

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SL CORPORATION,
Petitioner,

v.

ADAPTIVE HEADLAMP TECHNOLOGIES, INC.,
Patent Owner.

Case IPR2016-00193
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

I. INTRODUCTION

SL Corporation (“Petitioner”) filed a Petition (Paper 2; “Pet.”) to institute an *inter partes* review of claims 3–39 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 9; “Prelim. Resp.”). The Board instituted a trial as to claims 7–10, 12–21, 23, 24, and 28–39 of the ’034 patent. Paper 10 (“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 20. Petitioner relies on the Declaration of Harvey Weinberg (Ex. 1002) in support of its Petition, and the Reply Declaration of Harvey Weinberg (Ex. 1035) 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 February 23, 2017. The record contains a transcript of this hearing. Paper 25 (“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 7–10, 12–21, 23, 24, and 28–39 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).

See Pet. 1–2; Ex. 1001. These reexamination proceedings were merged and resulted in issuance of an *inter partes* reexamination certificate. 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. 3–4; Paper 5. Petitioner is not a party to any of these Delaware litigations. See *id.* However, Petitioner identifies Hyundai Motor America and Hyundai Motor Company as being real parties in interest. Pet. 3. Hyundai Motor America is a named defendant in one of the Delaware litigations. *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.

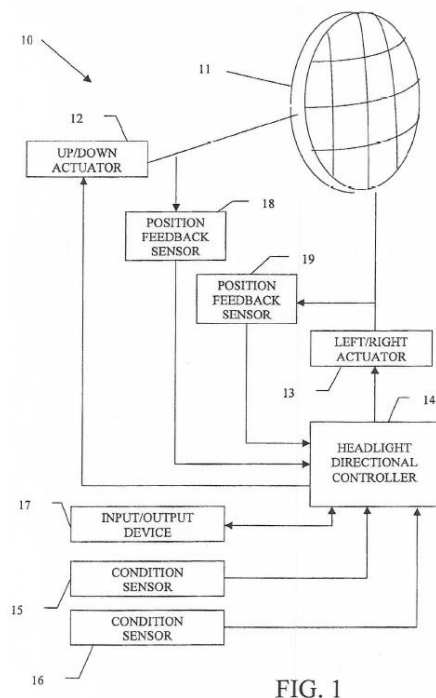


Figure 1 is a block diagram of automatic directional control system 10 for a vehicle headlight. *Id.* at 2:28–30, 63–65. Headlight 11 is mounted on a

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 Claim

Challenged claim 7 is independent, and the remaining challenged claims depend, directly or indirectly, from claim 7. Claim 7 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.
UK Published Patent Application GB 2 309 774 A (pub. Aug. 6, 1997) (“Takahashi”)	1019
Japan Patent Application Publication H10-324191 (pub. Dec. 8, 1998) (“Kato”)	1024
US Patent 6,229,263 B1 (iss. May 8, 2001) (“Izawa”)	1026
US Patent 6,293,686 B1 (iss. Sept. 25, 2001) (“Hayami”)	1027
Purported admissions by the Patent Owner in the '034 patent specification (“Patent Owner Admissions”)	1001

Pet. 13; Dec. on Inst. 36–37.

E. Grounds of Unpatentability

We instituted trial on the following grounds:

Ground¹	Challenged Claim(s)	Statutory Basis	References
1	7–9, 13–18, 21, 23, 24, and 28–33	35 U.S.C. § 103(a)	Kato and Takahashi
2	10 and 12	35 U.S.C. § 103(a)	Kato, Takahashi, Izawa and/or Patent Owner Admissions
3	19 and 20	35 U.S.C. § 103(a)	Kato, Takahashi, and Patent Owner Admissions
4	36–39	35 U.S.C. § 103(a)	Kato, Takahashi, and Hayami,
5	34 and 35	35 U.S.C. § 103(a)	Kato and Takahashi

Dec. on Inst. 36–37.

III. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art “would have had a minimum of an undergraduate degree in Mechanical or Electrical Engineering, Engineering Physics, or a comparable field, or equivalent industry experience. In addition, a POSITA would have had two or more years of professional automotive industry experience.” Ex. 1002 ¶ 15.

¹ We refer to the instituted grounds by these numbers in our analysis.

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. 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. 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. 7. 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.* 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). Petitioner has presented persuasive testimony and dictionary evidence that the ordinary and customary meaning of “vehicle” encompasses motorcycles. *See* Ex. 1035 ¶ 16; Ex. 1044; Ex. 1045. Patent Owner does not contend that the term “vehicle,” in ordinary usage, would exclude motorcycles. *See* PO Resp. 7.

Patent Owner does not sufficiently identify the portions of the specification that allegedly support its claim construction argument. *See* PO Resp. 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 Paragraphs 41 and 44–48 of the Katona Declaration. *See* PO Resp. 7. However Paragraph 41 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. 2002 ¶ 41. Paragraphs 44–48 attempt to contrast Kato’s motorcycle-related disclosure with portions of the ’034 patent specification that allegedly relate to vehicles with four wheels, but these paragraphs do not identify any lexicographic definitions of the term “vehicle,” or anything approaching a clear and unmistakable disclaimer or disavowal of claim scope. *See id.* ¶¶ 44–48. Moreover, even assuming, *arguendo*, that the ’034 patent was limited to headlight assemblies “fixed relative to the body of the

vehicle,” as Mr. Katona suggests (*see id.* ¶ 45), it still would not follow that Kato’s motorcycles fall outside the scope of the ’034 patent specification and claims. Kato discloses that motorcycle headlights need not be mounted to a motorcycle’s handlebars, but may instead be “affixed to the vehicle body” of a motorcycle. *See* Ex. 1024 ¶¶ 12, 14.

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 do not assert that we need to construe any additional terms in our final written decision. *See* PO Resp. 49; Reply 4–8. 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))).

C. *Asserted Grounds of Unpatentability*

1. Overview

All of the challenged claims are alleged to be unpatentable under 35 U.S.C. § 103. Dec. on Inst. 36–37. 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, 21, 23, 24, and 28–33 over Kato and Takahashi

a. Kato

Kato is directed to a headlight optical axis control device for a motorcycle. Ex. 1024, 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]

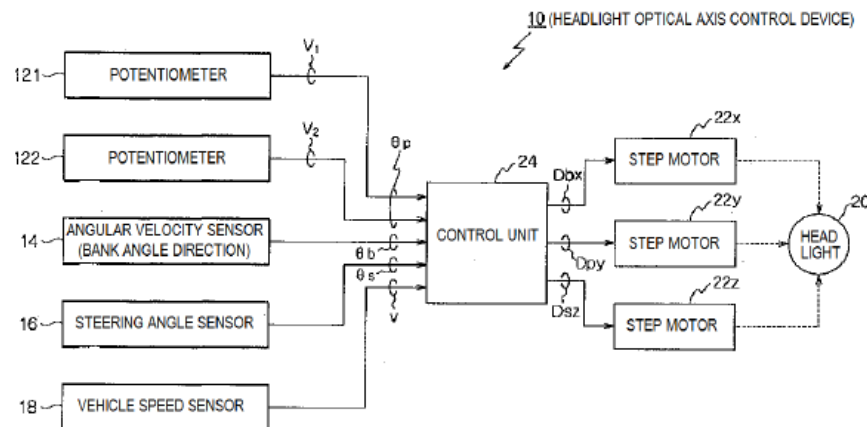


Figure 1 is a functional block diagram illustrating one embodiment of a headlight optical axis control device. Ex. 1024 ¶ 15. The device includes potentiometers 121 and 122 to detect pitch angle, angular velocity sensor 14 to detect bank angle, sensor 16 to detect the steering angle, and speed sensor 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. 1019, 1:3–7.

Figure 1 of Takahashi is reproduced below.

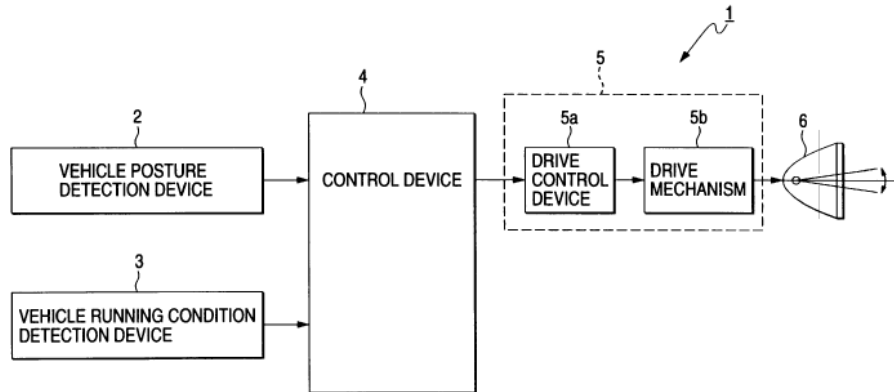


Figure 1 depicts the basic structure of an embodiment of Takahashi's illumination direction control device. Ex. 1019, 5:24–29. Vehicle posture detection device 2 detects, for example, the vertical inclination of the vehicle. *Id.* at 5:30–34. Vehicle running condition detection device 3 detects, for 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. 16–20, 53–54; Dec. on Inst. 15. Petitioner alleges that Takahashi discloses the “predetermined minimum threshold” limitation. Pet. 53–57.

Patent Owner, in its Response to the Petition, argues that the cited references do not teach the predetermined minimum threshold limitation of claim 7. PO Resp. 33. 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, 12–37. We find Petitioner’s evidence regarding the non-disputed limitations of claim 7 to be persuasive and adopt Petitioner’s reasoning. *See* Pet. 16–20; Ex. 1002 ¶¶ 31–36, 38–40. 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. 55–56 (quoting Ex. 1019, 9:16–34); PO Resp. 34–35 (quoting Ex. 1019, 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 tandem,” 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. 35. According to Patent Owner, this two-tiered “thresholding scheme cannot read on the threshold limitation of claim 7.” *Id.* Patent Owner also argues that Takahashi’s threshold is applied to the “*number of variations*” in a signal, rather than to the “magnitude of a sensed signal, as is required by claim 7.” *Id.* at 36. Petitioner concedes that Takahashi employs two separate thresholds, but

argues that claim 7, “which is open-ended as to how many sensor signals change by a predetermined minimum threshold, can be met by any number of threshold requirements.” Reply 21. Petitioner also asserts the distinction Patent Owner attempts to draw between the magnitude of a sensed signal, and the number of variations in a sensed signal, is a “distinction without a difference.” *Id.* at 22 (citing PO Resp. 12.) We agree with Petitioner.

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. 1019, 9:23–27. The fact that Takahashi’s controller employs a 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") exceeds a "predetermined minimum threshold" (i.e., Takahashi's given reference value).

We also disagree with Patent Owner's assertion that Takahashi's reference value is applied to the number of variations in a sensed signal, rather than the magnitude of variations. When read in isolation, the word "amount" in Takahashi's recitation "only when the amount of variations in the detect signal of the vehicle posture detection device 2 exceeds a given reference value" could arguably be read to refer to either a quantity or a magnitude. However, other portions of Takahashi make clear that phrase "amount" refers to the magnitude by which the detect signal has varied. For example, Takahashi's "Fig. 3 shows schematically the amount of variations in the output level V when the vehicle runs first along an uphill slope and thereafter runs along a road having a small gradient." Ex. 1019, 7:29–32. In Figure 3, the variable "V," which is indicated on the y axis of a graph, depicts a magnitude, rather than a quantity (i.e., it depicts a detect signal that is high when the vehicle is moving uphill, and lower when the vehicle moves to a road having a smaller gradient). *See id.* Fig. 3. Figures 4, 5, and 6 also support this reading of Takahashi. *See id.* 8:1–25, Figs. 4–6; *see also id.* at 8:26–9:32 ("[W]hen the amount of variations with time of the detect signal of the vehicle posture detect signal 2 is equal to or larger than a reference value, it may be judged that the gradient of the road has varied, and the illumination direction of the lamp 6 may be corrected.")

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 had reason to combine Takahashi's reference (i.e., threshold) values with Kato's headlight optical axis control device because doing so would reduce cost and improve safety and visibility. See Pet. 56; Ex. 1002 ¶¶ 80, 147 (citing Ex. 1019, 2:4–19, 18:18–22). As Petitioner points out (Pet. 55), 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. 1019, 9:16–34. Takahashi also teaches that prior art devices, in which “the lamp is driven with high frequency,” required actuators that were “expensive and consume[d] a large amount of electric power.” *Id.* at 2:4–19.

Patent Owner argues in response that Kato is not analogous art because the term “vehicle,” as used in the '034 patent, does not encompass motorcycles. See PO Resp. 17–24. In particular, Patent Owner argues that Kato's “optical axis control device for a motorcycle” (see Ex. 1024, 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 specification and claims of the '034 patent excludes motorcycles. PO Resp. 17–20. 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 8–12; Ex. 1035 ¶¶ 23–30) 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. 1024 ¶ 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 cars, trucks, and the like.” 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. 1024 ¶ 11. 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; *see* Ex. 1035 ¶¶ 17–21. 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 8–12; Ex. 1035 ¶¶ 31–32) 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 did only relate 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), 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 26–29). 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 29–31. 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 31–32. We are not persuaded by these arguments.

Takahashi’s thresholds operate to “prevent the illumination direction 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. 1019 9:16–20. 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. 2002 ¶¶ 544–54. We find credible the testimony of Petitioner's expert, Mr. Weinberg, 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. 1002 ¶¶ 79–80; Ex. 1037 ¶¶ 34–50.

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. 1024 ¶ 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. 29–31; Ex. 2002 ¶¶ 53–56; Reply 15–16. We also do not find that such thresholds would render Kato's system unsuitable for its intended purpose. *See* PO Resp. 31–32; Ex. 2002 ¶¶ 49–56. 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 16–20; Ex. 1037 ¶¶ 34–50. Patent Owner also has failed to cite any persuasive evidence of improper hindsight. *See* PO Resp. 31, 34.

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, 9, 13–18, 21, 23, 24, and 28–33:

Claims 8, 9, 13–18, 21, 23, 24, and 28–33 all depend from claim 7, and recite further limitations. 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 each of these claims. *See* Pet. 16–25; PO Resp. ii, 36–37. Patent Owner also does not raise with specificity any other disputes regarding the alleged obviousness of claims 8, 9, 13–18, 21, 23, 24, and 28–33, beyond those disputes discussed above with respect to claim 7. *See* PO Resp. ii, 36–37.

We have reviewed Petitioner’s evidence and arguments concerning the alleged obviousness of claims 8, 9, 13–18, 21, 23, 24, and 28–33. *See* Pet. 16–25, 53–58; Ex. 1002 ¶¶ 41–59, 78–80. Petitioner has shown that Kato teaches 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, 9, 13–18, 21, 23, 24, and 28–33 are unpatentable as obvious over Kato and Takahashi.

4. Ground 2: Alleged Obviousness of Claims 10 and 12 over Kato, Takahashi, Izawa, and/or Patent Owner Admissions

a. Izawa

Izawa is directed to a lighting-direction control unit for a vehicle lamp that is designed to “reduce [the] frequency . . . of dazzling light” by “control[ling] the lighting direction of the lamp if the pitch angle . . . is changed.” Ex. 1026, Abstract, 1:45–51. Izawa’s lighting-direction control unit detects changes in the height of the front and rear axles of a vehicle, and includes a “lighting control means for obtaining a change rate of acceleration in a direction in which the vehicle runs with respect to time.” *Id.* at 1:52–61. Izawa uses this acceleration change rate data to change the response of the vehicle lamp control in order to prevent headlight glare. *Id.* at 1:64–2:2.

b. Analysis

Petitioner alleges that Izawa discloses sensors that generate signals representative of “the rate of change of the road speed of the vehicle” and “the rate of change of the pitch of the vehicle,” as recited in claims 10 and 12, respectively. Pet. 29–30; Ex. 1002, ¶¶ 75, 77. Izawa discloses the use of “an acceleration sensor for detecting the acceleration of the vehicle in the direction in which the vehicle runs” (Ex. 1026, 3:12–14) and “an angular velocity sensor . . . for detecting change in the pitch angle of the vehicle” (*id.* at 3:26–28). Petitioner asserts that a person of ordinary skill in the art would have had reason to combine Izawa’s acceleration and angular velocity sensors with the Kato/Takahashi system discussed above because doing so would have allowed “adjusting the lights at the same rates as the vehicle’s position changes, thereby reducing glare and reduc[ing] the occurrence of incorrect light alignment.” Pet. 27; Ex. 2002 ¶ 71. Patent Owner does not dispute with specificity Petitioner’s assertions concerning claims 10 and 12, or raise any additional specific patentability arguments concerning these claims. See PO Resp. 36–37.

We find on this record that Izawa’s acceleration and angular velocity sensors generate signals that are representative, respectively, of “the rate of change of the road speed” and “the rate of change of the pitch” of a vehicle, as required by the challenged claims. 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 the headlights to be adjusted according to the rates at which the vehicle’s position was changing. See Pet. 27; Ex. 2002 ¶ 71.

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 10 and 12 are unpatentable as obvious over Kato, Takahashi, and Izawa.

5. Ground 3: Alleged Obviousness of Claims 19 and 20 over Kato, Takahashi, and Patent Owner Admissions

Claims 19 and 20 depend from claim 7, and further require that the recited two or more actuators include a “servo motor” and a “microstepping motor,” respectively. The ’034 patent specification describes “servo motors” as being a type of actuator “conventional in the art,” and also indicates that “microstepping motors” are a type of actuator “known in the art.” Ex. 1001, 3:28–33. Petitioner asserts that it would have been obvious to substitute these known types of actuators in place of Kato’s actuators (i.e., step motors 22x, 22y, and 22z). Pet. 30–32; Ex. 1002, ¶¶ 81–82. Patent Owner does not dispute with specificity Petitioner’s assertions concerning claims 19 and 20, or raise any additional specific patentability arguments concerning these claims. See PO Resp. 36–37.

On this record, we find that substituting admittedly “conventional” types of actuators, such as servo motors or microstepping motors, in place of Kato’s step motor actuators, would have been an obvious “substitution of one element for another known in the field” that does no more than “yield a predictable result.” See *KSR*, 550 U.S. at 416.

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 19 and 20 are unpatentable as obvious over Kato, Takahashi, and Patent Owner Admissions.

6. Ground 4: Alleged Obviousness of Claims 36–39 over Kato, Takahashi, and Hayami

a. Hayami

Hayami is directed to a lighting device for a vehicle that includes an illumination control means that “specifies the turn-on and turn-off of a plurality of lamps.” Ex. 1027, Abstract. In one disclosed embodiment, the plurality of lamps include head lamp 7, rain lamp 8, bending lamp 9, and cornering lamp 10. *Id.* at 5:15–20.

b. Analysis

Claim 36 depends from claim 7, and requires that the controller be “further responsive to at least one of said two or more sensor signals to automatically activate one or more vehicle lights that are different than the headlight.” Claim 37 additionally requires that the one or more vehicle lights different than the headlight “include one or more lights for illuminating a road in front of the vehicle during a turn.” Claim 38 requires activating one or more vehicle lights different than the headlight “responsive to a steering angle in excess of a predetermined magnitude.” Claim 39 is similar to claim 38, but further requires that the “one or more vehicle lights that are different than the headlight” be activated “to extend an angular range of a road surface.”

Petitioner contends that Hayami teaches the additional limitations of claims 36–39. *See* Pet. 51–52; Ex. 1002, ¶¶ 91–92, 159–160. In particular,

Petitioner alleges that Hayami's rain lamp 8, bending lamp 9, and cornering lamp 10 are "one or more vehicle lights that are different than the headlight" that are activated in response to the output of a steering angle sensor (i.e., a sensor signal), as recited in claim 36. *See* Pet. 51–52; Ex. 1027, 3:1–2.

Petitioner asserts that Hayami's rain lamp 8, bending lamp 9, and cornering lamp 10, which are activated when the steering angle exceeds predefined "threshold values" are "one or more lights for illuminating a road in front of the vehicle during a turn" as recited in claim 37, and also are "responsive to a steering angle in excess of a predetermined magnitude" as recited in claim 38. *See* Pet. 51–52; Ex. 1027 9–6:9, 9:24–29. Petitioner further asserts that bending lamp 9 and cornering lamp 10, which illuminate angular ranges of the road surface beyond those illuminated by the head lamp 7 (*see id.* Fig. 3, 5:32–67), "extend an angular range of a road surface" as recited in claim 39. *See* Pet. 51–52. Petitioner alleges that a person of ordinary skill would have found it obvious to combine the above-described aspects of Hayami with the Kato/Takahashi system described above in order to improve safety and visibility. *See* Pet. 52; Ex. 1002 ¶¶ 91–92, 159–60. Hayami teaches that illuminating lights other than the head lamp during cornering helps "assure safety as the vehicle runs through a heavily traveled place." Ex. 1027, 9:35–40. Patent Owner does not dispute with specificity Petitioner's assertions concerning claims 36–39, or raise any additional specific patentability arguments concerning these claims. *See* PO Resp. 36–37.

We find on this record that the disclosures in Hayami cited by Petitioner teach or suggest each additional limitation recited in claims 36–39. We also find on this record that a person of ordinary skill in the art would have had reason to incorporate the above-described features of

Hayami into the Kato/Takahashi system because doing so would have improved visibility during cornering, resulting in improved safety. *See* Pet. 52; Ex. 1002 ¶¶ 91–92, 159–60; *KSR*, 550 U.S. at 417 (“[I]f 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.”)

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 36–39 are unpatentable as obvious over Kato, Takahashi, and Hayami.

7. Ground 5: Alleged Obviousness of Claims 34 and 35 over Kato and Takahashi

Claim 34 depends from claim 7, and further requires that the recited controller be “responsive to changes in a suspension height of the vehicle that occur at frequencies lower than a suspension rebound frequency of the vehicle, thereby ignoring frequency changes in the suspension height of the vehicle that are a result of bumps in the road.” Claim 35 depends from claim 7, and further requires that the recited controller be “configured such that the predetermined minimum threshold amount functions as a filter to minimize undesirable operation of at least one of the two or more actuators.”

Petitioner asserts that, in the Kato/Takahashi system discussed above with respect to claim 7, the predetermined minimum threshold value would “act as a filter, preventing undesirable operation of the actuators,” as

required by claim 35. Pet. 57; Ex. 1002 ¶¶ 88, 156. Petitioner further asserts that a person of ordinary skill in the art would have understood that the threshold value should be set “to a value lower than a rebound frequency” to prevent the headlight actuators from activating every time there is a small bump in the road. Pet. 57; Ex. 1002 ¶¶ 86–87, 154–155. Mr. Weinberg further testifies that Takahashi’s system—which adjusts the vehicle headlamp when the vehicle “has passed through a change of road gradient,” but uses reference values to disregard “rough road surfaces” and “sudden stops or starts” (Ex. 1019, Abstract)—would necessarily be responsive to changes in suspension height of a vehicle that occur at frequencies lower than the vehicle’s suspension rebound frequency. Ex. 1002, ¶ 86. Patent Owner does not dispute with specificity Petitioner’s assertions concerning claims 34 and 35, or raise any additional specific patentability arguments concerning these claims. *See* PO Resp. 36–37.

We find on this record that that the controller of the Kato/Takahashi system described above would be responsive to changes in suspension height of the vehicle that occur at frequencies lower than a suspension rebound frequency, and that the predetermined minimum threshold of this system would function as a filter to minimize undesirable operation of a headlight actuator. The rationale for combining the teachings of Kato and Takahashi would be the same rationale set forth above in our discussion of claim 7.

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 34 and 35 are unpatentable as obvious over Kato and Takahashi.

IV. ORDER

Accordingly, it is

ORDERED that claims 7–9, 13–18, 21, 23, 24, and 28–33 of the '034 patent are unpatentable as obvious over Kato and Takahashi;

FURTHER ORDERED that claims 10 and 12 of the '034 patent are unpatentable as obvious over Kato, Takahashi, and Izawa;

FURTHER ORDERED that claims 19 and 20 of the '034 patent are unpatentable as obvious over Kato, Takahashi, and Patent Owner Admissions;

FURTHER ORDERED that claims 36–39 of the '034 patent are unpatentable as obvious over Kato, Takahashi, and Hayami;

FURTHER ORDERED that claims 34 and 35 of the '034 patent are unpatentable as obvious over Kato 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.

Case IPR2016-00193
Patent 7,241,034 C1

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