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Paper 11
Date: July 11, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

YECHEZKAL EVAN SPERO,
Patent Owner.

IPR2023-00318
Patent 9,955,551 B2

Before JON M. JURGOVAN, JASON W. MELVIN, and AARON W. MOORE, *Administrative Patent Judges*.

MELVIN, *Administrative Patent Judge*.

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

I. INTRODUCTION

Volkswagen Group of America, Inc. ("Petitioner") filed a Petition (Paper 2, "Pet.") requesting *inter partes* review of claims 56–87 of U.S. Patent No. 9,955,551 B2 (Ex. 1001, "the '551 patent"). Yechezkal Evan Spero ("Patent Owner") filed a Preliminary Response. (Paper 6, "Prelim. Resp."). As authorized, Petitioner filed a Preliminary Reply (Paper 7 ("Prelim. Reply")), and Patent Owner filed a Preliminary Sur-Reply (Paper 8 ("Prelim. Sur-Reply")). Pursuant to 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a), we have authority to determine whether to institute review.

An *inter partes* review may not be instituted unless "the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). For the reasons set forth below, we conclude that Petitioner has shown a reasonable likelihood it will prevail in establishing the unpatentability of at least one challenged claim, and we institute *inter partes* review.

A. REAL PARTIES IN INTEREST

Petitioner identifies itself as the real party in interest. Pet. 87. Patent Owner also identifies itself as the real party in interest, noting that Torchlight Technologies LLC is the exclusive licensee of the '551 patent. Paper 4, 1 (Patent Owner's Mandatory Notices).

B. RELATED MATTERS

Patent Owner identifies the following related federal district court litigations of the '551 patent: *Torchlight Techs. LLC v. Daimler AG et al.*, Case No. 1:22-cv-

00751 (D. Del.); *Torchlight Technologies LLC v. General Motors LLC et al.*, No. 1:22-cv-00752 (D. Del). Paper 4, 1.

Patent Owner identifies the following PTAB *inter parte* reviews of the '551 patent: *Volkswagen Group of America, Inc., v. Yechezkal Evan Spero*, IPR2023-00315 (instituted); *Volkswagen Group of America, Inc., v. Yechezkal Evan Spero*, IPR2023-00336 (pending). Paper 4, 2.[1]

C. THE '551 PATENT

The '551 patent is titled "Detector Controlled Illuminating System" and relates to an "illuminating device" whereby "illumination intensity and spectrum" are varied to illuminate "areas according to the principles of correct lighting practice," e.g., "adapt to ambient lighting, movement, visual tasks being performed, and environmental and personal conditions." Ex. 1001, codes (54), (57). The specification generally describes a lighting device that "incorporates one or more discrete light sources and their ancillary optical and electrical control equipment in an integrated illuminating element." *Id.* at 13:34–36. The combined unit is referred to as a Digital Lighting Fixture (DLF). *Id.* at 18:18–22.

The specification further describes transportation vehicle applications. *Id.* at 50:38–57:37. One such application involves a DLF headlamp device that includes a cluster of LEDs for flexible illumination. *Id.* at 50:50–58. With LEDs having a variety of aims, the headlamp's light distribution pattern may be controlled based on a number of factors, including detected oncoming vehicles. *See id.* at 51:43–47, 52:59–65.

[1] Patent Owner further lists matters involving two different patents related to the '551 patent, including several IPRs, a pending reissue, and a completed *ex parte* reexamination. Paper 4, 2 (identifying IPR2022-01500, IPR2022-01586, IPR2023-00197, IPR2023-00328, IPR2023-00335, 16/858,342, 90/,014,815).

D. CHALLENGED CLAIMS

Petitioner challenges claims 56–87 of the '551 patent. Pet. 3. Claim 56 is independent and is reproduced, below, with limitation identifiers reproduced from the Petition's claim appendix (Pet., Appx B):

[.p] 56. An illuminating device having automatic control of light provided to an illuminated area comprising:

[.1] a structure for incorporating illuminating device elements, wherein the structure comprises a motor vehicle;

[.2] a plurality of individually controllable LEDs incorporated in the structure via at least one headlamp mounted to the structure, each headlamp including at least one of the LEDs, the LEDs in communication with a power source;

[.3] electronic circuitry apparatus for the controlled powering of the LEDs and other of the illuminating device elements;

[.4] one or more processors;

[.5] one or more sensors, including one or more cameras, placed on the structure for detecting coordinate-specific information about the illuminated area and positioned to capture an image of at least one other vehicle ahead of the motor vehicle, at least one of said cameras in communication with power, and in communication with at least one of the one or more processors;

[.6] a controller, including at least one of the one or more processors, integrated with the structure via mounting, in communication with the LED controlling power electronic circuitry apparatus, said controller arranged to process the information communicated from the cameras and to automatically control the light provided to the illuminated area; and

[.7] memory storing instructions that, when executed by one or more processors of the controller, enable the controller to:

[.8] determine, based on data from one or more of the sensors, a vertical and horizontal position associated with the at least one other vehicle;

[.9] select a first cluster of the LEDs based at least in part on at least one of the vertical and horizontal position compared to known aimings of light associated with the first cluster; and

[.10] reduce intensity of illumination to non-glaring illumination of a first area associated with the at least one other vehicle, relative to intensity of illumination on both sides of the first area at elevations common with the first area illuminated by a second cluster of the LEDs, by control of emission from the first cluster.

Ex. 1035 (Reexam. Cert.), 8:14–57; Ex. 1002, 1015–16 (Certificate of Correction). Claims 64 (Ex. 1035 at 9:50–10:34), 72 (*id.* at 11:30–12:12), and 80 (*id.* at 12:66–13:40) are the other independent claims and Petitioner asserts that each recites only limitations similar to the limitations of independent claim 56 (Pet. 21–32). Remaining claims 57–63, 65–71, 73–79, and 81–87 depend, directly or indirectly, from independent claim 56, 64, 72, or 80. Ex. 1035, 8:58–14:52.

E. PRIOR ART AND ASSERTED GROUNDS

Petitioner asserts the following unpatentability grounds:

	Claims Challenged	35 U.S.C. §[2]	References/Basis
1	56, 57, 62–65, 70–73, 78–81, 86, 87	103	Beam,[3] Satonaka[4]
2	58–61, 66–69, 74–77, 82–85	103	Beam, Satonaka, Kobayashi[5]
3	56, 57, 62–65, 70–73, 78–81, 86, 87	103	Karlsson,[6] Nakamura[7]
4	58–61, 66–69, 74–77, 82–85	103	Karlsson, Nakamura, Gotou[8]

Pet. 3. Petitioner also relies on the Declaration of Dr. Jianzhong Jiao. Ex. 1003.

Petitioner asserts that each reference—Beam, Satonaka, Kobayashi, Karlsson, Nakamura, and Gotou—qualifies as prior art under pre-AIA 35 U.S.C. § 102(b) (2006). Pet. 3–4; *see also* pre-AIA 35 U.S.C. § 102(b) ("patent[] or . . . printed publication . . . more than one year prior to the date of the application for

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[2] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the application from which the '551 patent issued was filed before this date, the pre-AIA version of § 103 applies.

[3] Beam, U.S. Patent No. 6,144,158, issued Nov. 7, 2000. Ex. 1005, code (45).

[4] English translation of Satonaka et al., Japan Patent Publication No. H7-101291, published Apr. 18, 1995. Ex. 1014, 0001, code (43).

[5] Kobayashi, U.S. Patent No. 6,049,749, issued Apr. 11, 2000. Ex. 1008, code (45).

[6] Karlsson, WIPO Patent Publication No. 98/54030, published December 3, 1998. Ex. 1010, code (43).

[7] English translation of Nakamura et al., Japan Patent Publication No. H7-65603, published Mar. 10, 1995. Ex. 1013, 0001, code (43).

[8] Gotou, U.S. Patent No. 5,588,733, issued Dec. 31, 1996. Ex. 1012, code (45).

patent in the United States").[9] Patent Owner does not contest those assertions at this stage. *See*, *e.g.*, Prelim. Resp. Based on the current record and for purposes of institution, Petitioner has shown the asserted references qualify as prior art.

II. ANALYSIS

A. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner asserts that an ordinarily skilled artisan "would have had a bachelor's degree (B.S.) in mechanical engineering, electrical engineering, optical engineering, applied physics, or an equivalent field, as well as at least 2 years of industry experience in the area of automotive lighting and lighting-control systems" and "may work as part of a team" listing an example of such a team. Pet. 7 (citing Ex. 1003 ¶¶ 44–46, 67). Patent Owner presents a different description, proposing that a person of the level of ordinary skill in the art:

> would have had a Master's of Science Degree (or a similar technical Master's Degree, or higher degree) in an academic area emphasizing electrical engineering, computer engineering, or computer science with experience or education in optics and imaging systems or, alternatively, a Bachelor's Degree (or higher degree) in an academic area emphasizing electrical, computer engineering or computer science and having two or more years of experience in the field of optical and imaging systems.

Prelim. Resp. 9. Neither party, however, explains the significance of its proposed level of ordinary skill and we determine any difference between the proposed

[9] The '551 patent claims priority as follows: "The present application claims the benefit under 35 U.S.C [§] 119(e) of U.S. Provisional Application[s] No. 60/395,308 filed Jul. 12, 2002[and] . . . No. 61/535,981, filed Oct. 17, 2011 . . . . [T]his application is a continuation-in-part application of, and claims the benefit under 35 U.S.C. [§]120 from, U.S. [App.] No. 10/604,360, . . . filed on Jul. 14, 2003." Ex. 1001, 1:4–19.

levels of skill does not affect our determination here. We note that defining the level of skill as including "at least" a certain amount of experience renders the definition ambiguous. To the extent either party believes a difference between the two proposed definitions affects this proceeding, that party should explain how in the instituted trial.

B. Claim Construction

The parties agree that no express claim construction is required at this stage. Pet. 7–10; Prelim. Resp. 9–10. We agree and therefore do not construe the claims for this decision. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) ("The Board is required to construe 'only those terms that . . . are in controversy, and only 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)).

To the extent the scope of a particular claim term impacts a party's argument during trial, the party should propose an express construction and show how the record supports it.

C. Groupings Limitations for Independent Claims 56, 64, 72, and 80

Petitioner groups contentions for independent claims 56, 64, 72, and 80 together because:

> Each independent claim recites "an illuminating device" with several identical or patentably indistinct structural elements, including "memory storing instructions." EX1003, ¶111. The only differences between these claims are the stored instructions—and even the instructions recite similar or patentably indistinct elements. *Id.*

Pet. 21. Petitioner summarizes the similarities and supplements this analysis with a claim chart corresponding the claims' limitations. *Id.* at 22, n.3 (explaining

Appx's A, B). Petitioner reads claims 56, 64, 72, and 80 as a group to apply the claim language on the prior art, with structural limitations identified and grouped in the Appendices. *E.g.*, *compare* Pet. 24 (§ VI.B.2, "[56.1]/[64.1]/[72.1]/[80.1]") *with* App'x A (same grouping in "Claim Comparison Tables").

Although Patent Owner challenges Petitioner's groupings on procedural grounds (Prelim. Resp. 28–30 (addressed *infra* at 18 (§ II.H))), Patent Owner does not presently assert that a grouping is inaccurate, i.e., that differences among claims 56, 64, 72, and 80 prevents Petitioner's asserted, substantive application of prior art to the grouped limitations. *See generally* Prelim. Resp. Further, to the extent Patent Owner addresses particular limitations of the independent claims, Patent Owner addresses a set of limitations as identified and grouped by Petitioner. *Compare* Prelim. Resp. 63–64 (addressing "[56.5]/[64.5]/[72.5]/[80.5]") with Pet. 60–61 (same grouping).

Based on the present record, we adopt Petitioner's groupings of limitations for purposes of institution.

D. Ground 1: Obviousness over Beam and Satonaka

Petitioner asserts that claims 56, 57, 62–65, 70–73, 78–81, 86, and 87 are unpatentable as obvious over Beam and Satonaka. Because we find that Petitioner shows a reasonable likelihood that it will prevail as to at least the independent claims, we institute review.

Beam is titled "Adaptive/Anti-Blinding Headlights" and is directed to a system that automatically adjusts a vehicle's headlights to avoid blinding oncoming drivers. Ex. 1005, code (54), 1:5–18. Beam describes how its adaptive/anti-blinding headlight ("AABH") system contains an optical system 106, a sensor 107, a controller 108, and an illuminator 109. Oncoming light enters the

system through the optical system. *Id.* at 4:9–25. The sensor detects the light and converts the light into data, which is sent to the controller. *Id.* The controller then uses the data to adjust the output of light from the illuminator so that "[t]he resulting beam is at full intensity except in areas that would dazzle a driver ahead." *Id.* at 4:32–59.

Satonaka is titled "Vehicle Headlamp Device" and is directed to "optimal brightness for driver vision without inflicting glare on other vehicles." Ex. 1014, code (57). Referencing a flow diagram of steps (*id.*, Fig. 6), Satonaka discloses that its device operates as follows:

> When the headlamps are illuminated, the vehicular gap S_L up to the preceding vehicle and the vehicular gap S_R up to the oncoming vehicle as determined by the image processing apparatus are read to assess the combination of other vehicles (202–206). The lamp control voltage value V_H is set to the maximum voltage value V_{max} when there are no other vehicles (208), it is set to the voltage value V_L according to the vehicular gap S_R from the preceding vehicle anti-glare map when there is only a preceding vehicle (210), it is set to the voltage value V_R according to the vehicular gap S_R based on the oncoming vehicle anti-glare map when there is only an oncoming vehicle (212), and it is set to a low voltage value after the derivation of the voltage value V_L and voltage value V_R from each map when there are both preceding vehicles and oncoming vehicles (214). As a result, it will be possible to illuminate the front of the vehicle with light from the headlamp with brightness according to the existence of other vehicles and the vehicular gap.

Id., code (57); *see also id.* ¶¶ 40–51 (describing Fig. 6).

1. Independent Claims 56, 64, 72, and 80

Patent Owner does not presently contest Petitioner's contentions that Beam and its combination with Satonaka teaches every limitation. *See generally* Prelim. Resp. Patent Owner contends that Beam teaches away from the asserted

combination because it "explains that mounting the sensor within the headlamp assembly is critical to ensure accuracy." Prelim. Resp. 43. That argument relies on Patent Owner's assertion that the combination is "modifying Beam to include Satonaka's camera 22 that is mounted to the top of the windshield." *Id.* at 44; *accord id.* at 40 ("Petitioner relies on Satonaka's hardware, *i.e.*, its remote camera 22 and electrical connections for satisfying the '*camera*' limitations."). But that assertion is inaccurate; Petitioner relies on Satonaka for "determining and storing coordinates." Pet. 18; *accord id.* at 19 ("modify Beam's algorithm to include the coordinates of the pixels as taught by Satonaka"), 29 (same). Petitioner relies on Beam for the claimed camera. *Id.* at 28. Petitioner further asserts that, to the extent Beam does not disclose a powered connection for its camera, skilled artisans "would have been motivated to connect Beam's AABH to a power source, like the battery in Satonaka, to provide power to the electrical components in the AABH, including Beam's camera." *Id.* at 28. Neither assertion relies on Satonaka's camera and Patent Owner's argument is therefore inapposite.

Relatedly, Patent Owner argues that the proposed combination renders Beam inoperable by using Satonaka's remote camera rather than Beam's camera. Prelim. Resp. 48–49. For the same reason discussed above, the argument is not persuasive because Petitioner does not rely on a combination using Satonaka's remote camera. Pet. 18–20, 28–30.

Next, Patent Owner argues that Petitioner does not explain "how an image from Beam's co-located and boresighted camera would be used by Satonaka's vehicle recognition zone image processing strategy that is based on a remote camera." Prelim. Resp. 50–53. In particular, Patent Owner points out that the different viewpoint would shift the perspective. *Id.* at 51. Based on the present record, however, Petitioner has the better argument that because "Satonaka

provides details of how to implement the coordinate mapping of its pixels," skilled artisans would have understood the programming changes required to accommodate the combination. Pet. 20 (citing Ex. 1014 ¶¶ 22, 27; Ex. 1003 ¶ 110). Patent Owner does not contest that Satonaka discloses "how to implement the coordinate mapping of its pixels" but distinguishes that from "how to map coordinates to light sources." Prelim. Resp. 52. The claim language does not require a particular mapping between coordinates and light sources. Rather, it requires "detecting coordinate-specific information about the illuminated area" and, based on that information, "determin[ing] vertical and horizontal position associated with the at least one other vehicle." Satonaka describes how oncoming vehicles are detected within the coordinate frame of its image, and we conclude based on those disclosures that Satonaka satisfies the claim language. Ex. 1014 ¶¶ 30–34.

Patent Owner argues also that the Petition lacks an adequate reason for the combination. Prelim. Resp. 58–59. According to Patent Owner, the Petition is deficient because it lacks "evidence that Beam does not already accurately 'track the location of the upcoming vehicle.'" *Id.* at 58 (quoting Pet. 20). But Beam already tracking upcoming vehicles does not undermine a reason to also use Satonaka's teachings. *See Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023) (noting that a challenger need not show the combination "was an 'improvement' in a categorical sense" but only that it "was a 'suitable option'"). For the same reason, we do not find persuasive Patent Owner's arguments that Petitioner does not "explain any deficiency in Beam's teaching of tracking the location of the oncoming vehicle" or "any new or different functionality provided by this combination." *See* Prelim. Resp. 59.

We have reviewed Petitioner's contentions and evidence, along with Patent Owner's arguments against institution, and conclude that Petition has shown a reasonable likelihood of prevailing with respect to unpatentability of the independent claims over Beam and Satonaka.

2. Dependent Claims

We have reviewed Petitioner's contentions for the challenges to dependent claims 57, 62, 63, 65, 70, 71, 73, 78, 79, 81, 86, and 87 under Ground 1. *See* Pet. 36–46. Patent Owner has not yet substantively addressed those claims. Because we find Petitioner meets its burden for institution as to the independent claims, we do not address the dependent claims at this time.

E. GROUND 2: OBVIOUSNESS OVER BEAM, SATONAKA, AND KOBAYASHI

Petitioner asserts that dependent claims 58–61, 66–69, 74–77, and 82–85 are unpatentable as obvious over Beam and Satonaka in view of Kobayashi. Pet. 46–52. We have reviewed Petitioner's contentions under Ground 2. Patent Owner has not yet substantively addressed those contentions. Because we find Petitioner to meet its burden for institution as to the independent claims, we do not address the dependent claims at this time.

F. GROUND 3: OBVIOUSNESS OVER KARLSSON AND NAKAMURA

Petitioner asserts that claims 56, 57, 62–65, 70–73, 78–81, 86, and 87 are unpatentable as obvious over Karlsson and Nakamura. Pet. 52–76. Because we find that Petitioner shows a reasonable likelihood that it will prevail as to at least the independent claims, we institute review.

Karlsson is titled "A Lighting Device Having a Controllable Lighting Pattern" and is directed to a lighting device that automatically adjusts the lighting pattern and intensity of a vehicle's headlights to reduce blinding oncoming traffic.

Ex. 1010, codes (54), (57). Karlsson's system uses "a plurality of controllable spotlight beams . . . . such as LEDs, which can preferably be controlled either individually or in groups." *Id.* at 13:24–14:4. "[T]he pattern of the emitted light beam is varied automatically in an efficient manner and with maximum sensitivity in response to at least one control signal delivered by light-sensitive sensor." *Id.* at 2:30–35. Karlsson sought to improve road safety, noting that the desire for increased illumination leads to "the problem of blinding oncoming traffic which, in turn, may lead to a hazardous situation." *Id.* at 1:21–26. Karlsson describes that its controllable beams may by responsive to a sensor to provide a desired pattern. *Id.* at 4:25–31. That sensor may detect light from oncoming traffic, including "precisely the direction from which light is being detected, so that subsequently a precise adjustment of the pattern of the light beam can be carried out, for example so as not to emit light in the direction of the detected light." *Id.* at 5:16–32; *accord id.* at 9:18–26 ("glaring or blinding of oncoming traffic is effectively prevented"). Karlsson discloses that it may use a variety of sensors to detect light from oncoming traffic, including "a matrix of photo diodes" and "a photo-sensitive plate as used in modern video cameras." *Id.* at 12:19–24.

Nakamura is titled "Vehicle Headlamp Device" and is directed to "illuminat[ing] [in] front of a vehicle without any reduction of driver visibility even when the vehicle is traveling along a . . . winding road." Ex. 1013, code (57). Referencing a flow diagram of steps (*id.*, Fig. 12), Nakamura discloses that its device operates as follows:

> The positions of the preceding vehicle and oncoming vehicle, the deviation angle, and the output signals of the beam-switching switch are read (202, 204), and the low-beam lamps are controlled to the deflection angle according to the curved road when the high-beam lamps are illuminated (light distribution control B, 212). When the

> high-beam lamps are turned off and the low-beam lamps are not disconnected (208, 210), there will be control to the deflection angle according to the curved road (light distribution control A, 214). When the low-beam lamps are disconnected, the deflection angle will be set to the initial angle when proceeding straight forward (light distribution control C, 216). In this way, it will be possible to perform deflection to the low-beam according to the road shape even when the high-beams are turned on, improving visibility near the vehicle.

Id., code (57); *see also id.* ¶¶ 54–60 (describing Fig. 12).

1. Independent Claims 56, 64, 72, and 80

Petitioner relies on Karlsson's sensors as the claimed camera. Pet. 60–61. Patent Owner argues that Karlsson does not teach "one or more cameras" as claimed. Prelim. Resp. 63–64. We agree with Petitioner that the claim language reads on Karlsson's sensors, which it describes as including "a photo sensitive plate as used in modern video cameras." Ex. 1010, 12:22–24. Patent Owner contends that Karlsson "does not disclose that its sensors have the full capability of cameras, specifically with regards to capturing images" (Prelim. Resp. 64) but does not explain what the claims require beyond Karlsson's devices. Based on the present record, Karlsson discloses the claimed camera. *See* Ex. 1010, 12:19–22 ("[T]he light-sensitive sensors 9 and 23 are preferably designed to be capable of precisely determining the direction and the intensity of the detected light 11.").

Other than the claimed camera, Patent Owner challenges the combination of Karlsson and Nakamura for the same reasons discussed above regarding Beam and Satonaka. *See* Prelim. Resp. 44–47, 49–50, 53–57, 60–62. As an initial matter, it is not clear that Karlsson itself lacks the disclosures required to render the claims obvious. In particular, Petitioner relies on Karlsson as disclosing all claim elements, asserting further that, alternatively, skilled artisans would have had reason to use Nakamura's algorithmic details regarding "coordinate-specific

information." Pet. 60–61. Thus, challenging the combination with Nakamura does not appear dispositive on the present record.

Somewhat confusingly, despite agreeing that Petitioner relies on Karlsson's camera (Prelim. Resp. 63–64), Patent Owner submits that Petitioner relies on Nakamura's remote camera 22 as the claimed camera (*id.* at 44). Although Patent Owner asserts that Karlsson teaches away from such a remote camera (*id.* at 44–47), Petitioner unwaveringly relies on Karlsson's camera (Pet. 60–61) and Patent Owner's argument is therefore inapposite. Similarly, Patent Owner's argument that Nakamura's remote camera would render Karlsson inoperable (Prelim. Resp. 49–50) is unpersuasive because Petitioner relies on Karlsson's camera (Pet. 60–61).

Patent Owner argues additionally that the Petition does not adequately explain how Nakamura's processing strategy, which is based on a remote camera, would use the information sensed by Karlsson's lamp-located sensor. Prelim. Resp. 53–57. Patent Owner points out that the different viewpoint would shift the perspective. *Id.* at 54. Based on the present record, however, Petitioner has the better argument that skilled artisans would have understood how to map Karlsson's image with coordinates as taught by Nakamura. Pet. 54–56 (citing Ex. 1003 ¶¶ 248–251; Ex. 1013 ¶¶ 25–27, 36–47, 54–57), 61 (citing Ex. 1013 ¶¶ 36–47; Ex. 1003 ¶¶ 266–268 (citing Ex. 1013 ¶¶ 23–25, 36–47). According to Patent Owner, Petitioner agrees that Karlsson does not teach how to determine which LEDs to dim. Prelim. Resp. 55. The record does not support that view. Petitioner asserts that Karlsson discloses processing an image "to determine which area of the image contains a vehicle to control the headlights." Pet. 53 (citing Ex. 1003 ¶ 246). Petitioner asserts that using Nakamura's method of associating an image's pixels with a coordinate system to plot the oncoming cars' locations would have "provided the algorithm details that are already implicit in Karlsson's system,

therefore allowing the coordinates of the traffic ahead to be determined based on the video sensor data." Pet. 54 (citing Ex. 1003 ¶¶ 248). Those assertions and Petitioner's support for them are adequate at this stage to support institution because Petitioner relies on Nakamura as supplemental to Karlsson's existing method.

Finally, Patent Owner challenges Petitioner's reason for the combination, arguing that Petitioner has shown no improvement that Nakamura would bring to Karlsson. Prelim. Resp. 60–62. We find that Petitioner's reasons for the combination support institution. First, as discussed above, an obviousness combination need not show improvement in a categorical sense. *See PACT XPP Schweiz*, 61 F.4th at 1381. Petitioner's contentions justify that skilled artisans would have had reason to use Nakamura's coordinate-based approach with Karlsson's system. For example, Petitioner reasons that the combination would have used Nakamura's known coordinate technique to improve Karlsson's similar system. *Id.* at 54–55. And Petitioner asserts the combination would "further ensure Karlsson's system accurately identifies traffic ahead and dims its headlights appropriately, improving illumination quality and safety for drivers." *Id.* at 55. Thus, although Karlsson was already directed at dimming its headlights for oncoming traffic, Petitioner has shown sufficiently that Nakamura's teachings would have readily applied to Karlsson's system and would have worked towards Karlsson's goals.

We have reviewed Petitioner's contentions and evidence, along with Patent Owner's arguments against institution, and conclude that Petitioner has shown a reasonable likelihood of prevailing with respect to unpatentability of the independent claims over Karlsson and Nakamura.

2. Dependent Claims

We have reviewed Petitioner's contentions for the challenges to dependent claims 57, 62, 63, 65, 70, 71, 73, 78, 79, 81, 86, and 87 under Ground 3. *See* Pet. 67–76. Patent Owner has not yet substantively addressed those claims. Because we find Petitioner meets its burden for institution as to the independent claims, we do not address the dependent claims at this time.

G. GROUND 4: OBVIOUSNESS OVER KARLSSON, NAKAMURA, AND GOTOU

Petitioner asserts that dependent claims 58–61, 66–69, 74–77, and 82–85 are unpatentable as obvious over Karlsson and Nakamura in view of Gotou. Pet. 76–81. We have reviewed Petitioner's contentions for the challenges to those claims under Ground 4. Patent Owner has not yet substantively addressed those claims. Because we find Petitioner meets its burden for institution as to the independent claims, we do not address the dependent claims at this time.

H. DISCRETIONARY DENIAL UNDER § 314(a)

Patent Owner argues we should exercise our discretion to decline institution under § 314(a) because the Petition lacks particularity. Prelim. Resp. 28–36. First Patent Owner asserts that Petitioner's claim identifiers are unclear and that the Petition falls short of what is required by paraphrasing limitations. *Id.* at 30. While Petitioner's use of claim appendixes presents its challenges in a cumbersome manner, the Petition is sufficiently particular.

Patent Owner argues also that because Petitioner challenges the independent claims based on a single reference and alternatively based on a combination, the Petition is unclear by asserting both anticipation and obviousness. *Id.* at 31–36. We do not agree. Petitioner presents only obviousness grounds, which may rely on a single reference. Petitioner's alternative contentions are clearly stated for each

relevant limitation. *See, e.g.*, Pet. 28–29 (relying on Satonaka's power connection to a camera to the extent not disclosed by Beam), 29–30 (relying on Satonaka's processing that maps pixels to coordinates). Thus, we do not agree that the challenge raised anticipation, or that it inappropriately proposes uncertain grounds. *See* Prelim. Resp. 33–36.

I. DISCRETIONARY DENIAL UNDER § 316(b)

Patent Owner argues we should exercise our discretion to decline institution under § 316(b) because Petitioner has not justified three petitions against the '551 patent. Prelim. Resp. 36–38. We do not agree, because we find three petitions justified in view of the large number of claims and the differences in claim scope.

III. CONCLUSION

For the reasons discussed above, we conclude Petitioner has shown a reasonable likelihood of prevailing with respect to at least one claim. We have evaluated all of the parties' submissions and determine that the record supports institution.

Our determination at this stage of the proceeding is based on the evidentiary record currently before us. This decision to institute trial is not a final decision as to patentability of any claim for which *inter partes* review has been instituted. Our final decision will be based on the full record developed during trial.

IV. ORDER

Accordingly, it is

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review of claims 56–87 of the '551 patent is instituted on the grounds set forth in the Petition; and

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

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