

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

MICHIGAN MOTOR TECHNOLOGIES LLC,
Patent Owner.

IPR2020-00446
Patent 6,763,804 B2

Before NEIL T. POWELL, SCOTT B. HOWARD, and
SEAN P. O'HANLON, *Administrative Patent Judges*.

O'HANLON, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Volkswagen Group of America, Inc. (“Petitioner”) filed a Petition for *inter partes* review of claims 1–20 (“the challenged claims”) of U.S. Patent No. 6,763,804 B2 (Ex. 1001, “the ’804 patent”). Paper 1 (“Pet.”), 1. Michigan Motor Technologies LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

Institution of an *inter partes* review is authorized by statute only when “the information presented in the petition . . . and any response . . . 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.” 35 U.S.C. § 314(a) (2018). Further, a decision to institute may not institute on fewer than all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018).

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). For the reasons set forth below, upon considering the Petition, Preliminary Response, and evidence of record, we conclude that the information presented shows that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one of the challenged claims.

B. Real Parties in Interest

Petitioner identifies itself and its parent company, Volkswagen Aktiengesellschaft, as the real parties in interest. Pet. 1.

Patent Owner identifies itself as the sole real party in interest.
Paper 3, 2.

C. Related Matters

The parties indicate that the '804 patent is the subject of the following district court proceeding:

Michigan Motor Technologies LLC v. Volkswagen Aktiengesellschaft, No. 2:19-cv-10485 (E.D. Mich. filed Feb. 18, 2019).

Pet. 2; Paper 3, 2. We note that the '804 patent was also the subject of the following district court proceeding:

Michigan Motor Technologies LLC v. Hyundai Motor Company, No. 2-17-cv-12901 (E.D. Mich. filed Sept. 1, 2017).

D. The Challenged Patent

The '804 patent discloses an electronic throttle servo temperature protection system for an internal combustion engine. Ex. 1001, 1:6–8. The '804 patent recognizes that modern vehicles use electronic throttle control systems having a throttle control unit and a processor to control the fuel-air mixture that is introduced into the engine. *Id.* at 1:22–28. Such systems position the throttle plate using an actuator or servomotor that is designed to have the maximum control effort available (motor voltage, current, duty cycle) to enhance the throttle plate position response. *Id.* at 1:36–39. However, overuse of such a large control effort could lead to overstressing or overheating the system's physical components if a blockage of the throttle plate occurs or the mechanism encounters a mechanical limit, such as an open stop or a close stop. *Id.* at 1:39–47. Known systems avoid damage

caused by this overuse by shutting down when a threshold temperature is reached. *Id.* at 1:47–49.

The '804 patent purports to improve upon such known systems by detecting the control effort exerted by a positioning device to change the position of the throttle plate, determining whether the control effort exceeds a threshold for a predetermined time, and, if so, reducing the control effort. Ex. 1001, 2:2–9. Figure 2 is a flow chart of the process and is reproduced below:

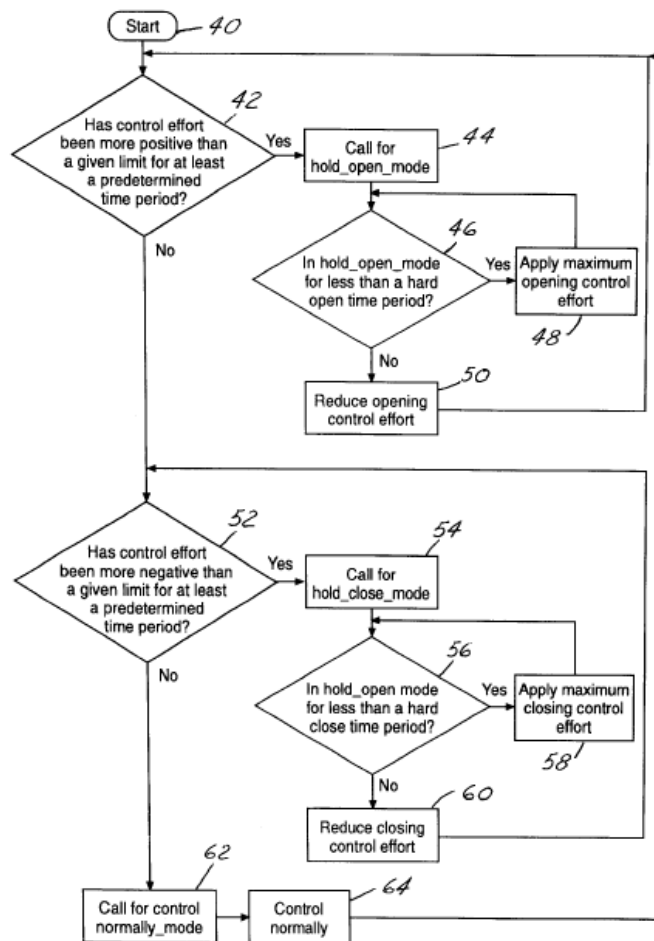


FIG. 2

Figure 2 is a flow chart depicting a method of providing electronic throttle servo overheating protection. *Id.* at 3:21–24. First, the controller determines if

the control effort has been more positive than a predetermined limit for a predetermined time period (step 42). *Id.* at 3:26–28. If so, the system initiates a hold open mode (step 44) in which full voltage is applied in the throttle opening direction to clear or crush any small debris obstructing movement of the throttle plate. *Id.* at 3:31–34, 4:10–12. If the system determines that the throttle plate has been in the hold open mode for longer than a predetermined time period (step 46), then the system reduces the opening control effort to a level that can be maintained indefinitely without causing the motor to overheat (step 50) and the process begins anew. *Id.* at 3:65–4:7.

If the controller determines that the control effort has not exceeded the positive limit for the requisite time for the hold open mode (step 42), then the controller determines if the control effort has been more negative than a predetermined limit for a predetermined time period (step 52). *Ex.* 1001, 4:15–19. If so, the system initiates a hold close mode (step 54) in which full voltage is applied in the throttle closing direction to clear or crush any small debris obstructing movement of the throttle plate. *Id.* at 4:21–24, 4:45–47. If the system determines that the throttle plate has been in the hold close mode for longer than a predetermined time period (step 56), then the system reduces the closing control effort to a level that can be maintained indefinitely without causing the motor to overheat (step 60) and the process begins anew. *Id.* at 4:33–43.

E. The Challenged Claims

Petitioner challenges claims 1–20 of the '804 patent, of which claims 1 and 11 are independent. Pet. 1, 3. Claim 1 is illustrative of the challenged claims and is reproduced below:

1. A method for controlling a positioning device of an internal combustion engine, the method comprising the steps of:
providing an electric motor for actuating the positioning device;
commanding the positioning device to change to a commanded position;
detecting a control effort required to change to said commanded position;
determining whether said control effort exceeds a threshold for a predetermined time period; and
reducing said control effort when said control effort exceeds said threshold for said predetermined time period;
wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to [cl]ose to a hold close mode.¹

Ex. 1001, 5:12–31.

F. Asserted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
Burney	US 4,656,407, issued April 7, 1987	1006
Itabashi	US 6,329,777 B1, issued December 11, 2001	1007

¹ For reasons set forth below, and for purposes of institution, we have corrected claim 1 to reflect the language as filed during prosecution of the application resulting in the '804 patent. *See* Ex. 1002, 70–71.

Name	Reference	Exhibit
Matsumoto	US 6,073,610, issued June 13, 2000	1008
Ohta	US 4,982,710, issued January 8, 1991	1020
<i>General Motors Reference Manual</i> 78–79, 94–95 (7th ed. 1995) (“GM Manual”)		1023
<i>Chrysler Front Wheel Drive 1981-92 Repair Manual</i> (1992) (“Chrysler Manual”)		1024
Ritenour	US 4,645,992, issued February 24, 1987	1027

Petitioner asserts the following grounds of unpatentability:

Claims Challenged	35 U.S.C. §	Reference(s)
1, 4, 7, 8, 11, 14, 15, 18	103(a) ²	Itabashi
2, 5, 9, 12, 16, 19	103(a)	Itabashi, GM Manual, Chrysler Manual
3, 6, 10, 13, 17, 20	103(a)	Itabashi, Ohta
1, 4, 7, 8, 11, 14, 15, 18	103(a)	Matsumoto, Burney, Ritenour
2, 5, 9, 12, 16, 19	103(a)	Matsumoto, Burney, Ritenour, GM Manual, Chrysler Manual
3, 6, 10, 13, 17, 20	103(a)	Matsumoto, Burney, Ritenour, Ohta

Pet. 3. Petitioner submits a declaration of Gerald J. Micklow, Ph.D., PE (Ex. 1003, “Micklow Declaration”) in support of its contentions. Patent Owner submits a declaration of Russell A. Leonard, Jr., Ph.D. (Ex. 2001) in support of its preliminary responses.

² The application resulting in the ’804 patent was filed prior to the date when the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (2011), took effect. Thus, we refer to the pre-AIA version of section 103.

II. ANALYSIS

A. Principles of Law

Petitioner bears the burden of persuasion to prove unpatentability, by a preponderance of the evidence, of the claims challenged in the Petition. 35 U.S.C. § 316(e). This burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). The Board may authorize an *inter partes* review if we determine that the information presented in the Petition and Patent Owner's Preliminary Response shows that there is a reasonable likelihood that Petitioner will prevail with respect to at least one of the claims challenged in the petition. 35 U.S.C. § 314(a).

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 the 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) any objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner contends that a person having ordinary skill in the art at the time of the invention (“POSA”) “would have had a B.S. degree in Mechanical Engineering or Electrical Engineering (or equivalent) and at

least two to four years of academic or industry experience in the relevant field of engine control systems.” Pet. 7 (citing Ex. 1003 ¶¶ 51–53).

Patent Owner contends that a person having ordinary skill in the art at the time of the invention “is a person with (1) a B.S. in mechanical engineering or a closely related field with three or more years’ experience in either engine systems or engine control systems or (2) at least a M.S. in mechanical engineering.” Prelim. Resp. 7–8 (citing Ex. 2001 ¶ 14).

The parties do not identify, and we do not discern, any material difference between the parties’ proposed definitions. We note that both parties’ definitions require a bachelor’s degree in engineering, such as mechanical engineering, or the equivalent with either a few years of industry or academic (such as that required to obtain a master’s degree in mechanical engineering) experience. For purposes of this decision and based on the record currently before us, we adopt Petitioner’s proposed definition of the level of ordinary skill, which is focused on the field of engine control systems. We note that the ’804 patent and the prior art of record are generally directed to electronic throttle control systems for internal combustion engines. *See, e.g.*, Ex. 1001, 1:6–8; Ex. 1007, 1:13–16; Ex. 1008, 1:7–12; *see also In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (approving the determination of the level of ordinary skill in the art by appeal to the references of record). Also, we note that we would reach the same conclusions under either proposed standard.

C. Claim Construction

In an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil

action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b) (2019). Thus, we apply the claim construction standard as set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

Claim terms are generally given their ordinary and customary meaning as would be understood by one with ordinary skill in the art in the context of the specification, the prosecution history, other claims, and even extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Phillips*, 415 F.3d at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

Only those terms that are in controversy need be construed, and only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner argues that we should construe “dose,” recited in claims 1 and 8, as “close” to correct a printing error in the claims. Pet. 7 (citing Ex. 1003 ¶ 55). Petitioner argues that “[t]he Board can use claim construction to correct minor typographical or clerical errors.” *Id.* (citing *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1357 (Fed. Cir. 2003); *Ultimax Cement Mfg. Corp. v. CTS Cement Mfg. Corp.*, 587 F.3d

1339, 1353 (Fed. Cir. 2009)). Petitioner contends that “all other terms should receive their plain and ordinary meaning.” *Id.*

Patent Owner contends that “[n]one of the claim terms require specific construction and should receive their plain and ordinary meaning.” Prelim. Resp. 8. Notably, Patent Owner does not address Petitioner’s proposed construction of “dose.” *Id.*

A district court may

correct an error in a patent by interpretation of the patent where no certificate of correction has been issued . . . only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims.

Novo Indus., 350 F.3d at 1354; *see also CBT Flint Partners, LLC v. Return Path, Inc.*, 654 F.3d 1353, 1358 (Fed. Cir. 2011) (holding obvious errors in a claim may be corrected in construing the claim). The Board has applied this same standard in our proceedings. *See, e.g., Research Prods. Corp. v. Honeywell Int’l Inc.*, IPR2018-00976, Paper 6 at 13–14 (PTAB Nov. 7, 2018) (Decision Granting Institution) (applying *Novo Industries* and holding that “one of more programmable characters” was obvious error; corrected to “one or more programmable characters”); *Apple Inc. v. Achates Reference Publ’g, Inc.*, IPR2013-00080, Paper 22 at 10–12 (PTAB June 3, 2013) (Decision Granting Institution) (applying *Novo Industries* and holding that “authorization code” was correctable to “authentication code”); *Google LLC v. Uniloc 2017 LLC*, IPR2020-00441, Paper 13 at 18–19 (PTAB July 17, 2020) (Decision Granting Institution) (applying *Novo Industries* and holding that “identifying . . . the remote computing device fingerprint and by a requesting location” was correctable to “identifying . . . the remote

computing device by a device fingerprint and by a requesting location”). But “courts may not redraft claims, whether to make them operable or to sustain their validity.” *Chef Am., Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1374 (Fed. Cir. 2004). The burden is on Petitioner to show that a claim contains the kind of error that is considered a drafting error. 37 C.F.R. § 42.20(c).

During prosecution of the application resulting in the ’804 patent, the Applicant added claim 9, which issued as claim 8, and claim 23, which issued as claim 1, via amendment. Ex. 1002, 69–71. Claim 9 recited “[t]he method as recited in claim 8, further comprising the step of applying a maximum control effort to the positioning device for a hard *close* time period,” and claim 23 recited, in relevant part, “wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to *close* to a hold close mode.” *Id.* (emphases added). The claims were allowed without amendment. *Id.* at 75–80. However, when the ’804 patent issued, each instance of “close” emphasized above was erroneously printed as “dose.” Ex. 1001, 5:31, 5:50. We note that, other than in claims 1 and 8, the word *dose* does not appear in the ’804 patent.

Accordingly, at this stage of the proceeding, we agree with Petitioner’s contention that “dose” as recited in claims 1 and 8 is an evident typographical or clerical error the true meaning of which is not subject to reasonable debate. We therefore interpret “dose” in these claims to be “close.”

At this time, we determine that no further express construction of any term is necessary. The parties are hereby given notice that claim construction, in general, is an issue to be addressed at trial. A final determination as to claim construction will be made at the close of the proceeding, after any hearing, based on all the evidence of record. The parties are expected to assert all of their claim construction arguments and evidence in the Petition, Patent Owner's Response, Petitioner's Reply, or otherwise during trial, as permitted by our rules.

D. Overview of the Prior Art

1. Burney

Burney discloses a method and system for controlling an electric servo motor of a vehicle cruise control system. Ex. 1006, 1:6–15. Burney recognizes that a problem can occur in known systems if the system directs the motor to move beyond the fully open position or the fully closed position, which can cause damage to the motor, gearing, and linkage between the motor and the throttle valve. *Id.* at 2:13–31. Previous systems have overcome this problem by using limit switches that shut the motor off when the throttle reaches its fully open or idle positions. *Id.* at 2:31–34. However, this solution requires each system to be adjusted individually and the manufacturer to keep large stocks of parts on hand, increasing costs and inefficiencies. *Id.* at 2:35–64.

Burney purports to improve upon such known systems by providing a limit detection circuit that terminates the current supplied to the motor. Ex. 1006, 3:5–21. The system compares a signal indicative of the vehicle speed with a signal indicative of the desired speed to generate an error

signal. *Id.* at 7:25–37. If the error signal is outside of a predetermined range, the motor drive circuit causes the motor to rotate one way or the other. *Id.* at 7:45–49, 9:66–10:16. However, if the system detects an increase in the motor drive current resulting from attempts to move the throttle valve beyond its limits, the system will terminate the supply of drive current to the motor. *Id.* at 3:22–35, 7:51–63, 10:17–43.

2. *Itabashi*

Itabashi discloses a control apparatus that limits the current provided to a motor driven throttle valve in an internal combustion engine. Ex. 1007, 1:13–16. In a normal mode of operation, when the driver moves the accelerator pedal, the engine control circuit drives the motor at 100% duty cycle to quickly adjust the throttle valve to the target position. *Id.* at 6:46–57. When the actual throttle valve position is within a predetermined range from the target position, the engine control circuit brakes the motor to stop the throttle valve by driving the motor at 100% duty cycle in the reverse direction. *Id.* at 6:63–7:3.

Itabashi recognizes that foreign objects may jam the throttle valve and water may cause the throttle valve to freeze in place. Ex. 1007, 1:28–37. Providing a high current to the motor under these circumstances may cause harm to the circuits. *Id.* at 1:30–33. Therefore, if the length of time that the 100% duty cycle is applied to the motor (in either the moving or braking direction) exceeds a predetermined length, the current supplied to the motor is reduced to a level to reduce heat generation within the circuit. *Id.* at 7:18–43, 8:25–36. If the throttle does not reach the target position within a second predetermined time length, the current supply to the motor is turned off. *Id.* at 7:60–8:3.

3. *Matsumoto*

Matsumoto discloses a method and system for controlling an electronic throttle valve for an internal combustion engine. Ex. 1008, 1:7–12. Matsumoto recognizes that existing fuel injection systems vary the fuel injection mode depending on vehicle operating conditions and that electronic throttle control systems using accelerator pedal position as the only input may not indicate the delivery of enough air to the engine in low load conditions. *Id.* at 1:42–2:37. Therefore, Matsumoto provides an air bypass valve device to provide additional air to the engine. *Id.* at 4:11–16. Matsumoto also discloses detecting failures in the engine control system, such as a stuck throttle valve, and describes safe operating modes for such failures. *See, e.g., id.* at 8:62–9:67.

4. *Ohta*

Ohta discloses a method and system for controlling an electronic throttle valve of an internal combustion engine. Ex. 1020, 1:6–10. Ohta recognizes that electronically actuated throttle valves are known and purports to improve upon these known systems by changing control variables in response to changing conditions of the throttle valve. *Id.* at 1:13–62. For example, Ohta recognizes that excessive torque may cause the vehicle wheels to slip. *Id.* at 3:5–9. Ohta prevents this wheel slip by providing tandem throttle valves, the opening of one being controlled by a traction control system via a direct current motor to adjust the engine output so that wheel slip is suppressed. *Id.* at 2:58–65, 3:10–19.

5. *GM Manual*

The GM Manual is a 1995 reference manual for General Motors vehicles that discloses, *inter alia*, throttle and idle control parameters and electrical and ignition parameters. Ex. 1023, 3–4. The GM Manual discloses that the battery powering the vehicle electrical system typically has a regulated voltage of 13.5–14.5 volts with the vehicle engine at idle. *Id.* at 4.

6. *Chrysler Manual*

The Chrysler Manual is a 1992 reference manual for Chrysler front wheel drive vehicles. Ex. 1024, 1, 6. The Chrysler Manual discloses that alternator and regulator specifications for 1981–87 Chrysler vehicles called for a voltage of 13.9–14.6 volts at 80° F. *Id.* at 110.

7. *Ritenour*

Ritenour discloses a drive circuit for a servo motor that inhibits power when the servo motor is driven to its mechanical limits. Ex. 1027, 1:8–11. Ritenour recognizes that when the moving element in a servo system reaches its mechanical limits, the motor is stalled and the drive current increases to a level that could cause damage to the motor. *Id.* at 1:13–19. Ritenour purports to improve upon such known systems by sensing when the drive current exceeds a threshold level for a predetermined time period and terminating the flow of current. *Id.* at 1:30–35, 1:60–64, 3:25–45.

E. Challenge Based on Itabashi

Petitioner argues that claims 1, 4, 7, 8, 11, 14, 15, and 18 would have been obvious in view of Itabashi. Pet. 18–38. In support of its showing,

Petitioner relies upon the Micklow Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner’s assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that claims 1, 4, 7, 8, 11, 14, 15, and 18 would have been obvious over Itabashi.

1. Independent Claim 1

Petitioner contends that Itabashi recites each element of claim 1 and, to the extent that Itabashi does not explicitly disclose a hold close mode, Petitioner argues that it would have been obvious to command Itabashi’s throttle to close to a hold close mode. Pet. 18–30.

a. Preamble

Claim 1 recites “[a] method for controlling a positioning device of an internal combustion engine.” Ex. 1001, 5:12–14. Petitioner maps Itabashi’s throttle valve to the recited positioning device and argues that Itabashi uses a motor drive control apparatus to control the throttle valve. Pet. 18–19 (citing Ex. 1003 ¶ 104; Ex. 1007, 1:13–16. 8:16–36).

Patent Owner does not address the preamble. *See generally* Prelim. Resp.

Itabashi discloses a control apparatus that limits the current provided to a motor-driven throttle valve in an internal combustion engine. Ex. 1007, 1:13–16. Thus, to the extent that the preamble is limiting, Itabashi supports Petitioner’s contentions.

b. Providing

Claim 1 recites “providing an electric motor for actuating the positioning device.” Ex. 1001, 5:15–16. Petitioner maps Itabashi’s motor to the recited motor and argues that “motor 13 is for actuating the positioning device because the motor actuates the throttle valve 12.” Pet. 19 (citing Ex. 1003 ¶ 105; Ex. 1007, 2:54–56, 3:7–10).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Itabashi’s system includes electrically-driven direct current motor 13 that produces a torque for driving throttle valve 12. Ex. 1007, 2:48–56. Thus, Itabashi supports Petitioner’s contentions.

c. Commanding

Claim 1 recites “commanding the positioning device to change to a commanded position.” Ex. 1001, 5:17–18. Petitioner argues that Itabashi’s drive command signals A1–A4 are produced by engine control circuit 15 and transmitted to drive control circuit 18 to command the throttle to move to a target position, which Petitioner maps to the recited commanded position. Pet. 19–21 (citing Ex. 1003 ¶ 106; Ex. 1007, 3:7–10, 6:28–57, 8:6–36, Figs. 1–3).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Itabashi discloses that

engine control circuit 15 produces drive command signals A1–A4 to a drive control circuit 18 in correspondence with the output signals of the throttle sensor 14 and the accelerator sensor 17. Thus, the drive control circuit 18 drives the motor 13

to rotate the throttle valve 12 to a target position corresponding to the detected actual accelerator position.

Ex. 1007, 3:4–10. Thus, Itabashi supports Petitioner’s contentions.

d. Detecting

Claim 1 recites “detecting a control effort required to change to said commanded position.” Ex. 1001, 5:19–20. Petitioner interprets “control effort” as the motor voltage, current, or duty cycle and identifies three ways in which it asserts that Itabashi satisfies this recitation. Pet. 21–23 (quoting Ex. 1001, 1:36–39). First, Petitioner asserts that the generation of command signals A1–A4 based on the output of the throttle and accelerator sensors satisfies the recited detecting. *Id.* at 21–22 (citing Ex. 1003 ¶ 109; Ex. 1007, 2:66–3:7). Second, Petitioner argues that current detection circuit 21 detects the current supplied to the motor. *Id.* at 22–23 (citing Ex. 1003 ¶ 110; Ex. 1007, 3:11–16, 6:36–39, 6:46–51, Figs. 1–2). Third, Petitioner asserts that “the drive circuit 20 uses MOSFETs 22–25 to detect the control effort required to move the throttle to the commanded position” and “[t]he MOSFETs detect the control effort from the drive logic circuit 19.” *Id.* at 23 (citing Ex. 1003 ¶ 111; Ex. 1007, 3:33–42, 3:48–51, 6:1–5, 6:19–24, 6:66–7:3, Figs. 2–3). Considering the first and third alternatives, Petitioner does not appear to explain with sufficient clarity how the asserted teachings of Itabashi correspond to the claim recitation. Regarding Petitioner’s first alternative, Petitioner does not explain adequately how the generation of command signals A1–A4 constitutes detection of motor voltage, current, or duty cycle, which, as noted above, Petitioner interprets the recited control effort to mean. Regarding Petitioner’s third alternative, Petitioner makes general assertions but does not identify or explain with sufficient specificity

what aspect of Itabashi's system corresponds to the recited control effort. Furthermore, we note that Petitioner only addresses its second alternative (motor current) for subsequent recitations of "control effort." *See, e.g.*, section II.E.1.e below. Thus, we address only Petitioner's mapping of Itabashi's detection of current supplied to motor 13 by current detection circuit 21.

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Itabashi's "drive control circuit 18 includes . . . a current detection circuit 21 which detects a motor current, i.e., an electric current supplied from the drive circuit 20 to the motor 13." Ex. 1007, 3:11–16. Thus, Itabashi supports Petitioner's contentions.

e. Determining

Claim 1 recites "determining whether said control effort exceeds a threshold for a predetermined time period." Ex. 1001, 5:22–23. Petitioner maps this recitation to Itabashi's "determin[ation of] whether the motor current (the control effort) exceeds V_{ref} (a threshold) for a predetermined time period (t_{38})." Pet. 23 (citing Ex. 1003 ¶¶ 73–78, 113–118).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Itabashi discloses that, when the target throttle position is changed, "the engine control circuit 15 drives the motor 13 with the motor current of 100% duty ratio during the time period t_1 so that the actual throttle position approaches the target throttle position in a short period of time." Ex. 1007, 6:46–51. Normally, the current is not limited during time period t_1 "because the count time t_{1a} of the timer 38, i.e., the period in which the motor current

exceeds the limit level, does not reach the time period t38 which defines the timing for starting the current limit operation.” *Id.* at 6:57–62. However, “[i]f the period t1a of continuation of supplying the motor current in excess of the limit level counted by the timer 38 exceeds the time period t38, the current limit operation is effected.” *Id.* at 7:23–27. When this occurs, “the MOSFET 24 is turned off temporarily to limit the motor current to be less than the limit level each time the motor current exceeds the limit level.” *Id.* at 7:39–42; *see also id.* at Fig. 4. Thus, Itabashi supports Petitioner’s contentions.

f. Reducing

Claim 1 recites “reducing said control effort when said control effort exceeds said threshold for said predetermined time period.” Ex. 1001, 5:24–26. Petitioner argues that “[a]fter the motor current exceeds Vref for predetermined time period t38, Itabashi reduces the motor current.” Pet. 25 (citing Ex. 1003 ¶ 119; Ex. 1007, Fig. 4).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

As discussed in section II.E.1.e above, Itabashi’s system reduces the current supplied to motor 13 when the current exceeds limit level Vref for a time longer than time period t38. Ex. 1007, 3:64–4:1, 7:23–42, Fig. 4. Thus, Itabashi supports Petitioner’s contentions.

g. Hold Mode

Claim 1 recites “wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the

positioning device to [cl]ose to a hold close mode.” Ex. 1001, 5:27–31. Relying on Figure 3, Petitioner argues that “[t]he command signals A1-A4 command the throttle to open to a hold open mode because the command signals A1-A4 command the throttle to move to and hold at the full open position.” Pet. 27–28 (citing Ex. 1003 ¶ 123). Petitioner relies on the “FULL OPEN” language provided in Figure 3. *Id.* at 28.

Petitioner asserts that “[c]ommand signals A1-A4 can also command the throttle to close to a hold close mode because the range of movement of the throttle valve is from ‘FULL OPEN’ to ‘FULL CLOSE.’” Pet. 28 (citing Ex. 1003 ¶ 125; Ex. 1007, Figs. 3–4). Petitioner argues that Itabashi’s engine braking constitutes moving the throttle to a closed position. *Id.* at 28–29 (citing Ex. 1003 ¶ 126; Ex. 1007, 1:66–2:6, 5:21–35, 7:57–59, 8:11–36, Figs. 3–4). Petitioner also argues that it would have been obvious “to command [Itabashi’s] throttle to close, and remain closed.” *Id.* at 29 (citing Ex. 1003 ¶¶ 127–129). Petitioner cites to several exhibits, and to Burney in particular, and asserts that it would have been well known to close Itabashi’s throttle to a hold close mode. *Id.* at 29–30 (citing Ex. 1003 ¶¶ 63–64, 128; Ex. 1005, code (57), 1:25–29; Ex. 1006, 11:7–11, 14:46–56; Ex. 1009, 4:14–20, 4:51–63, 6:11–14, 6:27–32, 6:40–45, Figs. 5–6; Ex. 1011, code (57), Figs. 4A–4D; Ex. 1016, 4:10–15, Fig. 2).

We note that none of Petitioner’s citations to Itabashi’s disclosure explicitly mention moving the throttle to a fully open or a fully closed position, which Petitioner equates to the hold open and hold close modes, respectively. *See* Pet. 27–28 (“The command signals A1-A4 command the throttle to open to a hold open mode because the command signals A1-A4 command the throttle to move to and hold at the full open position”;

“Command signals A1-A4 can also command the throttle to close to a hold close mode because the range of movement of the throttle valve is from ‘FULL OPEN’ to ‘FULL CLOSE.’”). Notably, Figures 3 and 4 disclose “FULL OPEN” and “FULL CLOSE” throttle positions, but show the throttle target value (which, as noted above, Petitioner maps to the recited commanded position) being slightly below the full open position and slightly above the full close position. Additionally, regarding Petitioner’s contentions that it would have been obvious to modify Itabashi to have a fully closed commanded position, Petitioner merely cites to several exhibits without providing sufficient explanation to support the assertion that commanding a throttle to move to a fully closed position was well known. *See id.* at 29–30. In particular, the cited portion of Burney does not seem to disclose explicitly commanding the throttle to move to a fully closed position when the vehicle is traveling down a steep hill as asserted by Petitioner. *Id.* (citing Ex. 1006, 13:9–23).

Patent Owner argues that “*Itabashi* does not disclose commanding the positioning device to a hold open or hold closed mode, period, much less then determining whether the control effort required to move the positioning device to the commanded position exceeds a threshold for a predetermined time period.” Prelim. Resp. 10 (citing Ex. 2001 ¶¶ 33–35).

Based on Petitioner’s citation to and reliance on Figures 3 and 4 (*see, e.g.,* Pet. 28–29), which disclose fully open and fully closed throttle positions, we agree that Itabashi indicates the ability of the throttle to move to these positions. Moreover, Patent Owner’s declarant testifies that “the range of movement of [Itabashi’s] throttle valve can operate from ‘FULL OPEN’ to ‘FULL CLOSE.’” Ex. 2001 ¶ 63 (citing Ex. 1007, Figs. 3–4).

[W]henver the accelerator pedal 16 moves to a position that commands a wide-open throttle or a closed throttle, the Itabashi invention drives the motor 13 at 100% duty cycle to move the throttle quickly to the commanded position and it just so happens that the commanded position can be either a wide open throttle or a closed throttle position

Id. Thus, the entire record as developed thus far supports Petitioner's assertion that it would have been obvious to command Itabashi's throttle valve to change to a fully open or a fully closed position.

h. Conclusion

Accordingly, for the foregoing reasons and based on this preliminary record, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 1 would have been obvious over Itabashi.

2. *Dependent Claims 4, 7, and 8*

Claims 4, 7, and 8 depend, directly or indirectly, from claim 1 and further recite applying a maximum control effort for a hard open time period or a hard close time period. Ex. 1001, 5:36–38, 5:43–50.^{3,4} Petitioner relies on Itabashi's disclosures of driving motor 13 with a 100% duty cycle in the opening direction during time period t1 and in the closing direction while braking. Pet. 30 (citing Ex. 1007, 6:46–51, 9:6–8, Fig. 3), 32 (citing

³ Claim 7 further limits the “wherein” clause of claim 1 to the second alternative of commanding the positioning device to close in a close hold mode. Ex. 1001, 5:43–47.

⁴ Similarly to claim 1, claim 8 (which was prosecuted as claim 9) contains an error in that “close” is mistakenly printed as “dose.” Ex. 1001, 5:48–50; Ex. 1002, 19, 69.

Ex. 1003 ¶ 125–128, 138–139; Ex. 1007, code (57), 6:63–7:3, 7:57–59, 8:11–15, Fig. 3).

Patent Owner does not make any arguments regarding these claims separate from its argument regarding Itabashi discussed above. *See generally* Prelim. Resp.

As discussed in section II.E.1.e above, Itabashi’s “engine control circuit 15 drives the motor 13 with the motor current of 100% duty ratio during the time period t1.” Ex. 1007, 6:46–51. Itabashi also discloses driving the motor with 100% duty ratio in the closing direction:

When the actual throttle position changes into a predetermined range from the target throttle position in the period t1, the engine control circuit 15 starts to brake the motor 13 to stop the throttle valve 12 at the target position. In the braking period t2, the MOSFETs 23 and 25 are both turned on continuously so that the motor 13 is driven with the motor current of 100% duty ratio in a reverse direction indicated by an arrow C in FIG. 2. Thus, the braking force of the motor 13 is increased to stop the throttle valve 12 at the target throttle position within a short period of time.

Id. at 6:63–7:3. Thus, Itabashi supports Petitioner’s contentions.

Accordingly, based on this preliminary record, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 4, 7, and 8 would have been obvious over Itabashi.

3. Independent Claim 11

Independent claim 11 recites a system having recitations that are substantially similar to the method steps recited in claim 1, including a controller with control logic operative to command the positioning device to close to the commanded position in a hold close mode, but does not recite a hold open mode. Ex. 1001, 6:5–24. Petitioner maps Itabashi’s disclosure to

the recitations of claim 11 in a substantially similar manner as with claim 1. Pet. 33–37.

Patent Owner does not make any arguments regarding this claim separate from its argument regarding Itabashi discussed above. *See generally* Prelim. Resp.

For the reasons as set forth in section II.E.1 above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 11 would have been obvious over Itabashi.

4. Dependent Claims 14, 15, and 18

Claims 14, 15, and 18 depend, directly or indirectly, from claim 11 and further recite an open hold mode and applying a maximum control effort for a hard open time period or a hard close time period. Ex. 1001, 6:29–36, 6:41–44. Petitioner maps Itabashi’s disclosure to the recitations of these claims in a substantially similar manner as with claims 1, 4, and 8. Pet. 37–38.

Patent Owner does not make any arguments regarding these claims separate from its argument regarding Itabashi discussed above. *See generally* Prelim. Resp.

For the reasons set forth in sections II.E.1.g and II.E.2 above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 14, 15, and 18 would have been obvious over Itabashi.

F. Challenge Based on Itabashi, GM Manual, and Chrysler Manual

Petitioner argues that claims 2, 5, 9, 12, 16, and 19 would have been obvious in view of Itabashi, the GM Manual, and the Chrysler Manual.

Pet. 38–44. In support of its showing, Petitioner relies upon the Micklow Declaration. *Id.* (citing Ex. 1003).

Patent Owner does not make any arguments regarding this challenge separate from its argument regarding Itabashi discussed above. *See generally* Prelim. Resp.

We have reviewed Petitioner’s assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that claims 2, 5, 9, 12, 16, and 19 would have been obvious over the combination of Itabashi, the GM Manual, and the Chrysler Manual.

*1. Claims 5, 9, 16, and 19*⁵

Claims 5 and 9 depend indirectly from claim 1, and claims 16 and 19 depend indirectly from claim 11. Ex. 1001, 5:39–40, 6:1–2, 6:37–38, 6:45–46. These claims recite that the maximum control effort is +14.5 volts in the opening direction and –14.5 volts in the closing direction. *Id.* Petitioner relies on Itabashi to disclose battery 26 to supply power to drive circuit 20, and relies on the GM Manual and the Chrysler Manual to teach typical voltages of ± 14.5 volts. Pet. 38–42 (citing Ex. 1003 ¶¶ 156, 158–162; Ex. 1007, 3:37–42, Fig. 2; Ex. 1023, 4; Ex. 1024, 110).^{6,7} Petitioner argues that it would have been an obvious design choice to a person having ordinary skill in the art to use this voltage, and that the

⁵ We address the claims in the same order as in the Petition.

⁶ Petitioner cites to the GM Manual page number (page 94), which is page 4 of Exhibit 1023.

⁷ Petitioner cites to the Chrysler Manual page number (page 3-9), which is page 110 of Exhibit 1024.

'804 patent confirms that the recited voltage is an obvious design choice. *Id.* at 41–42 (citing Ex. 1001, 3:36–54, 3:63–64; Ex. 1003 ¶¶ 162–163).

Itabashi discloses that its drive circuit 20 and current detection circuit 21 are powered by storage battery 26. Ex. 1007, 3:31–46, Fig. 2. The GM Manual discloses that, although the engine control system battery has a “measurement range [of] 0 to 25.5 volts, the reading should be close to normal charging system regulated voltage with the engine running,” which “is typically 13.5 to 14.5 volts at idle.” Ex. 1023, 4. The Chrysler Manual discloses that alternator and regulator specifications for 1981–87 Chrysler vehicles called for a voltage of 13.9–14.6 volts at 80° F. Ex. 1024, 110. Petitioner’s declarant testifies that, because “Itabashi does not specify the voltage that the storage battery 26 provides to the motor drive circuit,” a person having ordinary skill in the art “would have therefore looked for the voltage levels of typical automobile power supplies from multiple major automobile manufactures,” such as those disclosed in the GM Manual and the Chrysler Manual. Ex. 1003 ¶ 158. The '804 patent describes the recited voltages as being “typical” and that they “[o]bviously . . . may vary as required.” Ex. 1001, 3:61–64, 4:31–33. Based on the record before us, we agree that modifying Itabashi’s system to use the recited voltages as the maximum control effort when changing the position of throttle valve 12 would have been an obvious design choice to a person having ordinary skill in the art. *See In re Kuhle*, 526 F.2d 553, 555 (CCPA 1975) (finding that the use of a claimed feature “would be an obvious matter of design choice” when it “solves no stated problem” and “presents no novel or unexpected result” over the disclosed alternatives).

Accordingly, based on this preliminary record, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 5, 9, 16, and 19 would have been obvious over the combination of Itabashi, the GM Manual, and the Chrysler Manual.

2. Claims 2 and 12

Claim 2 depends directly from claim 1, and claim 12 depends directly from claim 11. Ex. 1001, 5:32–33, 6:25–26. Each of these claims recites that the threshold has an absolute value of 6 volts. *Id.* Petitioner argues that, “[g]iven the typical supply voltage was 14.5 volts, a POSA would have at least configured Vref to be less than 14.5 volts” and “[s]electing |6| volts as the threshold would have been an obvious design choice.” Pet. 43 (citing Ex. 1003 ¶ 166). Petitioner argues that, by describing ± 6 volts as being typically used as a threshold and stating “[o]bviously, these values may vary as required,” the ’804 patent admits that it would have been obvious to use a threshold having an absolute values of 6 volts. *Id.* at 43–44 (quoting Ex. 1001, 3:28–30, 4:19–21; citing Ex. 1003 ¶¶ 166–167).

As noted in section II.E.1.e above, Itabashi discloses that the motor current is limited if it exceeds limit level Vref for longer than time period t38. Ex. 1007, 7:23–27, 7:39–42, Fig. 4. Petitioner’s declarant testifies that “[g]iven [that] the typical supply voltage was 14.5 volts, a POSA would have at least configured Vref to be less than 14.5 volts” and “[s]electing |6| volts as the threshold would have been an obvious design choice.” Ex. 1003 ¶ 166. The ’804 patent describes the recited voltage threshold as being “typical” and that it “[o]bviously . . . may vary as required.” Ex. 1001, 3:28–31. Based on the record before us, we agree that modifying Itabashi’s system to use the recited threshold voltage would have

been an obvious design choice to a person having ordinary skill in the art. *See Kuhle*, 526 F.2d at 555.

Accordingly, based on this preliminary record, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 2 and 12 would have been obvious over the combination of Itabashi, the GM Manual, and the Chrysler Manual.

G. Challenge Based on Itabashi and Ohta

Petitioner argues that claims 3, 6, 10, 13, 17, and 20 would have been obvious in view of Itabashi and Ohta. Pet. 44–48. In support of its showing, Petitioner relies upon the Micklow Declaration. *Id.* (citing Ex. 1003).

Patent Owner does not make any arguments regarding this challenge separate from its argument regarding Itabashi discussed above. *See generally* Prelim. Resp.

We have reviewed Petitioner’s assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that claims 3, 6, 10, 13, 17, and 20 would have been obvious over the combination of Itabashi and Ohta.

1. Claims 3 and 13

Claim 3 depends directly from claim 1, and claim 13 depends directly from claim 11. Ex. 1001, 5:34–35, 6:27–28. These claims recite that the predetermined time period is 300 milliseconds. *Id.* Petitioner relies on Itabashi to disclose timer 38 used to determine whether the motor current exceeds the Vref threshold for a predetermined time period (t38) and relies on Ohta to teach that “the normal time period for moving the throttle from

open to close is approximately 150 milliseconds.” Pet. 44–45 (citing Ex. 1003 ¶¶ 169–170; Ex. 1007, 5:8–35, Fig. 4; Ex. 1020, Fig. 6). Petitioner argues that a person having ordinary skill in the art would have used a time longer than 150 milliseconds as the threshold “to build in tolerance, account for the additional time the system would take to move against the bias force of the throttle spring, and account for instances where the system takes a while to unjam the throttle valve” and that “[s]electing 300 milliseconds would have been an obvious design choice.” *Id.* at 45 (citing Ex. 1003 ¶¶ 171–172). Petitioner argues that the ’804 patent does not disclose the 300 millisecond threshold as being critical and that, by describing 300 milliseconds as being typically used and stating “[o]bviously, these values may vary as required,” the ’804 patent admits that it would have been obvious to use a time period of 300 milliseconds. *Id.* at 47–48 (quoting Ex. 1001, 3:28–31, 4:19–21; citing Ex. 1003 ¶¶ 172–173).

As noted in section II.E.1.e above, Itabashi discloses that the motor current is limited if it exceeds limit level V_{ref} for longer than time period t_{38} . Ex. 1007, 7:23–27, 7:39–42, Fig. 4. In Figure 6, Ohta illustrates “a graph showing the relationship between the real rotation angle position of the throttle value 6 and the real D.C. motor current value.” Ex. 1020, 6:4–6. Petitioner’s declarant testifies that this figure “shows that the normal time period for moving the throttle from open to close is approximately 150 milliseconds” and that a person having ordinary skill in the art

would have been motivated to use a time *higher* than 150 milliseconds to build in tolerance, account for the additional time the system would take to move against the bias force of the throttle spring, and account for instances where the system takes a while to unjam the throttle valve.

Ex. 1003 ¶¶ 170–171. Dr. Micklow further testifies that “[s]electing 300 milliseconds would have been an obvious design choice.” *Id.* ¶ 172. The ’804 patent describes the recited time period as being “typical” and that it “[o]bviously . . . may vary as required.” Ex. 1001, 3:28–31. Based on the record before us, we agree that modifying Itabashi’s system to use the recited time for time period t38 would have been an obvious design choice to a person having ordinary skill in the art. *See Kuhle*, 526 F.2d at 555.

Accordingly, based on this preliminary record, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 3 and 13 would have been obvious over the combination of Itabashi and Ohta.

2. Claims 6, 10, 17, and 20

Claims 6 and 10 depend indirectly from claim 1, and claims 17 and 20 depend indirectly from claim 11. Ex. 1001, 5:41–42, 6:3–4, 6:39–40, 6:47–48. These claims recite that the hard open and hard close time periods are 30 milliseconds. *Id.* Petitioner argues that Ohta teaches that “approximately 30 milliseconds of maximum current is used to drive the throttle valve from a fully open position to a fully closed position.” Pet. 46 (citing Ex. 1003 ¶ 174; Ex. 1020, Fig. 6). Petitioner argues that it would have been obvious to use this time period “because this is the minimum amount of time the control system needs to initiate throttle movement” and that a person having ordinary skill in the art would understand that using a longer time period would be harmful to the motor circuit. *Id.* (citing Ex. 1003 ¶¶ 175–176). We understand Petitioner to argue that it would have been obvious to use 30 milliseconds for the length of Itabashi’s time period t1, during which Petitioner argues Itabashi applies maximum effort.

See, e.g., Pet. 30 (addressing claim 4, from which claim 6 depends).

Petitioner argues that because the '804 patent does not disclose the 30 millisecond time period as being critical and describes 30 milliseconds as being typically used, it would have been an obvious design choice to use a time period of 30 milliseconds. *Id.* at 48 (citing Ex. 1003 ¶ 176; Ex. 1001 4:26–27).

Itabashi discloses that, when the driver moves the accelerator pedal, the engine control circuit drives the motor at 100% duty cycle to quickly adjust the throttle valve to the target position. Ex. 1007, 6:46–57.

Petitioner's declarant testifies that, in Figure 6, Ohta shows that "approximately 30 milliseconds of maximum current is used to drive the throttle valve from a fully open position to a fully closed position" and that a person having ordinary skill in the art "would have been motivated to use 30 milliseconds as the period for the hold open mode and the hold close mode because this is the minimum amount of time the control system needs to initiate throttle movement" and "would have understood that any additional time of applying maximum control effort would risk harming the motor circuit." Ex. 1003 ¶¶ 174–175. Dr. Micklow further testifies that "selecting 30 milliseconds for both the hard open time period and hard close time period would have been an obvious design choice." *Id.* ¶ 176. The '804 patent describes the recited time period as being "typical." Ex. 1001, 4:26–27. Based on the record before us, we agree that modifying Itabashi's system to use the recited time for time period t38 would have been an obvious design choice to a person having ordinary skill in the art. *See Kuhle*, 526 F.2d at 555.

Accordingly, based on this preliminary record, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 6, 10, 17, and 20 would have been obvious over the combination of Itabashi and Ohta.

H. Challenge Based on Matsumoto, Burney, and Ritenour

Petitioner argues that claims 1, 4, 7, 8, 11, 14, 15, and 18 would have been obvious in view of Matsumoto, Burney, and Ritenour. Pet. 49–74. In support of its showing, Petitioner relies upon the Micklow Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner’s assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that claims 1, 4, 7, 8, 11, 14, 15, and 18 would have been obvious over the combination of Matsumoto, Burney, and Ritenour.

1. Independent Claim 1

Petitioner relies on Matsumoto to disclose a throttle control system, Burney to teach a limit detection circuit, and Ritenour to teach reducing the motor current after a predetermined length of time has elapsed. Pet. 54–68.

a. Preamble

Claim 1 recites “[a] method for controlling a positioning device of an internal combustion engine.” Ex. 1001, 5:12–14. Petitioner argues that “Matsumoto discloses a throttle control system for an internal combustion engine.” Pet. 54–55 (citing Ex. 1003 ¶ 185; Ex. 1008, codes (54), (57), 1:7–12, 3:22–25, 3:37–41, 3:45–4:10).

Patent Owner does not address the preamble. *See generally* Prelim. Resp.

Matsumoto discloses a method and system for controlling an electronic throttle valve for an internal combustion engine. Ex. 1008, 1:7–12. Thus, to the extent that the preamble is limiting, Matsumoto supports Petitioner’s contentions.

b. Providing

Claim 1 recites “providing an electric motor for actuating the positioning device.” Ex. 1001, 5:15–16. Petitioner maps Matsumoto’s electric motor 154 to the recited motor and argues that it is “for actuating the throttle (a positioning device).” Pet. 55 (citing Ex. 1003 ¶ 186; Ex. 1008, 6:62–7:3).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Matsumoto discloses that its

electronic controlled throttle valve 15 that constitutes the [drive-by-wire system] 150 includes a butterfly valve 15[1] that is disposed in the intake passage 5A of the throttle body 5, a return spring 153 fitted on a shaft 152 that supports the butterfly valve 151, for applying a bias force to the butterfly valve 15[1] toward its closed position, [and] an electric motor (throttle actuator) 154 for rotating/driving the shaft 152.

Ex. 1008, 6:62–7:3. Thus, Matsumoto supports Petitioner’s contentions.

c. Commanding

Claim 1 recites “commanding the positioning device to change to a commanded position.” Ex. 1001, 5:17–18. Petitioner argues that Matsumoto’s engine control computer (“ECU”) 16 sets the target throttle

position based on the amount of depression of accelerator pedal 60 and the operating conditions of the motor, and commands throttle controller 160 to drive electric motor 154 to position the throttle to the commanded position. Pet. 56 (citing Ex. 1003 ¶ 188–190; Ex. 1008, 3:63–4:6, 7:12–60, Fig. 1).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Matsumoto discloses that “[t]he target opening (target throttle opening) of the throttle valve 15 is determined by an engine control computer (engine ECU) 16 . . . , depending upon an amount of depression of an accelerator pedal 60 (accelerator pedal position) detected by an accelerator position sensor (APS1) 51A, and operating conditions of the engine.” Ex. 1008, 3:67–4:6.

The drive-by-wire system (DBW) 150 principally consists of the electronic controlled throttle valve 15 . . . , engine ECU 16 for setting the target opening of the electronic controlled throttle valve 15, and the throttle controller 160 that controls the operation of the actuator 154 based on the target opening set by the engine ECU 16, thereby to adjust the throttle opening.

Id. at 7:12–18.⁸ Thus, Matsumoto supports Petitioner’s contentions.

d. Detecting

Claim 1 recites “detecting a control effort required to change to said commanded position.” Ex. 1001, 5:19–20. As noted in section II.E.1.d above, Petitioner interprets “control effort” as the motor voltage, current, or duty cycle. Pet. 21 (quoting Ex. 1001, 1:36–39). Petitioner argues that

⁸ We note that Matsumoto uses both “electric motor” and “throttle actuator” to refer to the same component. Ex. 1008, 6:67–7:1 (“an electric motor (throttle actuator) 154”).

Matsumoto’s “servomotor detects the control effort required to move the throttle to the target position.” *Id.* at 57 (citing Ex. 1003 ¶¶ 192–193). According to Petitioner, because throttle controller 160 drives electric motor 154 with a drive current, the motor “therefore ‘detects’ the presence and magnitude of the drive current and uses that current to move the throttle.” *Id.* at 57–58 (citing Ex. 1003 ¶ 193; Ex. 1008, 7:51–56, Figs. 1, 3).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Matsumoto’s ECU 16 sets the target opening of throttle valve 15, and throttle controller 160 controls operation of motor 154 to adjust the throttle opening. Ex. 1008, 7:12–18. “The throttle controller 160 has a throttle opening feedback control portion 160A which determines motor driving current according to the target opening of the throttle valve received from the engine ECU 16, and controls driving of the actuator (also called throttle control servo) 154 with the current thus determined.” *Id.* at 7:51–56. Thus, Matsumoto supports Petitioner’s contentions. Whether this “detecting” of the electric current by motor 154 is the same type of “detecting” as recited in claim 1 of the ’804 patent is an issue to be resolved at trial.

We note that in its mapping of the “determining” step addressed in section II.H.1.e below, Petitioner argues that Burney teaches monitoring the drive current supplied to a motor. *See, e.g.*, Pet. 61–62. For the reasons set forth below, Burney supports Petitioner’s contentions.

e. Determining

Claim 1 recites “determining whether said control effort exceeds a threshold for a predetermined time period.” Ex. 1001, 5:22–23. Petitioner relies on Matsumoto’s failure detecting means 70, which Petitioner argues

determines whether the throttle valve is stuck by “determin[ing] whether a difference between the target throttle position and the actual throttle position exceeds a threshold for a predetermined time period.” Pet. 60 (citing Ex. 1003 ¶ 199; Ex. 1008, 14:45–52). Petitioner relies on Burney to teach concluding that a throttle valve is stuck by monitoring the drive current and determining whether the drive current exceeds a threshold (“the voltage at the inverted (–) input of amplifier 60”) for a predetermined time period (“the amount of time it takes to charge capacitor c11”). *Id.* at 61–63 (citing Ex. 1003 ¶¶ 96, 202; Ex. 1006, 1:8–15, 4:1–14, 3:24–35, 9:16–23, 10:17–39, 11:15–25, 13:5–27, Fig. 3). Petitioner argues that it would have been obvious to a person having ordinary skill in the art to use “Matsumoto’s existing failure detecting means 70 not only to detect whether the throttle position exceeded a threshold (e.g., 1°) for a predetermined time period (e.g., 500ms) but also to determine whether the control effort exceeded a threshold for this predetermined time period.” *Id.* at 50–51 (emphasis omitted) (citing Ex. 1003 ¶ 180). Petitioner also argues that it would have been obvious to use Burney’s limit detection circuit in Matsumoto’s system as a redundant safety measure. *Id.* at 52–53 (citing Ex. 1003 ¶¶ 182–183). Petitioner relies on Ritenour to evidence that “[s]ervomotor protection circuits had used timing capacitors like the one in Burney for decades,” arguing that Ritenour’s “circuit uses timing capacitors 79 and 81 to perform this function.” *Id.* at 63–64 (citing Ex. 1003 ¶ 204; Ex. 1027, 1:30–35, 3:28–39, Fig. 2). Petitioner argues that, “[t]o prevent Matsumoto’s system from prematurely reducing or terminating the control effort to the motor, a POSA would have waited a predetermined time period before reducing current to the motor.” *Id.* at 52 (citing Ex. 1003 ¶ 181).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

Both Matsumoto and Burney detect when errors occur when positioning the throttle valve. Matsumoto discloses that its

failure detecting means 70 . . . compares the opening of the electronic controlled throttle valve 15 with the target opening, and determines that a failure arises due to sticking of the electronic controlled throttle valve 15 if a difference between these target and actual openings is kept being greater than a predetermined opening (for example, 1°) over a predetermined time (for example, 500 ms).

Ex. 1008, 14:45–52. Burney discloses that its limit detection circuit 18 includes amplifier 60 that normally produces a LOW output. Ex. 1006, 10:25–34. However, if the voltage applied to the positive input of amplifier 60 exceeds that applied to the negative input, amplifier 60 produces a HIGH output that causes electric current supplied to motor M to cease. *Id.* at 10:34–43. Petitioner argues that Burney’s capacitor C11, which is part of the limit detection circuit (*see id.* at 10:21–24, Fig. 3), is a timing capacitor that sets a time period before the output of amplifier 60 switches from LOW to HIGH. Pet. 63. Ritenour discloses a similar circuit for controlling a servo motor that uses a “timing capacitor” to determine the time period for which an elevated current must be applied in order for the system to turn the current supply off. Ex. 1027, 1:8–11, 3:26–39. Thus, Matsumoto, Burney, and Ritenour support Petitioner’s contentions. We further determine that, based on the record before us, Petitioner has articulated reasoning with rational underpinning explaining why a person having ordinary skill would have added Burney’s limit detection circuit 18 to Matsumoto’s failure detection means 70. *See, e.g.*, Pet. 51–54.

f. Reducing

Claim 1 recites “reducing said control effort when said control effort exceeds said threshold for said predetermined time period.” Ex. 1001, 5:24–26. Petitioner argues that, “[w]hen Matsumoto’s system uses Burney’s limit detection circuit with a timing capacitor, Matsumoto’s system reduces the control effort when the control effort exceeds the threshold for the predetermined time period.” Pet. 65–66 (citing Ex. 1003 ¶¶ 96, 207).

Patent Owner does not address this limitation. *See generally* Prelim. Resp.

As noted in section II.H.1.e above, Burney’s limit detection circuit 18 causes electric current supplied to motor M to cease when amplifier 60 switches from a LOW output to a HIGH output. Ex. 1006, 10:25–43. Thus, Matsumoto and Burney support Petitioner’s contentions.

g. Hold Mode

Claim 1 recites “wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to [cl]ose to a hold close mode.” Ex. 1001, 5:27–31. Petitioner argues that “[c]losed and open positions were standard positions for a throttle, so a POSA would have understood that [Matsumoto’s] ECU 16 commands the throttle valve to move to a maximum open position (hold open mode) or a maximum closed position (hold close mode).” Pet. 67 (citing Ex. 1003 ¶¶ 63–64, 210). According to Petitioner, Matsumoto’s “throttle valve can get stuck in its fully open position and its fully closed position, indicating, or at least suggesting, the ECU 16 commands the throttle valve to move to these positions.” *Id.* (citing

Ex. 1003 ¶ 210; Ex. 1008, 9:1–29). “Additionally, a POSA would have known that typical controllers commanded the throttle valve to fully open and fully close, and nothing in *Matsumoto* suggests that its system deviates from the industry norm.” *Id.* (citing Ex. 1003 ¶ 210; Ex. 1006, 7:57–63, 11:7–15, 13:5–23, 14:23–27, 14:46–56).

Patent Owner asserts that “*Matsumoto* detects when the throttle valve is stuck,” but “does not command the throttle valve to a fully open or closed position.” Prelim. Resp. 10–11 (citing Ex. 1008, 2:66–3:3, Ex. 2001 ¶¶ 43–45). “Regardless of where the throttle valve may happen to become stuck, *Matsumoto* never commands the throttle valve to a fully open or fully closed position” *Id.* at 11 (emphasis omitted) (citing Ex. 2001 ¶¶ 44–45).

Matsumoto discloses the target opening of throttle valve 15 is determined based on the amount of depression of accelerator pedal 60. Ex. 1008, 3:67–4:6. *Matsumoto* further discloses that the throttle can be “stuck at its open position” or “stuck at its closed position” (*id.* at 9:19–29), thereby disclosing that the throttle valve can be commanded to move to its fully open and fully closed positions. We note that Patent Owner interprets the recited “hold open mode” and “hold close mode” to refer to the fully open and fully closed positions, respectively. *See* Prelim. Resp. 10–11 (arguing that “*Matsumoto* does not command the throttle valve to a fully open or closed position”). Thus, *Matsumoto* supports Petitioner’s contentions.

h. Conclusion

Accordingly, for the foregoing reasons and based on this preliminary record, we determine that Petitioner has established a reasonable likelihood

of prevailing on its assertion that claim 1 would have been obvious over the combination of Matsumoto, Burney, and Ritenour.

2. Dependent Claims 4, 7, and 8

Claims 4, 7, and 8 depend, directly or indirectly, from claim 1 and further recite applying a maximum control effort for a hard open time period or a hard close time period. Ex. 1001, 5:36–38, 5:43–50. Petitioner argues that, when Matsumoto’s throttle controller 160 applies the control effort corresponding to the fully open position or the fully closed position, “this control effort is the ‘maximum’ control effort the throttle actuator 154 applies to the throttle valve” and to maintain this fully open position or fully closed position, “the throttle actuator 154 applies this maximum control effort for a period of time.” Pet. 68 (citing Ex. 1003 ¶ 217), 69–70 (citing Ex. 1003 ¶ 222). Petitioner also relies on Burney to teach providing a current to cause the motor to move the throttle to the fully open position, arguing that “[a] POSA would have understood that in such a situation the motor would apply a maximum control effort to the throttle for a period of time—a hard open time period.” *Id.* at 68–69 (citing Ex. 1003 ¶ 218; Ex. 1006, 12:10–13:4, 14:23–27). Similarly, Petitioner relies on Burney to teach commanding the motor to move the throttle to the idle position. *Id.* at 70 (citing Ex. 1003 ¶ 223; Ex. 1006, 12:10–13:4, 13:16–19).

Patent Owner does not make any arguments regarding these claims separate from its argument regarding Matsumoto discussed above. *See generally* Prelim. Resp.

As noted in section II.H.1.g above, Matsumoto discloses moving its throttle valve to the fully open position and the fully closed position. *See* Ex. 1008, 3:67–4:6, 9:19–29. Petitioner’s declarant testifies that a person

having ordinary skill in the art would understand that moving the throttle to its extreme positions would entail applying a maximum control effort to the throttle valve. Ex. 1003 ¶¶ 217, 222.

Accordingly, for the foregoing reasons and based on this preliminary record, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 4, 7, and 8 would have been obvious over the combination of Matsumoto, Burney, and Ritenour.

3. Independent Claim 11

As noted in section II.E.3 above, independent claim 11 recites a system having recitations that are substantially similar to the method steps recited in claim 1. Petitioner maps the disclosures of Matsumoto, Burney, and Ritenour to the recitations of claim 11 in a substantially similar manner as with claim 1. Pet. 70–73.

Patent Owner does not make any arguments regarding this claim separate from its argument regarding Matsumoto discussed above. *See generally* Prelim. Resp.

For the reasons as set forth in section II.H.1 above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 11 would have been obvious over the combination of Matsumoto, Burney, and Ritenour.

4. Dependent Claims 14, 15, and 18

Claims 14, 15, and 18 depend, directly or indirectly, from claim 11 and further recite an open hold mode and applying a maximum control effort for a hard open time period or a hard close time period. Ex. 1001, 6:29–36, 6:41–44. Petitioner maps the disclosures of Matsumoto, Burney, and

Ritenour to the recitations of these claims in a substantially similar manner as with claims 1, 4, and 8. Pet. 73–74.

Patent Owner does not make any arguments regarding these claims separate from its argument regarding Matsumoto discussed above. *See generally* Prelim. Resp.

For the reasons set forth in sections II.H.1.g and II.H.2 above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 14, 15, and 18 would have been obvious over the combination of Matsumoto, Burney, and Ritenour.

I. Challenge Based on Matsumoto, Burney, Ritenour, GM Manual, and Chrysler Manual

Petitioner argues that claims 2, 5, 9, 12, 16, and 19 would have been obvious in view of Matsumoto, Burney, Ritenour, the GM Manual, and the Chrysler Manual. Pet. 74–80. In support of its showing, Petitioner relies upon the Micklow Declaration. *Id.* (citing Ex. 1003).

Patent Owner does not make any arguments regarding this challenge separate from its argument regarding Matsumoto discussed above. *See generally* Prelim. Resp.

Petitioner relies on Matsumoto to disclose battery 61 and on Burney to teach supplying voltage V_{cc} to the battery, and relies on the GM Manual and the Chrysler Manual in a substantially similar manner as with the challenge based on Itabashi, the GM Manual, and the Chrysler Manual. Pet. 74–80. For the reasons set forth in section II.F above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 2, 5, 9, 12, 16, and 19 would have been obvious over

the combination of Matsumoto, Burney, Ritenour, the GM Manual, and the Chrysler Manual.

J. Challenge Based on Matsumoto, Burney, Ritenour, and Ohta

Petitioner argues that claims 3, 6, 10, 13, 17, and 20 would have been obvious in view of Matsumoto, Burney, Ritenour, and Ohta. Pet. 80–85. In support of its showing, Petitioner relies upon the Micklow Declaration. *Id.* (citing Ex. 1003).

Patent Owner does not make any arguments regarding this challenge separate from its argument regarding Matsumoto discussed above. *See generally* Prelim. Resp.

Petitioner relies on Matsumoto, Burney, and Ritenour as with claim 1 and relies on Ohta in in a substantially similar manner as with the challenge based on Itabashi and Ohta. Pet. 80–85. For the reasons set forth in section II.G above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 3, 6, 10, 13, 17, and 20 would have been obvious over the combination of Matsumoto, Burney, Ritenour, and Ohta.

III. CONCLUSION

For the foregoing reasons, we determine that the information presented establishes a reasonable likelihood that Petitioner would prevail in showing that at least one of claims 1–20 of the '804 patent is unpatentable.

Our determination in this Decision is not a final determination on either the patentability of any challenged claim or the construction of any claim term and, thus, leaves undecided any remaining fact issues necessary

to determine whether sufficient evidence supports Petitioner’s contentions by a preponderance of the evidence in the final written decision. *See Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (noting that “there is a significant difference between a petitioner’s burden to establish a ‘reasonable likelihood of success’ at institution, and actually proving invalidity by a preponderance of the evidence at trial”).

IV. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 of the ’804 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which commences on the entry date of this decision.

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For PETITIONER:

Michael D. Specht
Jason A. Fitzsimmons
Danny E. Yonan
Richard Bemben
Tyler J. Dutton
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
mspecht-PTAB@sternekessler.com
jfitzsimmons-PTAB@sternekessler.com
dyonan-PTAB@sternekessler.com
rbemben-PTAB@sternekessler.com
tdutton-PTAB@sternekessler.com
PTAB@sternekessler.com.

For PATENT OWNER:

Timothy Devlin
DEVLIN LAW FIRM LLC
TD-PTAB@devlinlawfirm.com
dlflitparas@devlinlawfirm.com