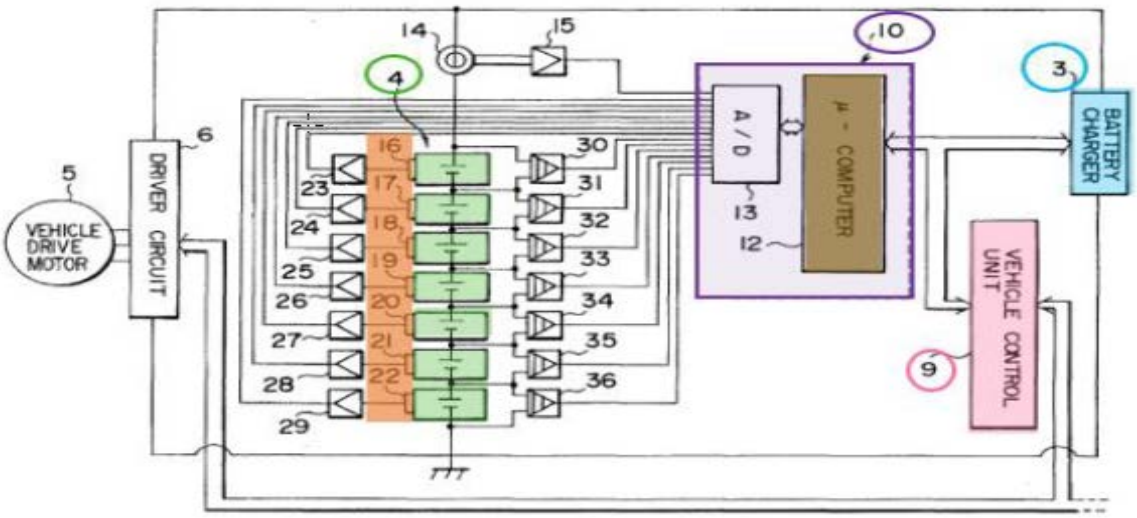


FIG. 2

Annotated Figure 2 above shows a battery management unit and its associated elements. Ex. 1003, 3:7−10. In particular, battery management unit 10 (purple) includes microcomputer 12 (brown) that executes the charge or discharge control processing of high voltage battery 4 (green) by outputting control commands to battery charger 3 (blue) and vehicle control unit 9 (pink). *Id*. at 3:59−5:22. High voltage battery 4 includes seven battery blocks. *Id*. at 4:47−50.

Figure 9 of Takahashi is reproduced below with annotations added by Petitioner (Pet. 20).

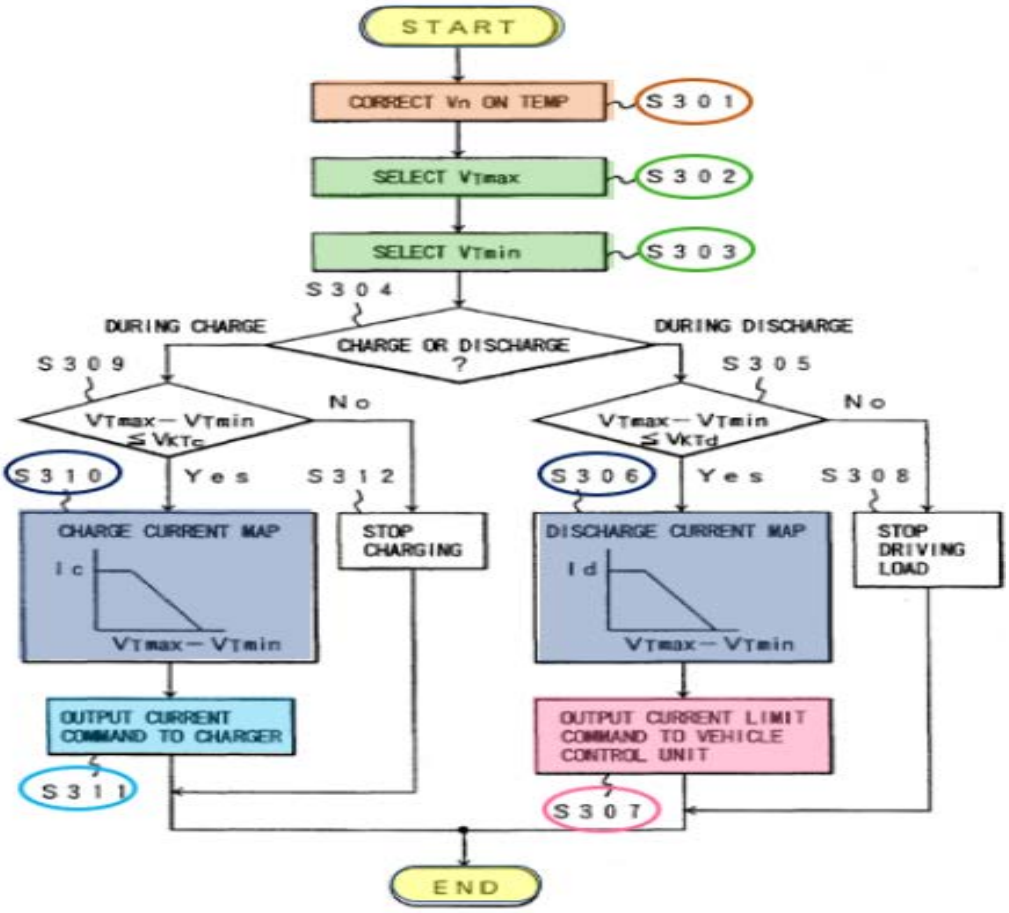


FIG. 9

Annotated Figure 9 above depicts a flowchart for a charge or discharge control processing. *Id.* at 3:35–37, 6:17–20, 8:20–29. In step S301 (orange), the control system obtains temperature T_n and temperature coefficient K_{Tn} of each block of the high voltage battery, and then *corrects detected voltage* V_n based on temperature correction coefficient K_T to obtain corrected voltage V_{Tn} of each block ($V_{T1}=K_{T1}\cdot V_1$, $V_{T2}=K_{T2}\cdot V_2$, $V_{T3}=K_{T3}\cdot V_3$, . . . $V_{T7}=K_{T7}\cdot V_7$). *Id.* at 8:31–41.

In steps S302 and S303 (green), the control system selects maximum value V_{Tmax} and minimum value V_{Tmin} among the *corrected* voltages V_{T1}, V_{T2}, V_{T3} . . . V_{T7}. *Id.* at 8:42–46. In step S304, the system checks whether the high voltage battery is being charged or discharged. In step S305, during discharge, the system calculates a difference between the two extreme values (V_{Tmax}–V_{Tmin}), and compares the calculated difference with an allowable specified value V_{KTd}. *Id.* at 8:62–9:3. If the compare result is V_{Tmax}–$V_{Tmin} \leq V_{KTd}$, the system proceeds to step S306. In steps S306 (navy), S307 (pink), S310 (navy), and S311 (light blue), the system outputs discharge and charge current limit commands I_d, I_c so that the current of high voltage battery will not exceed the current limits. *Id.* at 9:7–10.

Discussion

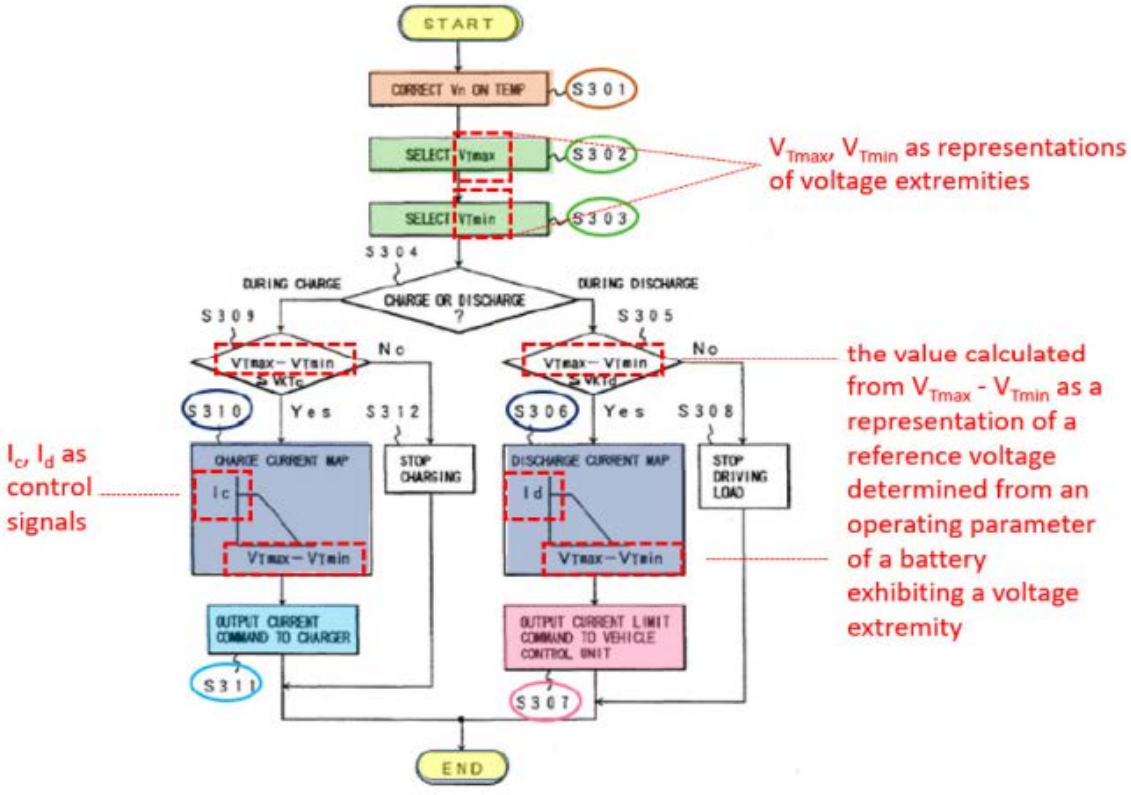
As noted above, each challenged claim requires a control signal to be produced *in response to* a reference voltage representation *and* a voltage extremity representation of a battery. Ex. 1001, 13:35–44, 15:5–9, 16:43–48, 52–58, 61–67, 18:4–8. For example, claim 1 recites:

> producing a *control signal* for use in changing the amount of energy transfer between the energy bus and the system of batteries *in response to*:
>
> *a representation of a reference voltage* determined from an operating parameter of *a battery exhibiting a voltage extremity* in the system of batteries; and
>
> *a representation of said voltage extremity*.

Id. at 13:37–44 (emphases added). As discussed in our claim construction analysis above, we interpret this limitation to require a control signal to be produced in response to *both* a representation of a reference voltage *and* a

representation of a voltage extremity that are associated with the same battery. We also interpret the claim term "voltage extremity" as "the highest or lowest voltage among a group of measured voltages," and the term "representation of" a voltage to mean "the form in which the voltage value is used," such as "in the form of data 'words' or 'bytes.'" The specification uses "representation" and "value" interchangeably. *Id*. at 8:64–65, 9:13, 11:7–65.

For each asserted ground, Petitioner relies on Takahashi to teach or suggest the "in response to" limitation. Pet. 13–26, 44–46, 56–74. In particular, Petitioner cites to Takahashi's embodiment shown in Figure 9, which is reproduced again below with color highlighting added by Petitioner (Pet. 20) and red annotations added by Patent Owner (Prelim. Resp. 2).



Annotated Figure 9 above depicts a flowchart for a charge or discharge control processing. As shown, Petitioner contends that: (1) I_d and I_c in steps S306 (navy), S307 (pink), S310 (navy), and S311 (light blue), correspond to the claimed "control signal" (Pet. 17–18); (2) V_{Tmax} and V_{Tmin} in steps S302 and S303 (green) correspond to the claimed representation of a voltage extremity (*id*. at 19, 22); and (3) their difference (V_{Tmax}–V_{Tmin}) in steps S305 and S309 corresponds to the claimed representation of a reference voltage (*id*. at 21–22; Ex. 1004 ¶ 65).

Patent Owner counters that I_d and I_c in Takahashi are not control signals produced "in response to" *both* a representation of a voltage extremity *and* a representation of a reference voltage. Prelim. Resp. 12–22. Patent Owner also argues that, because V_{Tmax} and V_{Tmin} are temperature *corrected* voltages, derived from calculations, neither V_{Tmax} nor V_{Tmin} meets the claimed "voltage extremity." *Id*. at 1–12. According to Patent Owner, the '991 patent indicates that the term "voltage extremity" requires an extremity among the *measured* voltages, not voltages derived from calculations. *Id*.

We agree with Patent Owner. As noted above, the claimed "control signal" must be produced in response to *two separately recited elements*: (1) a reference voltage representation, and (2) a voltage extremity representation, where both voltage representations are associated with the same battery.

In its analysis, Petitioner asserts that an ordinarily skilled artisan would have understood that Takahashi's charge and discharge current limit values (I_d, I_c) are produced in response to: (1) a representation of a

reference voltage ($V_{Tmax}-V_{Tmin}$) determined from an operating parameter (temperature) of a block exhibiting a voltage extremity (V_{Tmax} or V_{Tmin}) in the high voltage battery; and (2) a representation of the voltage extremity (V_{Tmax} or V_{Tmin}). Pet. 19; Ex. 1004 ¶ 65.

Petitioner's assertion, however, is conclusory and unsupported by Takahashi. As shown in Figure 9 of Takahashi (reproduced above), I_d and I_c are produced in response to only a single voltage value—the difference between the maximum temperature corrected voltage and the minimum temperature corrected voltage ($V_{Tmax}-V_{Tmin}$). Ex. 1003, 8:61−9:10, Fig. 9 (steps S305, S306, S309, S310). Dr. Miller also admits that Takahashi compares only the difference ($V_{Tmax}-V_{Tmin}$) with the specified discharge/charge value to produce I_d and I_c. Ex. 1004 ¶ 65. Therefore, Takahashi does not teach producing I_d and I_c in response to both (1) V_{Tmax} or V_{Tmin}, and (2) the difference ($V_{Tmax}-V_{Tmin}$), as Petitioner alleges.

Moreover, Petitioner improperly relies upon a single voltage value to account for two separate claimed elements. As noted above in our claim construction analysis, a reference voltage representation is separate and distinct from a voltage extremity representation, as the specification of the '991 patent confirms that the control signal is produced in response to these two separate voltage representations. Ex. 1001, 11:7−55, Fig. 6. At best, Takahashi teaches producing I_d and I_c in response to V_{Tmax} and V_{Tmin}. Ex. 1003, 8:61−9:10, Fig. 9 (steps S305, S306, S309, S310). However, Petitioner has not shown that these two voltages are associated with the same battery block, as required by the claims. Pet. 17−26. Therefore, we are not persuaded by Petitioner's argument that Takahashi's I_d and I_c are

produced in response to a reference voltage representation and a voltage extremity representation that are associated with the same battery block, as required by the challenged claims. *See Microsoft Corp.*, 789 F.3d at 1298–99 (vacating the Board's finding of unpatentability because the Board erred in concluding that "two other computers" could include the caching computer that was recited separately in the claim); *see also Smith Int'l*, 871 F.3d at 1383–84 (reversing the anticipation and obviousness rejections because the examiner arbitrarily included separately described components to the term "body").

In addition, we are not persuaded by Petitioner's argument that V_{Tmax} or V_{Tmin} in Takahashi is a representation of a voltage extremity, as required by the claims. Pet. 19–22. As discussed above in our claim construction analysis, we interpret the claim term "voltage extremity" as "the highest or lowest voltage among a group of *measured* voltages." Takahashi's V_{Tmax} and V_{Tmin} are *not* selected among the *measured* voltages. Rather, as Dr. Miller admits, "V_{Tmax} and V_{Tmin} represent the maximum and minimum temperature *corrected* voltages." Ex. 1004 ¶ 65 (emphasis added).

Indeed, Takahashi discloses that V_{Tmax} and V_{Tmin} are the highest and lowest voltages among the *calculated* temperature-corrected voltages. Ex. 1003, 8:31–46. Specifically, the temperature-corrected voltage of each block is *calculated* by multiplying the *detected* voltage of the block by a temperature correction coefficient ($V_{T1}=K_{T1}\cdot V_1$, $V_{T2}=K_{T2}\cdot V_2$, $V_{T3}=K_{T3}\cdot V_3$ . . . $V_{T7}=K_{T7}\cdot V_7$). *Id*. According to Takahashi, "the temperature correction coefficients K_T hav[e] a negative gradient (i.e., the coefficients K_T decrease[] with increasing temperature T)" because, in general, the battery

voltage tends to increase with increasing temperature. *Id*. at 8:47−56. In short, Takahashi's V_{Tmax} and V_{Tmin} are selected from *calculated* voltages, not *measured* voltages as required by the challenged claims as properly construed.

Furthermore, Petitioner's argument that V_{Tmax} or V_{Tmin} is a representation of a voltage extremity also is based on the assumption that V_{Tmax} and V_{Tmin} are calculated based on the highest and lowest *measured* voltages. However, Takahashi makes clear that, only *after* the system corrects each block's *measured* voltage, it then selects V_{Tmax} and V_{Tmin} among the *calculated* voltages. *Id*. at 8:20−9:10. Nothing in Takahashi indicates that the block that has the highest or lowest *calculated* voltage would be the same block exhibiting the highest or lowest *measured* voltage. *Id*. For example, Block 1 may exhibit the highest *measured* voltage among the measured voltages, but a different block (e.g., Block 2) may have the highest *calculated* voltage among the calculated voltages. Hence, V_{Tmax} would be the *calculated* voltage of Block 2, not Block 1. Petitioner does not explain why the *calculated* voltage of one block would be a representation of the *measured* voltage of a *different* block. Pet. 17−26; Ex. 1004 ¶¶ 60−69.

Therefore, Petitioner's argument that V_{Tmax} or V_{Tmin} is a representation of a voltage extremity is not supported by Takahashi, but merely based on speculation or conjecture. As our reviewing court has explained, "legal determinations of obviousness . . . should be based on evidence rather than on mere speculation or conjecture." *Alza Corp. v. Mylan Labs., Inc.*, 464 F.3d 1286, 1290 (Fed. Cir. 2006); *see also Star Sci.*,

Inc. v. R.J. Reynolds Tobacco Co., 655 F.3d 1364, 1375-76 (Fed. Cir. 2011) (prior art's "speculative and tentative disclosure of what 'might' or 'may' [explain the cause of a desired effect] does not sufficiently direct or instruct one of skill in this art").

For the foregoing reasons, we determine that Petitioner does not show sufficiently that Takahashi teaches or suggests the "in response to" limitation as recited in independent claims 1, 27, and 52−55, and as required by dependent claims 2−9, 13−18, 20, 26, 28−34, 38−44, 46, 50, and 51. Petitioner does not cite to Hoffman, Aranovich, and Bourbeau for this limitation. Pet. 61−75.

Conclusion on Obviousness

Accordingly, we determine that Petitioner has not shown a reasonable likelihood of prevailing on its assertions that claims 1−8, 13−18, 20, 27−33, 38−44, 46, and 52−55 are unpatentable under § 103(a) as obvious over Takahashi, that claims 6 and 29−31 are obvious over Takahashi and Hoffman, that claims 9 and 34 are obvious over Takahashi and Aranovich, and that claims 26, 50, and 51 are obvious over Takahashi and Bourbeau. *Id*. at 61−74.

III. CONCLUSION

For the foregoing reasons, the information presented in the Petition and evidence in this record do not establish that there is a reasonable likelihood that Petitioner would prevail in challenging claims 1–9, 13−18, 20, 26−34, 38−44, 46, and 50−55 of the '991 patent.

IV. ORDER

Accordingly, it is

ORDERED that the Petition is *denied*, and no trial is instituted.

For PETITIONER:

M. Andrew Holtman
David Reese
Abhay Watwe
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
andrew.holtman@finnegan.com
david.reese@finnegan.com
abhay.watwe@finnegan.com

For PATENT OWNER:

Scott Kamholz
Jennifer Robbins
COVINGTON & BURLING LLP
skamholz@cov.com
jrobbins@cov.com