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Paper 10
Entered: March 15, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

KOITO MANUFACTURING CO., LTD, and
SL CORPORATION,
Petitioner,

v.

ADAPTIVE HEADLAMP TECHNOLOGIES, INC.,
Patent Owner.

Case IPR2016-00079[1]
Patent 7,241,034 C1

Before MICHAEL P. TIERNEY, *Vice Chief Administrative Patent Judge*, RAMA G. ELLURU and SCOTT C. MOORE, *Administrative Patent Judges.*

MOORE, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

[1] Case IPR2016-01368 has been joined with this proceeding.

I. INTRODUCTION

Koito Manufacturing Co., Ltd. ("Petitioner") filed a Petition (Paper 2; "Pet.") to institute an *inter partes* review of claims 3–26 and 28–35 of U.S. Patent No. 7,241,034 C1 (Ex. 1001; "the '034 patent"). Adaptive Headlamp Technologies, Inc. ("Patent Owner") filed a Preliminary Response (Paper 10; "Prelim. Resp."). The Board instituted a trial as to claims 3–26, 28–32, and 35 of the '034 patent. Paper 11 ("Dec. on Inst.").

After institution of trial, Patent Owner filed a Patent Owner Response ("PO Resp.") to the Petition. Paper 16. Petitioner filed a Reply ("Reply") to the Patent Owner Response. Paper 18. Petitioner relies on the Declaration of Ralph V. Wilhelm, Ph.D. (Ex. 1019) in support of its Petition, and the Reply Declaration of Ralph V. Wilhelm, Ph.D. (Ex. 1037) in support of its Reply. Patent Owner relies on the Declaration of Joe Katona (Ex. 2002) in support of its Response.

An oral hearing was held on January 11, 2017. The record contains a transcript of this hearing. Paper 23 ("Tr.").

We have jurisdiction over this dispute under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Petitioner has shown by a preponderance of the evidence that claims 3–26, 28–32, and 35 are unpatentable under 35 U.S.C. § 103(a).

II. BACKGROUND

A. Related Proceedings

The '034 patent was subject to an *ex parte* reexamination (Control No. 90/011,011) and an *inter partes* reexamination (Control No. 95/001,621) filed by Volkswagen Group of America, Inc. Pet. 1. These reexamination

proceedings were merged and resulted in issuance of an *inter partes* reexamination certificate. *Id.*; Ex. 1002.

The ’034 patent also was the subject of prior litigation in the U.S. District Court for the Eastern District of Texas. Pet. 1–2. Neither Petitioner nor its subsidiaries were parties to this prior case, which was dismissed without prejudice on May 18, 2010. *See id.* The ’034 patent is asserted by Patent Owner in several pending litigations in the U.S. District Court for the District of Delaware. Pet. 2; Paper 6, 2–3. Petitioner is not a party to any of these Delaware litigations. *See id*.

B. The ’034 Patent

The ’034 patent discloses a structure and method for operating a directional control system for vehicle headlights. Ex. 1001, Abstract. Figure 1 of the ’034 patent is reproduced below.

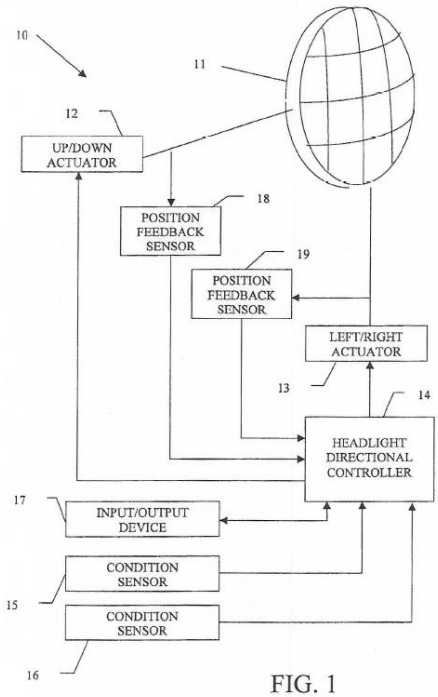

FIG. 1

Figure 1 is a block diagram of automatic directional control system 10 for a vehicle headlight. *Id.* at 2:28–30, 63–65. Headlight 11 is mounted on a vehicle in a manner that permits the direction of projected light to be adjusted by actuators 12 and 13. *Id.* at 3:10–13, 26–28. Condition sensors 15 and 16 sense operating conditions of the vehicle, and generate electrical signals that are responsive to the sensed operating conditions. *Id*. at 3:61–64. Headlight directional controller 14 receives the electrical signals generated by condition sensors 15 and 16, and responds by selectively operating actuators 12 and 13 to adjust the position of headlight 11. *Id.* at 3:49–58. The disclosed automatic directional control system also includes feedback sensors 18 and 19, which generate signals representative of the actual up/down and left/right position of headlight 11, and supply these signals to controller 14. *Id*. at 4:8–24. These feedback signals can be used to calibrate the disclosed system. *Id.* at 6:10–17.

C. Challenged Claims

Challenged claims 3 and 7 are independent claims, and the remaining challenged claims depend, directly or indirectly, from either claim 3 or claim 7. Claim 7 is illustrative of the challenged claims, and is reproduced below.

> 7. An automatic directional control system for a vehicle headlight, comprising:
>
> two or more sensors that are each adapted to generate a signal that is representative of at least one of a plurality of sensed conditions of a vehicle such that two or more sensor signals are generated, said sensed conditions including at least a steering angle and a pitch of the vehicle;

a controller that is responsive to said two or more sensor signals for generating at least one output signal only when at least one of said two or more sensor signals changes by more than a predetermined minimum threshold amount to prevent at least one of two or more actuators from being operated continuously or unduly frequently in response to relatively small variations in at least one of the sensed conditions; and

said two or more actuators each being adapted to be connected to the vehicle headlight to effect movement thereof in accordance with said at least one output signal;

wherein said two or more sensors include a first sensor and a second sensor; and

wherein said first sensor is adapted to generate a signal that is representative of a condition including the steering angle of the vehicle and said second sensor is adapted to generate a signal that is representative of a condition including the pitch of the vehicle.

D. References Relied Upon

Petitioner relies on the following references:

References	**Exhibit No.**
Japan Patent Application Publication H10-324191 (pub. Dec. 8, 1998) ("Kato")	1006, 1007
UK Published Patent Application GB 2 309 774 A (pub. Aug. 6, 1997) ("Takahashi")	1008
Japan Patent Application Publication H7-164960 (pub. June 27, 1995) ("Mori")	1009, 1010
Japan Patent Application Publication H01-223042 (pub. Sept. 6, 1989) ("Uguchi")	1011, 1012
Ishikawa et al, "*Auto-Levelling Projector Headlamp System with Rotatable Light Shield*," SAE Technical Paper Series No. 930726, Mar.1993 ("Ishikawa")	1013

References	Exhibit No.
U.S. Patent No. 5,751,832 (iss. May 12, 1998) ("Panter")	1014
Japan Patent Application Publication H6-335228 (pub. Dec. 2, 1994) ("Suzuki")	1015, 1016
U.S. Patent No. 6,193,398 B1 (iss. Feb. 27, 2001) ("Okuchi")	1017

Pet. 4–5; Dec. on Inst. 39.

E. Grounds of Unpatentability

We instituted trial on the following grounds:

Ground	Challenged Claim(s)	Statutory Basis	References
1	7–9, 13–18, 20, 21, 23, 24, 28, 29, 31, 32, and 35	35 U.S.C. § 103(a)	Kato and Takahashi
2	10	35 U.S.C. § 103(a)	Kato, Takahashi, and Mori
3	11 and 19	35 U.S.C. § 103(a)	Kato, Takahashi, and Uguchi
4	12	35 U.S.C. § 103(a)	Kato, Takahashi, and Ishikawa
5	22	35 U.S.C. § 103(a)	Kato, Takahashi, and Panter
6	25 and 26	35 U.S.C. § 103(a)	Kato, Takahashi, and Suzuki
7	30	35 U.S.C. § 103(a)	Kato, Takahashi, and Okuchi

Ground	Challenged Claim(s)	Statutory Basis	References
8	3 and 6	35 U.S.C. § 103(a)	Kato and Uguchi
9	4	35 U.S.C. § 103(a)	Kato, Uguchi, and Ishikawa
10	5	35 U.S.C. § 103(a)	Kato, Uguchi, and Takahashi

Dec. on Inst. 39.

III. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art "would be a person with at least a bachelor's degree in electrical engineering, computer science, or physics with at least two years of related post-graduate or industry work experience." Pet. 21. Petitioner further asserts that such a person "would have had a working understanding of microprocessor-driven controls for automotive systems including knowledge of automotive closed loop computer control, sensors and actuators, and would have been comfortable with elementary decision-making in the area of automotive systems development and design for new vehicles." *Id.* at 21–22.

Patent Owner asserts that a person of ordinary skill would have at least the following qualifications:

> a bachelor's degree in electrical engineering, computer science, physics, or other related field of study; at least two years of relevant work experience in the automotive industry; a working understanding of control systems and associated components used within the automotive industry; and, relevant work experience with product development and design in the automotive industry.

PO Resp. 4–5.

The parties' formulations as to the level of ordinary skill in the art are similar to one another, and neither party identifies with specificity an error in the opposing party's formulation. The parties also agree that none of the disputes in this case turn on differences between the parties' respective formulations. Tr. 33:1–6, 67:20–68:1. On the record presented we hold that the cited prior art is representative of the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the level of ordinary skill in the art may be evidenced by the cited references themselves). Specifically, the references are consistent with the parties' formulations and demonstrate the level of skill in the art. Our determinations regarding the patentability of the challenged claims would remain the same under either party's proposed formulation.

B. Claim Construction

We interpret claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent. 37 C.F.R. § 42.100(b); *see Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (concluding the broadest reasonable construction "regulation represents a reasonable exercise of the rulemaking authority that Congress delegated to the Patent Office"). There is a presumption that claim terms are given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art in the context of the specification. *See In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). An applicant may rebut that presumption by providing a definition of the term in the specification with reasonable clarity, deliberateness, and precision. *In re*

Paulsen, 30 F.3d 1475, 1480 (Fed. Cir. 1994). An applicant also may narrow the meaning of a claim term by disclaiming or disavowing claim scope; however, such a "disclaimer or disavowal of claim scope must be clear and unmistakable, requiring 'words or expressions of manifest exclusion or restriction' in the intrinsic record." *Unwired Planet, LLC v. Apple Inc*., 829 F.3d 1353, 1358 (Fed. Cir. 2016) (quoting *Teleflex, Inc. v. Ficosa N. Am. Corp*., 299 F.3d 1313, 1327 (Fed. Cir. 2002)). In the absence of such a definition or disclaimer, limitations are not to be read from the specification into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Our Decision on Institution did not expressly construe any claim terms. Dec. on Inst. 7. Patent Owner, however, now asserts that "the term 'vehicle,' as used consistently throughout the '034 patent and as understood by one of ordinary skill in the art, does not encompass motorcycles." PO Resp. 6. Patent Owner argues that such a construction is appropriate "in light of the inclusion and exclusion of certain discussion throughout the specification of the '034 patent." *Id*. at 6–7. For the reasons below, we construe the term "vehicle," as used in the '034 patent, to include motorcycles.

The specification of the '034 patent uses the term "vehicle" in a broad sense. For example, the Background of the Invention section of the '034 patent uses the term "vehicle" to encompass "land vehicles, and many other types of vehicles (such as boats and airplanes, for example)." Ex. 1001, 1:20–21. The specification also makes clear that the claims are not limited to the specific vehicle types described in the Detailed Description of the Preferred Embodiment. *See, e.g., id*. at 2:60–3:3 ("The illustrated headlight

11 is, of itself, conventional in the art and is intended to be representative of any device that can be supported on *any type of vehicle* for the purpose of illuminating any area.") (emphasis added).

Patent Owner does not dispute that the term "vehicle," in ordinary usage, could encompass motorcycles. Tr. 41:12–23. Patent Owner further concedes that the '034 patent does not contain an express lexicographic definition of the term "vehicle," (Tr. 41:24–43:8), and instead argues that "the disclosure of the patent in the claims and the problem to be solved" make clear that the term "vehicle" excludes motorcycles (*id.* at 42:19–43:5). Patent Owner, however, does not sufficiently identify the portions of the specification that allegedly support its claim construction argument. *See* PO Resp. 6–7 (indicating that Patent Owner's claim construction argument is based on "certain discussion throughout the specification of the '034 patent, as noted throughout this Response"). Patent Owner cites to Paragraph 38 of the Katona Declaration (*see* PO Resp. 7), but this declaration testimony relates to the Kato reference and does not identify any portion of the '034 patent that supports Patent Owner's argument (*see* Ex. 2002 ¶ 38; Ex. 1007 ¶¶ 4–5). Moreover, we find that the "Claim Interpretation" section of the Katona Declaration is conclusory in nature because it does not identify any specific portion of the '034 patent specification that supports Patent Owner's argument. *See* Ex. 1002 ¶ 44.

For the foregoing reasons, and based on the current record and our review of the specification of the '034 patent, we are not persuaded that the intrinsic record contains a lexicographic definition or a disclaimer that would exclude motorcycles from the scope of the term "vehicle." To the contrary, the specification makes clear that the term "vehicle" is a broad

term that is intended to encompass any type of vehicle. Accordingly, we determine that the term "vehicle," as used in the specification and claims of the '034 patent, encompasses motorcycles.

The parties have not asked us to construe any other claim terms, and we decline to adopt other or further claim constructions because doing so is not necessary in order to resolve the parties' disputes. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) ("[C]laim terms need only be construed 'to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))); *see also* Tr. 24:1–12, 60:20–62:2 (both parties agree that the Board need not construe any additional claim terms in the '403 Patent).

C. Asserted Grounds of Unpatentability

1. Overview

Petitioner argues that all of the challenged claims are unpatentable under 35 U.S.C. § 103. Pet. 4. A claim is unpatentable under 35 U.S.C. § 103 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 such subject matter pertains." 35 U.S.C. § 103(a). The question of obviousness under 35 U.S.C. § 103 is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). The Supreme Court has held that "[t]he combination of familiar

elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). The Supreme Court also has held that "if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *Id*. at 417.

2. Objective Indicia of Nonobviousness

The parties have not identified any objective evidence of nonobviousness that allegedly bears on the patentability of the challenged claims.

3. Ground 1: Alleged Obviousness of Claims 7–9, 13–18, 20, 21, 23, 24, 28, 29, 31, 32, and 35 over Kato and Takahashi

Of the challenged claims in this ground, only claim 7 is independent. The remaining claims in this ground depend, either directly or indirectly, from claim 7.

a. Kato

Kato is directed to a headlight optical axis control device for a motorcycle. Ex. 1007, Abstract. Kato's device may incorporate a pitch angle sensor, an actuator that pivots an optical axis of the headlight in the pitch angle direction, and a control unit that causes the actuator to adjust the pitch angle of the headlight based on the pitch angle detected by the pitch angle sensor. *Id*. ¶ 7.

Figure 1 of Kato is reproduced below.

[FIG. 1]

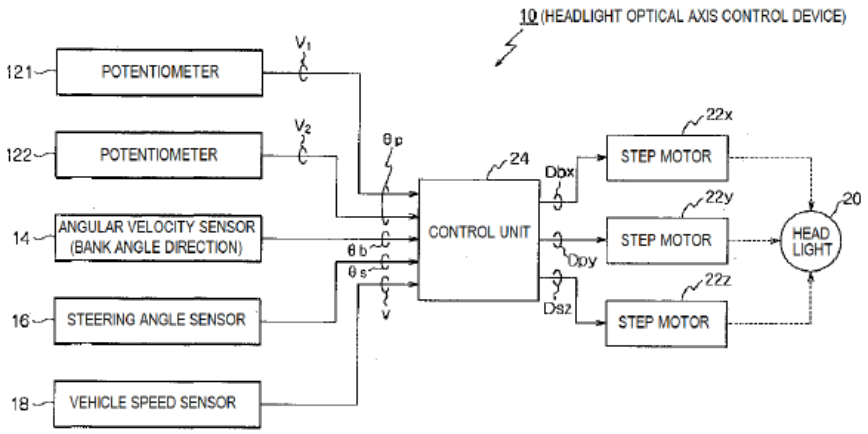

Figure 1 is a functional block diagram illustrating one embodiment of a headlight optical axis control device. Ex. 1007 ¶ 15. The device includes potentiometers 121 and 122 to detect pitch angle, angular velocity sensor 14 to detect bank angle, sensor 16 to detect the steering angle, and speed sensor 18 to detect the vehicle speed. *Id.* ¶ 16. The device also includes controller 24, which determines a pitch angle correction amount, a bank angle direction correction amount, and a steering angle direction correction amount based on input from potentiometers 121 and 122, and sensors 14, 16, and 18. *Id.* Controller 24 then controls step motors 22x, 22y, and 22z to correct the angle of the optical axis of the headlight. *Id*.

b. Takahashi

Takahashi is directed to a vehicle lamp illumination direction control device that detects the posture of a vehicle, and adjusts the illumination of a vehicle lamp. Ex. 1008, 1:3–7.

Figure 1 of Takahashi is reproduced below.

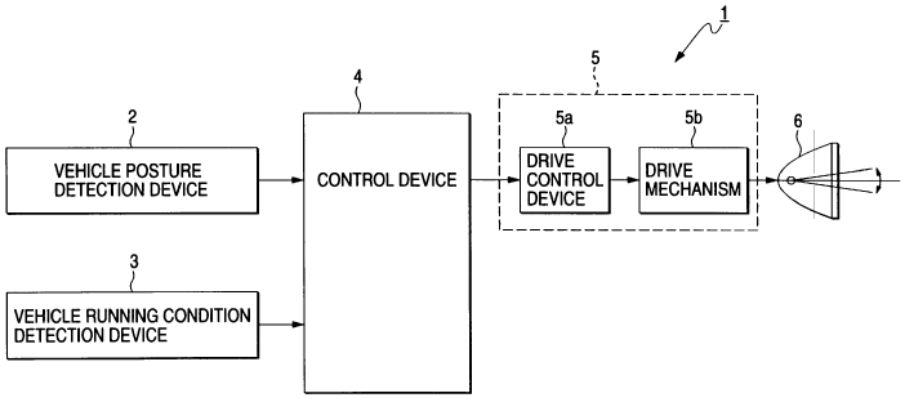

Figure 1 depicts the basic structure of an embodiment of Takahashi's illumination direction control device. Ex. 1008, 5:24–29. Vehicle posture detection device 2 detects, for example, the vertical inclination of the vehicle. *Id. at* 5:30–34. Vehicle running condition detection device 3 detects, for example, whether the vehicle is moving or stopped. *Id.* at 6:16–25. Control device 4 receives signals from detection devices 2 and 3, and transmits a control signal to drive 5 in order to correct the illumination direction of lamp 6. *Id.* at 6:26–32.

c. Analysis

Independent Claim 7

Petitioner alleges that Kato discloses all the limitations of claim 7, except for a controller that generates an output signal only when at least one of two or more sensor signals changes by more than a "predetermined minimum threshold amount" (the "predetermined threshold amount limitation"). Specifically, claim 7 recites a controller

> generating at least one output signal only when at least one of said two or more sensor signals changes by more than a predetermined minimum threshold amount to prevent at least

> one of two or more actuators from being operated continuously or unduly frequently in response to relatively small variations in at least one of the sensed conditions

Pet. 25. Petitioner alleges that Takahashi discloses the "predetermined minimum threshold" limitation. *Id.*

Patent Owner, in its Response to the Petition, argues that the cited references "do not disclose or suggest" the predetermined minimum threshold limitation of claim 7. PO Resp. 32. Patent Owner, however, does not dispute with specificity Petitioner's assertion that Kato discloses a headlight control device that satisfies all other limitations recited in claim 7. *See id*. at ii, 12–35. We find Petitioner's evidence regarding the non-disputed limitations of claim 7 to be persuasive and adopt Petitioner's reasoning. *See* Pet. 24–32; Ex. 1019 ¶¶ 51–55, p. 22–24. The disputed predetermined minimum threshold limitation of claim 7, and Patent Owner's other arguments regarding the patentability of claim 7, are addressed below.

The parties dispute whether the following portion of Takahashi discloses the predetermined minimum threshold limitation of claim 1:

> Also, in order to prevent the illumination direction of the lamp 6 from being corrected inadvertently when a sudden change in the posture of the vehicle occurs temporarily or due to the wrong operation of the lamp 6 caused by external disturbances, for example, when the vehicle makes a sudden start or a sudden stop, preferably, a threshold value with respect to time may be set in detection of the road gradient and, *only when the amount of variations in the detect signal of the vehicle posture detection device 2 exceeds a given reference value and such excessive state continues for a time equal to or more than the threshold value, the illumination direction of the lamp 6 may be corrected*; or, a threshold value with respect to the running distance of the vehicle may be set and, only when the amount of

> variations in the detect signal of the vehicle posture detection device 2 exceeds a given reference value and such excessive state continues for a distance equal to or more than the threshold value, the illumination direction of the lamp 6 may be corrected.

See Pet. 32–33 (quoting Ex. 1008, 9:16–34); PO Resp. 33 (quoting Ex. 1008, 9:16–28). Petitioner alleges that Takahashi's "given reference value" corresponds to the "predetermined minimum threshold amount" recited in claim 7. Pet. 33.

Patent Owner argues in response that Takahashi's headlight controller is "simultaneously responsive to two threshold requirements working in common," and that "only one of the two tiered thresholds of Takahashi is rooted in a measured operating condition of the vehicle while the second is time based." PO Resp. 34. According to Patent Owner, this two-tiered "thresholding scheme cannot read on the threshold limitation of Claim 7." *Id*. Petitioner concedes that Takahashi employs two separate thresholds, but argues that the predetermined minimum threshold limitation "does not preclude there being an additional threshold (e.g., of time) that also must be met before the 'at least one output signal' is generated." Reply 19. We are persuaded by Petitioner's argument.

The "predetermined minimum threshold" limitation of claim 7 recites a controller "responsive to said two or more sensor signals" for

> generating at least one output signal *only when at least one of said two or more sensor signals changes by more than a predetermined minimum threshold amount* to prevent at least one of two or more actuators from being operated continuously or unduly frequently in response to relatively small variations in at least one of the sensed conditions

Claim 7 (emphasis added). This limitation requires (i) a predetermined minimum threshold that is applied to "at least one of said two or more sensor signals," and (ii) that no "output signal" be generated by the controller unless this predetermined minimum threshold is met. Takahashi's controller generates an output signal to correct the illumination direction of lamp 6 only when *both* "the amount of variations in the detect signal of the vehicle posture detection device 2 exceeds a given reference value" (i.e., a predetermined minimum threshold is exceeded), *and* "such excessive state continues for a time equal to or more than the threshold value" (i.e., a second time threshold is also exceeded). Ex. 1008, 9:23–27. The fact that Takahashi's controller employs this second time-based threshold does not mean Takahashi's controller falls outside the scope of the predetermined minimum threshold limitation because, notwithstanding the existence of this second time-based threshold, Takahashi's controller only generates an output signal when "at least one of said two or more sensor signals" (i.e., the amount of variations in the detect signal of Takahashi's vehicle posture detection device 2) exceeds a "predetermined minimum threshold" (i.e., Takahashi's given reference value). Accordingly, on this record, we find that Takahashi's controller satisfies the predetermined minimum threshold limitation of claim 7.

Petitioner asserts that a person of ordinary skill would have found it obvious to combine Takahashi's reference (i.e., threshold) values with Kato's headlight optical axis control device. *See* Pet. 34–35. As Petitioner points out (*id*. at 34), Takahashi teaches that the use of such reference values is desirable because it "prevent[s] the illumination direction of [the

headlight] from being corrected inadvertently when a sudden change of the posture of the vehicle occurs temporarily . . . ." Ex. 1008, 9:16–34.

Patent Owner argues in response that Kato is not analogous art because the term "vehicle," as used the '034 patent, does not encompass motorcycles. PO Resp. 15–24. In particular, Patent Owner argues that Kato's "optical axis control device for motorcycle" (*see* Ex. 1007, 1) is addressed to a different field of endeavor than the "automatic directional control system for vehicle headlights" (Ex. 1001, 1:1–2) of the '034 patent, because the term "vehicle" in the '034 patent excludes motorcycles. PO Resp. 20. Patent Owner also argues that Kato is not reasonably pertinent to the problem addressed by the '034 patent. *Id*. at 20–24. We disagree.

Patent Owner's first argument, that Kato and the '034 patent are directed to different fields of endeavor, depends on its argument that the term "vehicle," as used in the '034 patent, excludes motorcycles. As discussed above, we reject this argument. In view of our determination that the '034 patent's use of the term "vehicle" does not exclude motorcycles, we are persuaded by Petitioner's arguments (*see* Reply 7–8; Ex. 1037 ¶ 23) and find that Kato is directed to the same field of endeavor as the '034 patent, i.e., automatic directional control systems for vehicle headlights. *Compare* Ex. 1001, 1:57–67, *with* Ex. 1007 ¶ 1.

Even if the '034 patent's controller and Kato's motorcycle controller were directed to different fields of endeavor, Kato's controller would still be reasonably pertinent to the problem addressed by the '034 patent. In particular, we find that Patent Owner is incorrect in its assertion that "[n]o crossover applicability exists [] between control devices for a motorcycle headlight and those of four-wheeled vehicles." PO Resp. at 19. For

example, Kato's controller adjusts a headlight's optical axis based upon changes to pitch angle or steering angle of a motorcycle. Ex. 1007 ¶ 11; *see* Ex. 1037 ¶ 33. The controller of the '034 patent adjusts the aiming angle of vehicle headlights to account for operating conditions such as "steering angle" and "pitch." Ex. 1001, 2:3–20. In view of the fact that the '034 patent and Kato both disclose controllers that automatically adjust headlights of motorized vehicles according to steering angle and pitch, we are persuaded by Petitioner's arguments (*see* Reply 8–13; Ex. 1037 ¶¶ 24–29) that Kato would "logically have commended itself" to the attention of an inventor considering the problem addressed by the '034 patent, even if the problem addressed by the '034 patent only related to four wheeled vehicles. *See In re Icon Health and Fitness, Inc.*, 496 F.3d 1374, 1379–80 (Fed. Cir. 2007). On this record, we find that Kato qualifies as analogous art.

Patent Owner also argues that a person of ordinary skill in the art would not have had reason to combine Kato with the threshold of Takahashi. PO Resp. 24–31. In particular, Patent Owner argues that Takahashi "is applicable in the context of cars, trucks, rather than in the context of motorcycles" (*id.* at 25–26), and that a headlight controller for a motorcycle (such as Kato's controller) would operate differently because, for example, motorcycles lean when they turn, and because "smaller, more agile motorcycles experience greater magnitude changes in pitch, steering or bank angles during operation than four-wheeled vehicles." *Id.* at 26–27. Patent Owner also argues that language in Kato suggesting that the headlight angle be corrected immediately teaches away from a combination with Takahashi. *Id.* at 28–29. Patent Owner additionally argues that the proposed combination would render Kato's system unsuitable for performing its

intended purpose (i.e., the "immediate" correction of headlight direction). *Id.* at 30–31. We are not persuaded by these arguments.

Takahashi's thresholds operate to "prevent the illumination of the lamp [] from being corrected inadvertently when a sudden change in the posture of the vehicle occurs temporarily or due to the wrong operation of the lamp [] caused by external disturbances." Ex. 1007 ¶ 6. We are not persuaded that Takahashi's thresholds could not be used to prevent the direction of Kato's motorcycle headlight from being corrected inadvertently in the event of a temporary change in vehicle posture or external disturbance. Mr. Katona, Patent Owner's expert, identifies several differences between motorcycles and four-wheeled vehicles, but does not persuasively and credibly explain why these differences would have prevented the use of such thresholds to prevent Kato's headlight from being adjusted inadvertently in the event of a sudden and transient disturbance. *See* Ex. 1002 ¶¶ 54–56. We find credible the testimony of Petitioner's expert, Dr. Wilhelm, that a skilled artisan would have realized that Takahashi's thresholds could be used to prevent a motorcycle headlight controller from making undesirable adjustments to the headlight. Ex. 1019 ¶¶ 61–62; Ex. 1037 ¶¶ 34–36.

We also are not persuaded by Patent Owner's argument that Kato teaches away from the use of Takahashi's thresholds, or that such thresholds would render Kato's system unsuitable for its intended purpose. Kato's stated "Object of the Invention" is "to provide a headlight optical axis control device that can stably ensure a beam irradiation range of a headlight even when pitch, bank, steering angle or the like change while driving a motorcycle." Ex. 1007 ¶ 6. Kato does disclose an embodiment that is able

to correct direction of a headlamp "immediately" (*id*. ¶ 8), but we do not find that the portions of Kato cited by Patent Owner "criticize, discredit, or otherwise discourage investigation" into the use of a threshold of the type taught by Takahashi. *Galderma Labs. v. Tolmar, Inc*., 737 F.3d 731, 738 (Fed. Cir. 2013); *see* PO Resp. 28–29, Ex. 2002 ¶¶ 57–58. We also do not find that such thresholds would render Kato's system unsuitable for its intended purpose. *See* PO Resp. 30–31; Ex. 2002 ¶¶ 57–58. Rather, we agree with Petitioner that a skilled artisan would have realized that Takahashi's threshold values could have been set to minimize time delays while still realizing the advantages of Takahashi's invention (i.e., avoiding unnecessary headlight adjustments due to short-term disturbances, such as those caused by a rough road surface). Reply 17–18; Ex. 1037 ¶¶ 34–39. Patent Owner also has failed to cite any persuasive evidence of improper hindsight. *See* PO Resp. 29, 33.

We find on this record that combining Takahashi's reference values with the Kato's headlight optical axis control system would result in an obvious "combination of familiar elements according to known methods . . . [that] does no more than yield predictable results." *See KSR*, 550 U.S. at 416. We also find on this record that a person of ordinary skill would have recognized that Takahashi's thresholds could have been used to improve Kato's motorcycle headlight controller in the same way they were used to improve Takahashi's headlight controller. *See id*. at 417.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a

preponderance of the evidence that claim 7 is unpatentable as obvious over Kato and Takahashi.

Dependent Claims 8, 14–18, 20, 21, 23, 24, 28, and 32:

Patent Owner does not dispute with specificity Petitioner's assertion that Kato discloses a headlight optical axis control device that satisfies each additional limitation recited in claims 8, 14–18, 20, 21, 23, 24, 28, and 32. *See* Pet. 26–31, 34–35; PO Resp. ii, 43–44. Patent Owner also does not raise with specificity any other disputes regarding the alleged obviousness of claims 8, 14–18, 20, 21, 23, 24, 28, and 32, beyond those disputes discussed above with respect to claim 7. *See* PO Resp. ii, 43–44.

We have reviewed Petitioner's evidence and arguments concerning the alleged obviousness of claims 8, 14–18, 20, 21, 23, 24, 28, and 32. *See* Pet. 26–31, 34–35; Ex. 1019 ¶¶ 51–63. Petitioner has shown that Kato discloses each additional limitation recited in these claims. *See id*. Accordingly, we find that the same combination of Kato and Takahashi discussed above with respect to claim 7 would have satisfied all elements of each of these dependent claims.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claims 8, 14–18, 20, 21, 23, 24, 28, and 32 are unpatentable as obvious over Kato and Takahashi.

Dependent Claims 9, 13, 29, 31, and 35:

Takahashi's vehicle posture detection device may include "height detection device[s] 7," located at the vehicle's front and rear suspensions, to

"detect[] the expansion and contraction amount x of a suspension S in order to detect the amount of variations in the vertical positon of the axle of the vehicle." Ex. 1008, 6:5–9; *see also id*. Fig. 2 (depicting the locations of height detection devices 7). Petitioner argues that these height detection devices are "one or more additional sensors for sensing . . . a suspension height of the vehicle" as recited in claim 9, and "one or more additional sensors [that] generate a signal that is representative of the suspension height of the vehicle" as recited in claim 13. *See* Pet. 37; Ex. 1019, 31–32. Takahashi also discloses that the vehicle posture detection device (which includes the height detection devices) may calculate a vehicle's "vertical inclination" (i.e., pitch). Ex. 1008, 5:30–32. Petitioner argues that Takahashi, therefore, discloses calculation of the pitch of a vehicle by sensing a front and rear suspension height of the vehicle, as recited in claim 31. Petitioner alleges that it would have been obvious to combine Takahashi's vehicle posture detection device (including height detection devices 7) with Kato's system because Takahashi teaches that measurements of the road gradient can be used to correct the illumination direction of the vehicle lamp. Pet. 37; Ex. 1019 ¶ 65; Ex. 1008, 7:12–17 ("based on the information from the vehicle posture detection device . . . when the road gradient varies suddenly, [control device 4] can correct the illumination direction of the lamp 6."). Patent Owner does not dispute with specificity Petitioner's assertions concerning claims 9, 13, and 31, or raise any additional specific patentability arguments concerning these claims. *See* PO Resp. ii, 43–44.

Claim 29 depends from claim 28, and further recites that the memory of the automatic directional control system of claim 28 "includes non-

volatile memory." Petitioner asserts that Takahashi teaches the use of non-volatile memory in a headlight control device, such as Kato's device (Pet. 38); and Dr. Wilhelm testifies that "[t]he use of non-volatile memory with such control units was well known" in the art (Ex. 1019 ¶ 66). Claim 35 depends from claim 7, and further recites that the predetermined minimum threshold "functions as a filter to minimize undesirable operation of at least one of the two or more actuators." Petitioner asserts that the reference (i.e., threshold) values of Takahashi function "as a filter to minimize undesirable operation of at least one of the two or more actuators," and that the Kato/Takahashi combination discussed above with respect to claim 7, therefore, also would satisfy all limitations of claim 35. Pet. 35, 39–40. Patent Owner does not dispute with specificity Petitioner's assertions concerning claims 29 and 35, or raise any additional specific patentability arguments concerning these claims. *See* PO Resp. ii, 43–44.

With respect to claims 9, 13, and 31, we find that further combining Takahashi's vehicle posture detection device with Kato's system would constitute a "combination of familiar elements according to known methods . . . [that] does no more than yield predictable results." *See id.* at 416. With respect to claim 29, we find that substituting Takahashi's non-volatile memory for the memory that stores Kato's programming (*see* Ex. 1007 ¶ 17; Ex. 1019 ¶ 63) would constitute a "mere substitution of one element for another known in the field" that does no more "than yield a predictable result." *KSR*, 550 U.S. at 416. Lastly, we find on this record that the combination of Kato and Takahashi discussed above with respect to claim 7 also would satisfy all limitations of claim 35

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claims 9, 13, 29, 31, and 35 are unpatentable as obvious over Kato and Takahashi.

4. Ground 2: Alleged Obviousness of Claim 10 over Kato, Takahashi, and Mori

a. Mori

Mori discloses a vehicle headlamp device that can adjust the optical axis of a headlight in response to sensed conditions. *See* Ex. 1010, Abstract. The disclosed headlamp device employs sensors that detect the depression speed of the accelerator pedal and brake pedal. *See id.* Abstract, ¶ 12.

b. Analysis

Petitioner asserts that Mori's accelerator pedal and brake pedal sensors are "sensors [that] generate a signal that is representative of the rate of change of the road speed of the vehicle," as recited in claim 10. *See* Pet. 40; Ex. 1019, 37; Ex. 1010 ¶¶ 23, 24. Petitioner asserts that a person of ordinary skill in the art would have had reason to modify Takahashi to include Mori's accelerator pedal depression speed and brake pedal depression speed sensors because such a person would have realized that detecting acceleration and deceleration would have allowed for correction of the headlight angle to account for squatting (i.e., when the front of the vehicle raises) during acceleration, and diving (i.e., when the rear portion of the vehicle raises) during deceleration. Pet. 40–41; Ex. 1010 ¶ 4; Ex. 1019 ¶¶ 74–75. Patent Owner does not dispute with specificity Petitioner's

assertions concerning claim 10, or raise any additional specific patentability arguments concerning this claim. *See* PO Resp. 43–44.

We find on this record that Mori's accelerator pedal and brake pedal sensors are "one or more additional sensors [that] generate a signal that is representative of the rate of change of the road speed of the vehicle," as recited in claim 10. We also find on this record that a person of ordinary skill in the art would have had reason to combine Mori's accelerator pedal and brake pedal sensors with the Kato/Takahashi system discussed above because doing so would have allowed for correction of the headlight angle to account for squatting during acceleration and diving during deceleration. *See* Pet. 40–41; Ex. 1010. ¶ 4; Ex. 1019 ¶¶ 74–75.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claim 10 is unpatentable as obvious over Kato, Takahashi, and Mori.

5. Ground 3: Alleged Obviousness of Claims 11 and 19 over Kato, Takahashi, and Uguchi

a. Uguchi

Uguchi discloses a vehicle headlight control device that can adjust the irradiation direction of a headlight according to the steering direction of a vehicle. Ex. 1012, 2:5–9. Uguchi's device calculates "an amount of change in the steering angle speed" of the vehicle, and adjusts the irradiation of the headlight "when the amount of change of the speed [in steering angle] is greater than a predetermined value." *Id*.

b. Analysis

Petitioner asserts that Uguchi's "acceleration sensor that can detect an amount of change in speed" of the steering angle is a sensor that "generate[s] a signal that is representative of the rate of change of the steering angle of the vehicle," as recited in claim 11. *See* Pet. 41–42; Ex. 1019, 38–41; Ex. 1012, 4:18–20. Petitioner also asserts that Uguchi discloses the use of a servo motor as a headlight actuator, as required by claim 19. *See* Pet. 41, 43; Ex. 1019, 40–41. In particular, Petitioner points to Uguchi's disclosure that "[t]here have been a variety of ideas to change the irradiation direction of a headlight in conjunction with a steering operation. . . . For example, . . . an electric cornering lamp system configured to detect a rotating angle of a headlight . . . and control through a servomotor." Ex. 1012, 2:15–19. Petitioner additionally argues that a person of ordinary skill in the art would have had reason to modify the combination of Kato and Takahashi discussed above, to include a sensor that detects the rate of change of steering angle of a vehicle, and actuators that include servo motors, because such a person would have realized that detecting the rate of change in the steering angle of a vehicle could have been used to reduce time delay in a headlight control system. *See* Pet. 43; Ex. 1019 ¶ 79; Ex. 1012, 5:10:13. Patent Owner does not dispute with specificity Petitioner's assertions concerning claims 11 and 19, or raise any additional specific patentability arguments concerning these claims. PO Resp. 43–44.

We find on this record that Uguchi's acceleration sensor and servo motors satisfy the additional limitations recited in claims 11 and 19, respectively. We also find that a person of ordinary skill in the art would have had reason to combine these components of Mori's system with the

Kato/Takahashi system discussed above, because detecting the rate of change in steering angle could have been used to reduce time delay. *See* Pet. 43; Ex. 1019 ¶ 79; Ex. 1012, 5:10:13.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claims 11 and 19 are unpatentable as obvious over Kato, Takahashi, and Uguchi.

6. Ground 4: Alleged Obviousness of Claim 12 over Kato, Takahashi, and Ishikawa

a. Ishikawa

Ishikawa is a technical paper titled "Auto-Levelling Projector Headlamp System with Rotatable Light Shield." Ex. 1013, 1. Ishikawa describes a gyroscopic sensor that detects the rate of change of inclination of a vehicle. *Id*. at 4.

b. Analysis

Petitioner asserts that Ishikawa discloses a sensor that "generate[s] a signal that is representative of the rate of change of the pitch of the vehicle," as recited in claim 12. *See* Pet. 44–45; Ex. 1019, 42–43. Ishikawa's "gyroscopic sensor detects the rate of change of inclination [i.e., pitch]" of a vehicle. Ex. 1013, 4. Petitioner also asserts that a person of ordinary skill in the art would have had reason to modify the combination of Kato and Takahashi discussed above, to include the gyroscopic sensor of Ishikawa, because such a person would have recognized that measuring the rate of change of a vehicle's pitch would have provided instantaneous inclination

information that could be used by a controller to adjust the position of a headlight. Pet. 45; Ex. 1019 ¶¶ 84–86; Ex. 1013, 4. Patent Owner does not dispute with specificity Petitioner's assertions concerning claim 12, or raise any additional specific patentability arguments concerning this claim. PO Resp. 43–44.

We find on this record that Ishikawa's gyroscopic sensor satisfies the additional limitations recited in claim 12. We also find on this record that a person of ordinary skill in the art would have had reason to combine Ishikawa's gyroscopic sensor with the Kato/Takahashi system discussed above because data indicating the rate of change of vehicle pitch could be used by a controller to rapidly adjust the position of a headlight. *See* Pet. 45; Ex. 1019 ¶¶ 84–86; Ex. 1013, 4.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claim 12 is unpatentable as obvious over Kato, Takahashi, and Ishikawa.

7. Ground 5: Alleged Obviousness of Claim 22 over Kato, Takahashi, and Panter

a. Panter

Panter is directed to a vehicle headlight aiming apparatus and method. Ex. 1014, 1:6–7. Panter discloses that it was known in the art to provide a vehicle headlight with a manually adjustable support structure so that the beam of the headlight can be calibrated to match a standard headlight image pattern. *Id*. at 1:16–23.

b. Analysis

Petitioner asserts that in Panter's system, the "directional orientation at which a beam of light projects is capable of being adjusted relative to the vehicle by manual operation," as recited in claim 22. *See* Pet. 45–46; Ex. 1019, 45–46. Dr. Wilhelm testifies that, "[a]lthough Panter does not expressly teach that the manual adjustments are made to 'actuators,' this would have been obvious to a POSITA . . . in view of the fact that actuators—as taught[] by Kato and Takahashi—are connected to the vehicle headlights for adjustment thereof." Ex. 1019 ¶ 88. Petitioner further argues that a person of ordinary skill in the art would have had reason to modify the combination of Kato and Takahashi discussed above, to include manual operation of the recited two or more actuators, because Panter discloses that manual adjustment capability is known in the art to improve headlights. Pet. 46; Ex. 1019 ¶¶ 88–90; *see also* Ex. 1014, 1:14–16 (disclosing that "[h]eadlights must be aimed according to standards," and that these standards differ in different countries). Patent Owner does not dispute with specificity Petitioner's assertions concerning claim 22, or raise any additional specific patentability arguments concerning this claim. PO Resp. 43–44.

We find on this record that Panter's system includes a calibration mode in which "a directional orientation at which a beam of light projects is capable of being adjusted relative to the vehicle by manual operation," as recited in claim 22. We also find on this record that it would have been obvious to incorporate this calibration mode into the Kato/Takahashi system discussed above, such that the manual calibration would be performed via manual actuation of Kato's actuators, because this would have been an

obvious use of "a technique [that] has been used to improve one device . . . [to] improve similar devices in the same way." *See KSR*, 550 U.S. at 417; Pet. 46; Ex. 1019 ¶¶ 88–90; Ex. 1014, 1:14–16.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claim 22 is unpatentable as obvious over Kato, Takahashi, and Panter.

8. Ground 6: Alleged Obviousness of Claims 25 and 26 over Kato, Takahashi, and Suzuki

a. Suzuki

Suzuki discloses a linear actuator that is used for adjusting the optical axis of a headlight. Ex. 1016, 3:18–20. Suzuki also discloses that such actuators may be used together with position sensors that detect the position of the actuators. *See, e.g., id.* at 4:45–48; 5:12–15.

b. Analysis

Petitioner asserts that Suzuki discloses a "position feedback sensor capable of providing a position feedback signal associated with" a headlight actuator, as recited in claim 25. *See* Pet. 47–48; Ex. 1019, 47–48. In particular, Suzuki discloses the use of a magnet and detection device to detect "a current position of the actuator." Ex. 1016, 5:12–15. Petitioner also asserts that Suzuki discloses the use of a "position feedback sensor [that] includes a Hall Effect sensor," as recited in claim 26. *See* Pet. 47–48; Ex. 1019, 47–48. Suzuki discloses "a position detecting device 23 [that includes] a HALL device." Ex. 1016, 4:45–48. Petitioner additionally

asserts that one of ordinary skill in the art would have had reason to modify the combination of Kato and Takahashi discussed above, to include a position feedback sensor (such as a Hall Effect sensor) that provides a position feedback signal associated with a headlight actuator, because such a feedback sensor advantageously would have allowed the Kato/Takahashi system to more accurately determine the position of a headlight's optical axis. *See* Pet. 48; Ex. 1019 ¶¶ 92–94; *see also* Ex. 1016 ¶ 2 ("accurately find[ing] out a position . . . of the actuator moving in the linear direction" makes it "possible to set an optical axis to the desired direction," and can also "eliminate the need of a mechanical stopper with regard to the headlight optical axis position"). Patent Owner does not dispute with specificity Petitioner's assertions concerning claims 25 and 26, or raise any additional specific patentability arguments concerning these claims. PO Resp. 43–44.

We find on this record that Suzuki discloses the additional limitations recited in claims 25 and 26. We also find on this record that incorporating Suzuki's Hall effect feedback sensor into the Kato/Takahashi system discussed above would have allowed for more accurate determination of the position of a headlight, and would have been an obvious use of "a technique [that] has been used to improve one device . . . [to] improve similar devices in the same way." *See KSR*, 550 U.S. at 417; Pet. 48; Ex. 1019 ¶¶ 92–94; Ex. 1016 ¶ 2.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claims 25 and 26 are unpatentable as obvious over Kato, Takahashi, and Suzuki.

9. Ground 7: Alleged Obviousness of Claim 30 over Kato, Takahashi, and Okuchi

a. Okuchi

Okuchi discloses a vehicle headlight optical axis automatic adjusting system. Ex. 1017, Abstract. Okuchi's system includes EEPROM 29, which contains "system error information" denoting "factors exerting influence on the calculation of the inclination angle" of a vehicle, "such as an installation error of [a] vehicle height sensor." *Id.* at 12:12–24. Okuchi also discloses the use of "filtering . . . to remove high frequency components of [detected] vibration . . . and the change in the [detected] pitch angle due to unevenness of the road surface" in order to "preven[t] the [headlight] actuator from responding." *Id*. at 6:33–38.

b. Analysis

Petitioner asserts that Okuchi's EEPROM, which stores "system error information," is a memory "configured to store a predetermined reference position associated with the headlight," as recited in claim 30. *See* Pet. 48–49; Ex. 1019, 49–50; Ex. 1017, 12:12–24. In particular, Petitioner asserts that "an installation error of [a] vehicle height sensor," as disclosed in Okuchi, is a "predetermined reference position associated with the headlight." *See id.* Petitioner also asserts that one of ordinary skill in the art would have had reason to modify the combination of Kato and Takahashi discussed above, to include a memory containing system error information, as described in Okuchi, because this system error information "exert[s] influence on the calculation of the inclination angle" that is used to adjust a vehicle headlight. Ex. 1017, 12:12–24; *see* Pet. 48–49; Ex. 1019, 49–50.

Patent Owner does not dispute with specificity Petitioner's assertions concerning claim 30, or raise any additional specific patentability arguments concerning this claim. PO Resp. 43–44.

We find on this record that Okuchi's EEPROM is a memory "configured to store a predetermined reference position associated with the headlight," as recited in claim 30. We also find on this record that one of ordinary skill in the art would have had reason to combine Okuchi's EEPROM into the Kato/Takahashi system discussed above because installation errors and the like can influence headlight aiming, and because Okuchi's error information could have been used to allow a headlight controller to compensate for such errors when adjusting a vehicle headlight. *See* Ex. 1017, 12:12–24; Pet. 48–49; Ex. 1019, 49–50.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claim 30 is unpatentable as obvious over Kato, Takahashi, and Okuchi.

10. Ground 8: Alleged Obviousness of Claims 3 and 6 over Kato and Uguchi

Petitioner asserts that Kato discloses all limitations of claims 3 and 6, except for the following two limitations recited in claim 3:

> generating at least one output signal only when at least one of said two or more sensor signals changes by more than a predetermined minimum threshold amount to prevent at least one first one of two or more actuators from being operated continuously or unduly frequently in response to relatively small variations in at least one of the sensed conditions

(the "predetermined minimum threshold" limitation), and "wherein at least one of said two or more sensors generates at least one of said two or more sensor signals that is representative of a rate of change of the steering angle of the vehicle" (the "steering angle rate of change" limitation). Pet. 52–53. Petitioner alleges that Uguchi discloses the predetermined minimum threshold and steering angle rate of change limitations. *Id.* In particular, Petitioner cites disclosures in Uguchi of a vehicle headlight control device that "calculates an amount of change in the steering angle speed" (i.e., the steering angle rate of change), and then operates a driving means to "change the irradiation direction of the headlight" when "both or either of the amount of change in the steering angle speed and the steering angle exceed the predetermined amount that has been preset" (i.e., a predetermined minimum threshold). Pet. 54–55; Ex. 1012 at 2:41–3:10; 5:10–13.

Patent Owner, in its Response to the Petition, does not dispute with specificity Petitioner's assertion that Uguchi discloses the predetermined minimum threshold and steering angle rate of change limitations of claim 3, or Petitioner's assertion that Kato discloses a headlight control device that satisfies all remaining limitations of claims 3 and 6. PO Resp. ii–iii; 35–53. We find Petitioner's evidence that Kato and Uguchi disclose all limitations of claim 3 to be persuasive and adopt Petitioner's reasoning. *See* Pet. 52–56; Ex. 1019 ¶¶ 100–107.

Petitioner alleges that one of ordinary skill in the art would have had reason to combine Uguchi's rate-of-change-of-steering-angle sensor and thresholds with the headlight optical axis control device of Kato because doing so would have advantageously reduced the time delay of Kato's headlight optical axis control device. *See* Pet. 56; Ex. 1019 ¶¶ 105–106; Ex.

1012, 5:10–14 ("when both or either of the amount of change in the steering angle and the steering angle exceed the predetermined about . . . the program activates the driving means, and changes the direction of the lamp, . . . with reduced time delay (time lag) and no discomfort.")

In response, Patent Owner repeats its argument that Kato is not analogous art to the '034 patent, and thus may not be relied upon to show obviousness. PO Resp. 37–38. This argument is not persuasive for the reasons discussed in Section III.C.3.c, *supra*.

Patent Owner also argues that a person of ordinary skill in the art would not have had reason to combine Uguchi and Kato because Uguchi's vehicle headlight control device is allegedly related to four-wheeled vehicles, whereas Kato's headlight controller allegedly relates to motorcycles. PO Resp. 38–40. Patent Owner additionally argues that Uguchi teaches away from a combination with Kato, and that modifying Kato's system in the manner proposed by Petitioner would render Kato's system unsuitable for its intended purpose. *Id*. at 40–43. We are not persuaded by these arguments.

As discussed above, Uguchi uses rate-of-change-of-steering-angle data and thresholds to "reduce[] time delay (time lag) and [prevent] discomfort." Ex. 1012, 5:10–14. We are not persuaded that these features of Uguchi's system could not have been used to reduce time lag and prevent discomfort in Kato's system. In particular, Patent Owner's expert, Mr. Katona's testimony that Uguchi relates only to "equipment and features typically implemented within four-wheeled vehicles and not in motorcycles, including fog lamps, a bumper, and a steering wheel" (Ex. 2002 ¶ 65) is not persuasive. Uguchi's disclosure is not limited to the adjustable fog lamps

mounted to a bumper described in the "Example" section of the disclosure (*see, e.g.*, Ex. 1012, 2:5–9, 2:12–13, 2:37–3:4), and Mr. Katona does not provide an adequate explanation of why the rate of change of steering angle could not be calculated from a sensor attached to motorcycle handlebars (*see* Ex. 2002 ¶ 65). Mr. Katona's testimony that Petitioner's motivation to combine argument "appears dubious" is conclusory in nature, erroneously refers to the Takahashi reference (which is not part of this ground), and relates to an alternative rationale for combining argument that we do not rely on in this decision. *See* Ex. 2002 ¶ 66. With respect to Patent Owner's teaching away and unsuitable-for-its-intended-purpose arguments, Mr. Katona does not adequately explain why Uguchi's system, which "reduces time delay (time lag)" (Ex. 1012, 5:10–14), would not serve Kato's goal of "a control system with the highest degree of responsiveness" (*see* Ex. 2002 ¶ 67). Mr. Katona also does not adequately explain why these features of Uguchi would prevent Kato's system from responding to changes in inclination of a motorcycle. *See* Ex. 1002 ¶ 68. Patent Owner additionally fails to cite persuasive evidence of improper hindsight. *See* PO Resp. 41.

On this record, we credit Dr. Wilhelm's testimony that one of ordinary skill would have realized that Uguchi's rate-of-change-of-steering-angle sensor and thresholds could be used to advantageously reduce time delay and discomfort within Kato's system. Ex. 1019 ¶¶ 105–106; Ex. 1037 ¶¶ 46–54. Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claims 3 and 6 are unpatentable as obvious over Kato and Uguchi.

11. Ground 9: Alleged Obviousness of Claim 4 over Kato, Uguchi, and Ishikawa

Petitioner alleges that Ishikawa discloses a sensor that "generates a signal that is representative of a rate of change of the pitch of the vehicle," as recited in claim 4. *See* Pet. 57–58; Ex. 1019, 57–58. Ishikawa's gyroscopic sensor "detects the rate of change of inclination [i.e., pitch]" of a vehicle. Ex. 1013, 4. Petitioner also argues that a person of ordinary skill would have realized that Ishikawa's gyroscopic sensor could be used to advantageously provide instantaneous inclination information that could be used by a controller to adjust the position of a headlight. *See* Pet. 57–58; Ex. 1019 ¶ 110; Ex. 1013, 4. Patent Owner does not dispute with specificity Petitioner's assertions concerning claim 4, or raise any additional specific patentability arguments concerning this claim. PO Resp. 43–44.

We find on this record that Ishikawa's gyroscope "generates a signal that is representative of a rate of change of the pitch of the vehicle," as recited in claim 4. We also find on this record that one of ordinary skill in the art would have had reason to incorporate Ishikawa's gyroscope into the Kato/Uguchi system described above because such a gyroscope would have provided inclination information that could be used by a controller to instantaneously adjust a headlight. *See* Pet. 57–58; Ex. 1019 ¶ 110; Ex. 1013, 4.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a preponderance of the evidence that claim 4 is unpatentable as obvious over Kato, Uguchi, and Ishikawa.

12. Ground 10: Alleged Obviousness of Claim 5 over Kato, Uguchi, and Takahashi

Petitioner asserts that Takahashi discloses vehicle posture detection sensor that "generates a signal that is representative of a suspension height of the vehicle." Pet. 58–59; Ex. 1019 ¶¶ 111–112. Petitioner also asserts that one of ordinary skill would have had reason to combine Takahashi's vehicle posture detection device (including height detection devices 7), with the system of Kato and Uguchi described above, because Takahashi teaches that measurements of road gradient can be used to correct the illumination direction of the vehicle lamp. Pet. 59; Ex. 1019 ¶ 112; Ex. 1008, 7:12–17 ("based on the information from the vehicle posture detection device . . . when the road gradient varies suddenly, [control device 4] can correct the illumination direction of the lamp 6."). Patent Owner does not dispute with specificity Petitioner's assertions concerning claim 5, or raise any additional specific patentability arguments concerning this claim. PO Resp. 43–44.

We find on this record that Takahashi discloses a sensor that "generates a signal that is representative of a suspension height of the vehicle," as recited in claim 5. We also find on this record that a skilled artisan would have had reason to incorporate Takahashi's vehicle height detection device (including height detection devices 7) into the Kato/Uguchi system described above, in view of Takahashi's teaching that road gradient measurements can be used to correct the illumination direction of a headlight. *See* Pet. 59; Ex. 1019 ¶ 112; Ex. 1008, 7:12–17.

Based on the arguments and evidence presented in the Petition and having considered all of the arguments and evidence presented by both parties during the trial, we find Petitioner has established by a

preponderance of the evidence that claim 5 is unpatentable as obvious over Kato, Uguchi, and Takahashi.

IV. ORDER

Accordingly, it is

ORDERED that claims 7–9, 13–18, 20, 21, 23, 24, 28, 29, 31, 32, and 35 of the ’034 patent are unpatentable as obvious over Kato and Takahashi;

FURTHER ORDERED that claim 10 of the ’034 patent is unpatentable as obvious over Kato, Takahashi, and Mori;

FURTHER ORDERED that claims 11 and 19 of the ’034 patent are unpatentable as obvious over Kato, Takahashi, and Uguchi;

FURTHER ORDERED that claim 12 of the ’034 patent is unpatentable as obvious over Kato, Takahashi, and Ishikawa;

FURTHER ORDERED that claim 22 of the ’034 patent is unpatentable as obvious over Kato, Takahashi, and Panter;

FURTHER ORDERED that claims 25 and 26 of the ’034 patent are unpatentable as obvious over Kato, Takahashi, and Suzuki;

FURTHER ORDERED that claim 30 of the ’034 patent is unpatentable as obvious over Kato, Takahashi, and Okuchi;

FURTHER ORDERED that claims 3 and 6 of the ’034 patent are unpatentable as obvious over Kato and Uguchi;

FURTHER ORDERED that claim 4 of the ’034 patent is unpatentable as obvious over Kato, Uguchi, and Ishikawa;

FURTHER ORDERED that claim 5 of the ’034 patent is unpatentable as obvious over Kato, Uguchi, and Takahashi; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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