

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC. AND
PORSCHE CARS NORTH AMERICA, INC.,
Petitioners,

v.

YECHEZKAL EVAN SPERO,
Patent Owner.

U.S. Patent No. 9,955,551

Case IPR2023-00318

**PATENT OWNER'S NOTICE OF APPEAL TO THE U.S. COURT OF
APPEALS FOR THE FEDERAL CIRCUIT**

Notice is hereby given, pursuant to 35 U.S.C. §§ 141, 142, 319 and 37 C.F.R. §§ 90.2(a), 90.3(a)(1), that Patent Owner Yechezkal Evan Spero (“Patent Owner”) hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision of the Patent Trial and Appeal Board (“PTAB”) entered on July 9, 2024 (Paper 35) in Case No. IPR2023-00318 regarding U.S. Patent No. 9,955,551 (the “’551 Patent”), attached as Exhibit A; and the Order denying Director Review of the Final Written Decision dated August 28, 2024 (Paper 37), attached as Exhibit B; and from all underlying findings, determinations, orders, decisions, rulings and opinions that are adverse to Patent Owner, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered July 11, 2023 (Paper 11). This notice is being timely filed within 63 days of the issuance of the denial of the Request for Director Review.

In accordance with 37 C.F.R. § 90.2(a)(3)(ii) and Federal Rule of Appellate Procedure 15(a)(2)(C), without waiving and expressly reserving the right to raise other issues, the expected issues on appeal include, but are not limited to:

1. Whether the PTAB erred in failing to determine whether claims 56, 57, 62-64, 70-72, 78-81, 86, and 87 of the ’551 Patent are unpatentable as obvious under 35 U.S.C. § 103 in view of U.S. Patent Number 6,144,158 (“Beam”) and Japanese Patent Publication JPH07-101291 (“Satonaka”).

2. Whether the PTAB erred in failing to determine whether claims 58-61, 66, 68, 69, 74, 76, 77, 82-85 of the '551 Patent are unpatentable as obvious under 35 U.S.C. § 103 in view of U.S. Patent No. 6,144,158 (“Beam”), Japanese Patent Publication JPH07-101291 (“Satonaka”), and U.S. Patent No. 6,049,749 (“Kobayashi”)
3. Whether the PTAB erred in finding that Petitioner has shown by a preponderance of the evidence that claims 56, 57, 62-64, 70-72, 78-81, 86, and 87 of the '551 Patent are unpatentable as obvious under 35 U.S.C. § 103 in view of WIPO Patent Publication No. 1998/54030 (“Karlsson”) and Japanese Patent Publication No. JPH07-65603 (“Nakamura”).
4. Whether the PTAB erred in finding that Petitioner has shown by a preponderance of the evidence that whether claims 58-61, 66, 68, 69, 74, 76, 77, and 82-85 of the '551 Patent are unpatentable as obvious under 35 U.S.C. § 103 in view of WIPO Patent Publication No. 1998/54030 (“Karlsson”), Japanese Patent Publication No. JPH07-65603 (“Nakamura”), and U.S. Patent Number 5,588,733 (“Gotou”).
5. Whether the PTAB erred on all other issues decided adversely to Patent

Owner in any findings, determinations, orders, decisions, rulings or opinions underlying or supporting the Final Written Decision and the Request for Director Review.

Pursuant to 37 C.F.R. § 90.2(a)(1) and (a)(2), as well as Fed. Cir. R. 15(a)(1), and as reflected in the attached Certificate of Service and Filing, this Notice of Appeal is simultaneously being filed with the Director of the United States Patent and Trademark Office, the PTAB, and the Clerk's Office for the United States Court of Appeals for the Federal Circuit, along with the requisite docketing fee.

Respectfully submitted,

Dated: October 30, 2024

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CERTIFICATE OF FILING AND SERVICE

The undersigned hereby certifies that on October 30, 2024 a copy of **PATENT OWNER'S NOTICE OF APPEAL** was served by United States Postal Service Priority Express mail to counsel of record as follows:

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In addition, I certify that **PATENT OWNER'S NOTICE OF APPEAL** is being filed on **October 30, 2024** as follows:

- by electronic mail with the Director of the United States Patent and Trademark Office c/o Office of the Solicitor to efileSO@uspto.gov, pursuant to 37 C.F.R. § 90.2(a)(1)(i);
- electronically with the PTAB through the P-TACTS system, pursuant to 37 C.F.R. § 90.2(a)(1)(ii); and
- electronically with the United States Court of Appeals for the Federal Circuit via the CM/ECF system, pursuant to Fed. R. App. Proc. 25(a)(2)(B)(i) and Fed. Cir. R. of Prac. 25(a)(1)(A).

Respectfully submitted,

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EXHIBIT A

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC. and
PORSCHE CARS NORTH 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*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Dismissing Petitioner's Motion to Exclude Evidence
37 C.F.R. § 42.64(c)

* Porsche Cars North America, Inc, which filed a petition in IPR2023-01296, has been joined as a party to this proceeding.

I. INTRODUCTION

Volkswagen Group of America, Inc. (“Volkswagen”) 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”; Ex. 1035 (Reexamination Certificate)). Yechezkal Evan Spero (“Patent Owner”) filed a Preliminary Response. Paper 6. We instituted review. Paper 11 (“Institution Decision” or “Inst.”). Following institution, Porsche Cars North America, Inc. (“Porsche”), filed a petition for *inter partes* review and a Motion for Joinder in IPR2023-01296, requesting that Porsche be joined as a petitioner to this proceeding. IPR2023-01296, Papers 1, 3. We instituted trial in IPR2023-01296, granted the Motion for Joinder, and added Porsche as a petitioner here. *Id.*, Paper 9. A copy of that decision was entered into the record of this proceeding. Paper 23. Thus, Volkswagen and Porsche are, collectively, “Petitioner” here.

Patent Owner filed a Response (Paper 16, “PO Resp.”), Petitioner filed a Reply (Paper 19, “Pet. Reply”), and Patent Owner filed a Sur-Reply (Paper 22, “PO Sur-Reply”).

Petitioner filed a Motion to Exclude Evidence (Paper 27, “Mtn. Exclude”), which Patent Owner opposed (Paper 28, “Opp. Mtn. Exclude”), and Petitioner filed a Reply (Paper 31, “Reply Mtn. Exclude”).

We held an oral hearing on March 20, 2024. Paper 34 (“Tr.”).

For the reasons below, we conclude that Petitioner has proven claims 56–64, 66, 68–72, 74, and 76–87 unpatentable, but has not proven any of claims 65, 67, 73, and 75 unpatentable.

A. REAL PARTIES IN INTEREST

Petitioner Volkswagen identifies itself as the real party in interest. Pet. 87. Petitioner Porsche identifies itself and its affiliate Dr. Ing. h.c. F. Porsche Aktiengesellschaft as the real parties in interest. IPR2023-01296, Paper 2, 84. Patent Owner 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

The parties identify that the '551 patent is the subject of concluded reexamination control number 90/014,815 and pending reissue application 16/858,342. Pet. 89; Paper 4, 1–2.

Patent Owner identifies the following related federal district court litigations involving 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 also the following PTAB *inter partes* reviews of the '551 patent: *Volkswagen Group of America, Inc., v. Yechezkal Evan Spero*, IPR2023-00315 (pending); *Volkswagen Group of America, Inc., v. Yechezkal Evan Spero*, IPR2023-00336 (pending). Paper 4, 2.²

C. THE '551 PATENT

The '551 patent is titled “Detector Controlled Illuminating System” and relates to an “illuminating device” whereby “illumination intensity and

² Patent Owner further lists matters involving patents related to the '551 patent. Paper 4, 2 (identifying IPR2022-01500, IPR2022-01586, IPR2023-00197, IPR2023-00328, IPR2023-00335).

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.

D. CHALLENGED CLAIMS

Petitioner challenges claims 56–87 of the ’551 patent. Pet. 1, 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, 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, 9:50–34), 72 (*id.* at 11:30–12), and 80 (*id.* at 12:66–13:40) are the other independent claims and Petitioner asserts that

each recites only limitations similar to those of independent claim 56 (Pet. 22–46). Remaining claims 57–63 (Ex. 1035, 8:58–9:49), 65–71 (*id.* at 10:35–11:29), 73–79 (*id.* at 12:13–65), and 81–87 (*id.* at 13:41–14:52) depend, directly or indirectly, respectively (as grouped) from independent claims 56, 64, 72, and 80.

E. PRIOR ART AND ASSERTED GROUNDS

Petitioner asserts the following unpatentability grounds:

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

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).

Pet. 3. Petitioner relies also on the Declarations of Dr. Jianzhong Jiao. Ex. 1003; Ex. 1052.

F. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner submits 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.” Pet. 7 (citing Ex. 1003 ¶ 67). Petitioner adds that such artisans “may work as part of a team, for example, with computer engineers to integrate/program controllers and various control inputs to affect control of a given light source.” *Id.* Patent Owner does not dispute that proposed level of skill (PO Resp. 9), and we adopt it here.

II. ANALYSIS

A. CLAIM CONSTRUCTION

Petitioner asserts that no claim requires express construction. Pet. 7. Petitioner notes that, during reexamination of the ’551 patent, the Office interpreted “electronic circuitry apparatus for the controlled powering of the LEDs” as a means-plus-function limitation and identified the corresponding structure as “logic control electronics unit 7.” *Id.* at 8 (citing Ex. 1002, 929–39; Ex. 1001, 25:34–52).

Patent Owner asserts that “[n]o claim construction is necessary because Patent Owner’s arguments do not hinge on the outcome of an actual controversy about claim interpretation.” PO Resp. 10. As to the “electronic circuitry apparatus,” Patent Owner does not dispute that the claim language reads on the asserted prior art under any construction. Thus, we need not

address the construction of that term. *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)). Some of Petitioner’s and Patent Owner’s arguments depend on claim scope, and we address those implicit claim-construction arguments below.

B. 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.

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 be 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). In its operation, Nakamura discloses processing “image 120 that is an image that was

obtained by camera 22.” Ex. 1013 ¶ 36. Further, it discloses that “[e]ach pixel of the image that is formed by the image signal identifies a position based on the coordinates (X_n , Y_n).” *Id.* ¶ 25.

Petitioner contends that Karlsson’s lack of express disclosures about storing and processing the direction of target light sources to determine which LEDs to dim would have led skilled artisans to search for techniques on storing and processing images. Pet. 53 (citing Ex. 1003 ¶¶ 246–247). Thus, reasons Petitioner, those artisans would have had reason “to modify Karlsson’s system to include the coordinates of the pixels [in its images], and the corresponding vehicle recognition process as taught by Nakamura.” *Id.* at 54 (citing Ex. 1003 ¶ 248). Petitioner submits that the modification would require only “basic programming changes, not changes to Karlsson’s physical components.” *Id.* The result of the proposed combination, according to Petitioner, would be “providing the algorithm details implicit in Karlsson’s system through Nakamura’s known technique of mapping pixels in an image” and “further ensur[ing] Karlsson’s system accurately identifies traffic ahead and dims its headlights appropriately, improving illumination quality and safety for drivers.” *Id.* at 55 (citing Ex. 1003 ¶ 251).

1. A camera sensor with LED light sources
(claims 56, 64, 72, 80)

The independent claims recite “one or more sensors, including one or more cameras.” *E.g.*, Ex. 1035, 8:28. Petitioner relies on Karlsson’s sensors as the claimed camera. Pet. 60–61. We agree with Petitioner that the claim language reads on Karlsson’s sensor 23, which it describes as including “a photo-sensitive plate as used in modern video cameras.” Ex. 1010, 12:22–24.

Patent Owner argues that Karlsson discloses two alternative sensors—“a matrix of photo-diodes” and “a photo-sensitive plate as used in modern video cameras.” PO Resp. 40–41 (quoting Ex. 1010, 12:22–24). Patent Owner tacitly recognizes that Karlsson’s sensor 23 is a camera, but contends that sensor 23 is disclosed only in connection with Figure 3 and “Karlsson does not disclose that the light source 2 described with reference to Figure 3 embodiment includes a plurality of LEDs.” *Id.* at 43. Patent Owner expresses the argument also as “the Karlsson-Nakamura combination does not teach a ‘a plurality of individually controllable LEDs’ compatible with the ‘one or more cameras’ embodiment.” *Id.* at 48. Thus, the core dispute is whether Karlsson discloses a camera sensor used with controllable-LED light sources.

We agree with Petitioner, as Karlsson discloses that LEDs are an exemplary light source in all its embodiments. Ex. 1010, 21:13–17; Pet. Reply 18–19. Karlsson discloses multiple approaches for controlling its light distribution. While one such approach uses a light modulator to control the distribution from a single light source (*see* Ex. 1010, 9:3–6, 12:14–19), Karlsson additionally describes modulating the light source itself (*id.* at 13:24–14:4). Indeed, Karlsson notes that its spotlight beams may be provided either by individually controlled sources (*id.* at 14:1–4) or by a “suitable modulator means” (*id.* at 14:5–15), thus confirming the interchangeability of the two approaches within its disclosed invention. That description of two possible approaches refers to “light source 2,” which is the element depicted in multiple figures as the light source. *See id.*, 14:1–4, Figs. 1–4, 7, 8. And Karlsson further describes an embodiment designating “light source 2” as comprising individual light sources controlled in

response to sensor 23 (*id.* at 14:22–32),⁹ further supporting Petitioner’s contention that Karlsson discloses using individually controllable LED with a camera sensor.

Patent Owner submits that Petitioner relies on Karlsson’s “matrix of photo diodes as illustrated in Figure 14 for satisfying various control limitations.” PO Resp. 43 (citing Pet. 14, 65, 66, 68, 71, 72, 75). In the cited portions, however, Petitioner cites Karlsson’s Figure 14 as one of several supporting disclosures, not as the sole basis for Petitioner’s contentions. Moreover, nothing about Petitioner’s contentions relies on an aspect of Figure 14’s sensors unique to that embodiment. In particular, Karlsson describes that Figure 14 depicts “an embodiment of a spatial distribution of spotlight sources and spotlight sensors . . . in particular for use in a headlight of a motor vehicle, such as a car.” Ex. 1010, 19:18–21. Karlsson describes an approach where distributed sensors may each be coupled with a spotlight source but clarifies that its invention encompasses “manual adjustment of the pattern of the light beam to be emitted” and control “to effect a desired lighting pattern.” *Id.* at 20:6–11. In other words, aspects of the Figure 14 embodiment relate to an alternative control strategy that Petitioner does not rely on. For the “plurality of individually controllable LEDs,” Petitioner relies on Karlsson’s disclosure distinct from the Figure 14 embodiment. Pet. 58 (citing Ex. 1010, 11:29–32, 13:24–29 (disclosing a “plurality of controllable spotlight beams,” each that may be “a light beam from LED”)). Thus, we do not agree that Figure 14 undermines Petitioner’s contentions.

⁹ Although the particular embodiment uses light sources coupled through optical fibers, it speaks to Karlsson’s disclosure regarding individual light sources in combination with camera sensors.

We find that Karlsson discloses a system that may use a variety of configurations but does not limit its exemplary operations to a particular configuration. Thus, by relying on Karlsson’s teaching that LEDs may be “controlled either individually or in groups” (Pet. 64–65 (quoting Ex. 1010, 14:1–4) (emphasis omitted)), Petitioner does not also rely on Karlsson’s spotlight sensors (which Patent Owner submits are not a “camera”). In sum, we conclude that Petitioner has shown that Karlsson’s sensor 23 is the claimed camera and that nothing in Petitioner’s contentions or Karlsson’s disclosures is inconsistent with a system using that camera with an array of individually controllable LEDs.

2. Detecting coordinate-specific information
(claims 56, 64, 72, 80)

The independent claims require that the camera is “for detecting coordinate-specific information about the illuminated area” and that the controller’s determination is “based on the coordinate-specific information.” *E.g.*, Ex. 1035, 8:29–30, 1:51–53. Petitioner contends that Karlsson’s camera detects coordinate-specific information about the illuminated area because it is “capable of precisely determining the direction and the intensity of the detected light.” Pet. 61 (quoting Ex. 1010, 12:19–22) (emphasis omitted). Petitioner reasons that Karlsson’s disclosure would lead skilled artisans to “underst[and] that images received by the camera, and the direction data associated with them, are ‘coordinate-specific information about the illuminated area’ as claimed because the direction is stored in a format (as coordinates).” *Id.* (citing Ex. 1003 ¶¶ 265).

Patent Owner contends that “Karlsson does not disclose storing the direction of the detected light 11 in a format as coordinates.” PO Resp. 45.

Patent Owner points to Karlsson’s description of its Figure 14 embodiment operating without a controller by associating each sensor with a light source and using the sensor to directly control the light source. *Id.* at 45–46. That description, however, does not bear on Petitioner’s combination. As described, the combination does not rely on sensors distributed among the light sources, but instead relies on Karlsson’s sensor 23. Pet. 60–61. Thus, Patent Owner’s reliance on Karlsson’s Figure 14 embodiment is inapposite.

Patent Owner does not propose a construction for “coordinate-specific information” that would require something more than Karlsson discloses. We agree with Petitioner’s contentions because Karlsson’s camera enables Karlsson’s system to determine the direction of incoming light sources.

Petitioner further asserts that it would have been obvious “to modify Karlsson’s system to map the image with coordinates, as taught by Nakamura, to provide the algorithmic detail implicit in Karlsson.” Pet. 61. Patent Owner does not address whether Nakamura discloses the claimed “coordinate-specific information” and instead challenges whether skilled artisans would have had reason to combine the two references’ teachings. *See* PO Resp. 44–46, 55–61. We address that argument below. *See infra* at 20 (§ II.B.6). For the reasons explained by Petitioner, we find that Nakamura discloses the claimed “coordinate-specific information,” in that the combined system would both include coordinates associated with detected images and also determine which coordinates in a sensed image correspond to a vehicle. *See* Pet. 52–56, 61.

3. “the data includes image data”
(claims 57, 65, 73, 81)

Claim 57 depends from claim 56 and recites that “the data includes image data.” Ex. 1035, 8:58–59. Claims 65, 73, and 81 recite parallel limitations. *Id.* at 10:36, 12:23–24, 13:42. Petitioner does not expressly address the “image data” limitation for claim 57. Pet. 67–69. Patent Owner asserts that, by not doing so, the Petition is deficient. PO Resp. 11.

In our view, however, Petitioner’s contentions show without question that Karlsson’s data from its cameras includes image data. The Petition asserts that Karlsson’s sensor is a camera because it is “a photo-sensitive plate as used in modern video cameras” (Pet. 60 (quoting Ex. 1010, 12:19–24) (emphasis omitted)) and that Karlsson’s system receives images from the camera (*id.* at 61; *accord id.* at 63–64 (addressing how the asserted combination would process a “detected image”)). Those contentions are consistent with Karlsson’s disclosures and Patent Owner does not dispute them. Petitioner has established that Karlsson’s system involves a camera sending video images to its controller. Claim 57 requires nothing more, and thus Petitioner’s contentions for the independent claims satisfy that aspect of claim 57 and the other claims that recite similar language.

4. “identify a plurality of positions associated with the target
as the target moves”
(claims 72, 80)

Independent claim 80 requires a controller that can “identify, based on data received from one or more of the sensors, a plurality of positions associated with the target as the target moves relative to the motor vehicle.” Ex. 1035, 13:30–33; Ex. 1002, 1018. Independent claim 72 recites a similar limitation, expressed as the ability to “maintain a variance of illumination

provided to the target relative to the laterally adjacent areas, when subsequent data from one or more of the cameras indicates a change in position of the target.” *Id.* at 12:4–12.

Petitioner contends that these limitations are satisfied because Karlsson’s system includes “repeatedly controlling the intensity of the light emitted” to minimize glare to other vehicles. Pet. 74 (quoting Ex. 1010, 2:30–3:6).¹⁰ Petitioner relies on Karlsson’s “automatic and iterative nature,” which Petitioner contends results in repeating the detection and illumination sequence. *Id.*

Patent Owner argues Karlsson is deficient because it has no way of “‘knowing’ that the target is the same target frame-to-frame.” PO Resp. 50. Patent Owner asserts that Karlsson’s system, whether itself or as modified by Nakamura, would not be able to distinguish light from an oncoming vehicle from light reflected from a road sign, and therefore has no ability to identify a vehicle as a “target.” PO Resp. 51–52 (“Karlsson does not identify the targets and therefore cannot distinguish between light associated with vehicle B in Fig. 2, from reflection of light from a roadside sign”).

As evident from its statements, Patent Owner relies on an implicit claim construction: that a controller must associate a target’s identity with a prior target. But the claim language neither imposes nor supports any such requirement. Claim 72 is illustrative, in that it expressly states that the disputed language regarding “illumination provided to the target” is achieved “by repeating the determination of target location, selection of the

¹⁰ We agree with Petitioner that the Petition’s reference to “Beam’s system” is a clear typographical error and that the Petition’s substance and citations refer to Karlsson, not Beam. *See* Pet. Reply 20.

cluster and variance to illumination provided to the target, relative to the laterally adjacent areas, based on the subsequent data.” Ex. 1035, 12:8–11. That supports Petitioner’s view that a system can “maintain a variance of the illumination provided to the target” by iteratively performing the “determine,” “select,” and “vary” steps. Claim 80 does not expressly state that steps are repeated, but instead requires the processor be able to identify “a plurality of positions associated with the target” and “change, responsive to the positions associated with the target, first light associated with” LEDs aimed towards the target as the target moves. *Id.* at 13:30–40. That language, like claim 72’s, does not impose an additional requirement of correlating a detected target to prior detected targets. Rather, it requires that a given target results in multiple identified positions that produce light changes.

Based on our understanding of the claim language, Patent Owner’s assertion that, in Karlsson, “[e]ach subsequent detection of light is performed anew and has no relationship to a prior detection and may or may not correspond to the same target” (PO Resp. 52) does not preclude the claim from reading on Karlsson. As Petitioner has identified, the claim language reads on Karlsson’s system when a particular vehicle results in multiple, subsequent detections at multiple positions. Pet. 74. Although Patent Owner poses an alternative situation in which Karlsson’s system might detect other objects rather than the particular vehicle first detected (*see* PO Resp. 50–51), that does not undermine Petitioner’s showing because the claims do not require that a system perform only as claimed. That is, even if Karlsson’s system detects and accommodates additional targets, if a single target results in multiple light configurations, the claim language is satisfied. And Patent Owner concedes that Karlsson’s system produces “a

darkened area that changes position over time due to movement of the vehicle providing light relative to various light sources.” *Id.* at 52. That admission is consistent with Karlsson’s disclosure that its system adapts to sensed objects by “intermittently, repeatedly controlling” its light beam. Ex. 1010, 2:30–3:6. We find that when Karlsson’s system controls light to prevent glare to an oncoming vehicle, that would result in the processor identifying a plurality of positions associated with the vehicle and varying light associated with LEDs aimed toward the vehicle. Thus, the record supports Petitioner’s position that claims 72’s and 80’s disputed language reads on Karlsson.

5. “select a second, different cluster . . . directed towards the other vehicle”
(claim 64)

Independent claim 64 requires a controller that can, after “select[ing] a first cluster of the LEDs having light associated therewith that is directed toward the other vehicle” and controlling a first change to the light associated with the first selected cluster, also “select a second, different cluster . . . directed towards the other vehicle” and “control a second, subsequent change” to the light directed towards the other vehicle. Ex. 1035, 10:14–34; Ex. 1002, 1016.

Petitioner contends that the second selection and control limitations read on Karlsson’s system because it functions “on any number of target vehicles” and “[a] second vehicle would require a second cluster, as claimed, to execute Karlsson’s glare-reduction process.” Pet. 71. Petitioner alternatively relies on Nakamura’s detection and accommodation of multiple target vehicles. *Id.* at 72.

Patent Owner contends that claim 64's "second, different cluster" and "second, subsequent change" limitations require "use of a second, different cluster for the same vehicle at a different point in time" and do not read on a second other vehicle. PO Resp. 48–49 (emphasis omitted). We agree. The claim language refers to a second cluster directed to "the other vehicle," i.e., the vehicle associated with the first selected cluster. We do not agree with Petitioner's argument that "the claim language does not restrict the second cluster to a single vehicle." Pet. Reply 8.

Patent Owner did not raise this claim-construction position in its Preliminary Response and instead first presented it in the Response. *See* Prelim. Resp. 9, 38–63. We did not address claim 64's construction in our Institution Decision. Inst. 8, 15–17. Thus, we consider Petitioner's additional argument that Karlsson discloses the "second, different cluster" limitation construed as "single-vehicle tracking, as PO understands this element of claim 64 to recite." Pet. Reply 19; *see Axonics, Inc. v. Medtronic, Inc.*, 75 F. 4th 1374, 1383 (Fed. Cir. 2023). In light of Patent Owner's approach to claim construction, we do not agree that Petitioner's additional argument is impermissible. *See* PO Sur-Reply 10.

Petitioner argues that Karlsson satisfies the claim language for the same reasons discussed above regarding claims 72 and 80. Pet. Reply 19; *see supra* at 15 (§ II.B.4). In particular, Petitioner points out that "Karlsson's system performs the detection/illumination steps . . . repeatedly, updating as necessary for any changes in the position of the detected vehicle." Pet. Reply 19–20 (citing Pet. 74–75). Petitioner submits that "[u]pdating the detected location changes the position of the target vehicle, meaning the updated area would use a second, different cluster as recited in claim 64." *Id.*

at 20 (citing Ex. 1052 ¶¶ 138–140). We agree. As discussed above regarding claims 72 and 80, claim 64’s language reads on Karlsson’s disclosures.

6. Motivation to combine
(claims 56, 64, 72, 80)

As summarized above, Petitioner recognizes that “Karlsson does not expressly disclose how the direction of the target light sources is stored and processed to determine which LEDs to be dimmed to avoid glare,” and contends that skilled artisans had reason “to modify Karlsson’s system to include the coordinates of the pixels, and the corresponding vehicle recognition process[,] as taught by Nakamura.” Pet. 53–55. Petitioner reasons that the modification “would have expressly 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.” *Id.* at 54 (citing Ex. 1003 ¶ 248); *accord id.* at 55 (“The combination would have had the predictable result of providing the algorithm details implicit in Karlsson’s system through Nakamura’s known technique of mapping pixels in an image.”). Petitioner notes the benefits of ensuring the system “accurately identifies traffic ahead and dims its headlights appropriately, improving illumination quality and safety for drivers.” *Id.* at 55. As to the modification’s challenge, Petitioner asserts that skilled artisans need only have modified Karlsson’s software “to include the pixel coordinates and corresponding algorithm in Nakamura” and that Nakamura “explains how to implement the coordinate mapping of the pixels received by a camera.” *Id.* at 55–56 (citing Ex. 1013 ¶¶ 25–27, 36–44; Ex. 1003 ¶ 251).

Patent Owner asserts that Petitioner's combination is deficient because Karlsson uses a lamp-located sensor whereas Nakamura uses a central-top-windshield sensor. PO Resp. 57. Patent Owner points to Karlsson disclosing advantages of locating the sensor with the illumination system. *Id.* at 58 (citing Ex. 1010, 2:10–18, 3:27–37). Further, Patent Owner emphasizes the changed perspective between a “camera at the center of the windshield near the driver's eyeline,” as in Nakamura, and Karlsson's collocated camera–illuminator. *Id.* at 59–61. In Patent Owner's view, Petitioner needs to have accounted for how skilled artisans would have mapped Nakamura's coordinates to Karlsson's LEDs. *Id.* at 59.

As to the advantages of Karlsson's lamp-located sensor, nothing about that arrangement would have changed in the proposed combination. As described, Petitioner proposes using aspects of Nakamura's processing in combination with Karlsson's physical system. *See* Pet. 52–56. Thus, the combination preserves any advantages Karlsson obtains by locating a sensor with each illumination system.

As to a change of perspective, the record does not support that Nakamura's processing relies on a single, unchangeable perspective. Rather, Nakamura discloses identifying relevant image regions through reference markers such as “white lines of the lane” and adjustments such as “correction amount α ” to accommodate the reference markers. Ex. 1013 ¶¶ 36–46; *see* Pet. 56 (“Nakamura explains how to implement the coordinate mapping of the pixels received by a camera.”). Thus, Nakamura's approach is already suitable to a changed perspective and Petitioner did not have to explain further details of the required adaption. *See also* Ex. 1052 ¶¶ 110 (“Wherever the camera is located on the vehicle, a simple calibration for

camera location versus driver’s viewpoint would be conducted to carry on the image processing.”), 156 (noting that the same reasoning applies to the Karlsson–Nakamura combination as the Beam–Satonaka combination). Additionally, Patent Owner has not persuasively supported its assertion that the changed perspective—locating sensors at the headlamps rather than centered at the top of the windshield—would impair the system’s ability to detect other vehicles. *See* PO Resp. 59–61. Patent Owner’s expert could not testify as to the camera locations used to generate the images that form the basis for Patent Owner’s argument, as he was not present at the test that generated those images. Ex. 1053, 104:22–105:14, 106:16–107:6, 109:17–110:4. While there may be some tradeoffs involved in using a different camera location than Nakamura discusses, those tradeoffs would be balanced by the benefits that Karlsson discloses from locating a camera with each headlamp.

Nakamura’s teachings relate to identifying regions in the illuminated field that should be dimmed. Ex. 1013 ¶ 45. Such a determination aligns with Karlsson’s own similar determination, and would be implemented as a lighting change by Karlsson’s system. *See, e.g.*, Ex. 1010, 9:18–26.

Having considered the full record, we find that skilled artisans would have had reason to modify Karlsson’s system with Nakamura’s teachings regarding capturing and using image coordinates as summarized above.

7. Cluster including non-contiguous LEDs
(claims 65, 73)

Claim 64 requires a camera “positioned to capture an image of another vehicle” and a controller that can “select a first cluster of the LEDs having light associated therewith that is directed towards the other vehicle”

at “a first position” and “select a second, different cluster of the LEDs . . . directed towards the other vehicle” at “a second, subsequent position.”

Ex. 1035, 9:64–10:29. Claim 65 depends from claim 64 and further requires “at least one of the first cluster or the second cluster includes non-contiguous LEDs.” *Id.* at 10:43–45. Claim 73, depending from claim 72, recites parallel limitations requiring non-contiguous LEDs. *Id.* at 12:18–19. Petitioner addresses these limitations by reference to its contentions for claim 57. Pet. 67–69 (addressing claim 57), 73 (addressing claim 65 by relying on Petitioner’s assertions for claim 57), 74 (same, for claim 73).

Petitioner asserts that “Karlsson’s cluster can be selected ‘for forming random patterns of the light beam’ to ‘provide a desired lighting pattern.’” Pet. 67 (quoting Ex. 1010, 13:24–29, 14:26–30). Petitioner reasons that the non-contiguous limitation is obvious because “non-contiguous patterns fall under the broader category of any random pattern,” and skilled artisans would know “that one of the desired patterns would be non-contiguous.” *Id.* at 67–68. Petitioner supports the latter assertion based on Karlsson’s ability to dim its LEDs “[w]hen there are two or more separated vehicle targets.” *Id.* at 68 (citing Ex. 1010, 9:18–26; Ex. 1003 ¶ 284).

Patent Owner challenges that assertion, arguing that forming random patterns does not alone satisfy the claim language and that handling multiple vehicles involves “separate clusters for each vehicle,” whereas the claim requires a “single cluster for the single vehicle including non-contiguous lights.” PO Resp. 54.¹¹ We agree.

¹¹ Claim 57 similarly recites that one of the two clusters “includes non-contiguous LEDs.” Ex. 1035, 8:64–67. Patent Owner does not argue that Petitioner’s contentions are deficient as to claim 57, which we

First, disclosing a genus (random patterns) does not necessarily render obvious all species of that genus (here, a non-contiguous cluster).

Additionally, relying on a particular pattern produced by Karlsson's lights does not resolve the arrangement of LEDs used to create that pattern because a cluster of LEDs is distinct from the pattern it produces. Depending on the LED aimings and optical system, a non-contiguous cluster could produce a uniform, contiguous pattern (and a contiguous cluster could produce a non-contiguous pattern). Thus, for multiple reasons, Karlsson's ability to create random patterns does not mean that it selects a non-contiguous cluster of LEDs.

Second, and more significantly, Petitioner's assertion that Karlsson would select a non-contiguous pattern is based on multiple detected vehicles. Pet. Reply 21. Claim 65's language (with claim 64's), however, requires selecting "a first cluster of the LEDs" and a "second, different cluster of the LEDs" illuminating a single detected vehicle where at least one of the two clusters "includes non-contiguous LEDs." Likewise, claim 73's language requires selecting "a cluster of the LEDs having light associated therewith that is directed at the target" where "the cluster includes non-contiguous LEDs." That language requires that a cluster illuminating a single detected vehicle includes non-contiguous LEDs. Petitioner asserts that Patent Owner "relies on a flawed understanding of these claims." Pet. Reply 21. To that

understand to mean that claim 57's language reads on a non-contiguous cluster directed at multiple vehicles, as Petitioner asserts (*see* Pet. 67–69). Regardless, Patent Owner has forfeited any argument challenging whether the prior art discloses claim 57's non-contiguous requirement. *See* Paper 12, 9 ("Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.").

end, Petitioner argues “the plain language does not require a cluster be assigned to a single vehicle” because it requires only “that the cluster include LEDs that emit light toward at least a portion of the other vehicle” and “[t]here is no restriction on the cluster having additional LEDs pointed at a second vehicle.” *Id.* at 11–12. That interpretation is not persuasive. We agree that the claimed headlight may select a cluster of LEDs including some that do not emit light toward a detected vehicle (for example, LEDs pointed at a second vehicle), but such LEDs would not be part of the claimed “cluster,” which the claim language defines as “LEDs having light associated therewith that is directed towards the other vehicle.” That claimed cluster must include non-contiguous LEDs, so other LEDs emitting light elsewhere are not relevant to the claimed cluster. We conclude that Petitioner’s assertions do not address the properly understood claim language and thus fail to show unpatentability.

Petitioner asserts additionally that Nakamura discloses detecting multiple vehicles and that it would have been obvious to modify Karlsson’s system to “detect[] and adjust[] light based on multiple vehicles . . . because this would improve safety and system performance when multiple other vehicles are present.” Pet. 68–69. That suffers from the same problem as Petitioner’s Karlsson-based contention and fails to show unpatentability for the same reason.

8. *Objective indicia of nonobviousness*

Patent Owner submits that the ’551 patent satisfied a long-felt need for “glare-free adaptive beam technology” and received industry praise for doing so. PO Resp. 68–72. To that end, Patent Owner relies on statements

made in a reexamination declaration by Mr. Joseph Stam. Ex. 2023, 683–742. Patent Owner, however, has not presented Mr. Stam’s declaration as a declaration in this case, instead relying on its expert, Dr. Turk, who “reviewed the objective evidence statements in the Stam declaration.” PO Resp. 68 (citing Ex. 2024 ¶ 224). Dr. Turk, however, was not able to recall the meaning of multiple terms he used in his declaration (Ex. 1053, 124:5–135:18) and asserted that he determined that ADB technology falls within the claims by looking at the Stam declaration, without independently verifying statements in the Stam declaration or reviewing the documents upon which those statements were based (*id.* at 135:19–137:16). Dr. Turk’s declaration addressing secondary considerations is not credible as to the substance of the asserted secondary considerations, and Patent Owner’s asserted secondary considerations are not persuasive for that reason alone.

Additionally, Petitioner asserts that Patent Owner has not shown any evidence that is “linked to an alleged unique characteristic” and therefore cannot establish the required nexus. Pet. Reply 25. In that regard, Petitioner points out that Patent Owner has alleged a connection only to claims not at issue in this proceeding. *Id.* at 26. We agree that Patent Owner has not made a showing that establishes nexus between any evidence of nonobviousness and the challenged claims here. Although Patent Owner asserts a nexus with claims challenged in IPR2023-00315, our Final Written Decision in that proceeding explained why Patent Owner had not established nexus with those claims either. IPR2023-00315, Paper 35, 21–24.

Accordingly, because Patent Owner’s prior arguments failed to establish a nexus and because Patent Owner fails to establish an adequate

nexus in this proceeding, we find that objective indicia do not support nonobviousness here.

9. Conclusion

As discussed above, Petitioner has not proven the unpatentability of claim 65 or 73. *See supra* at 22 (§ II.B.7). Other than as discussed, Patent Owner does not contest Petitioner’s assertions regarding obviousness of the challenged claims over Karlsson and Nakamura. *See* PO Resp. 10–13, 40–61. We have considered the full record, including evidence and arguments presented by Petitioner and Patent Owner on whether Karlsson and Nakamura disclose each limitation, whether skilled artisans had reason to combine the teachings as asserted, and whether objective indicia support nonobviousness. Based on the full record, we conclude that Petitioner has proven that the subject matters of independent claims 56, 64, 72, and 80, and dependent claims 57–63, 66–71, 74–79, and 81–87 would have been obvious for the reasons provided in the Petition, Reply, and as discussed above. Pet. 52–76; Pet. Reply 18–26.

C. OBVIOUSNESS OVER KARLSSON, NAKAMURA, AND GOTOU

Gotou is titled “Head Lamp Device for Vehicle” and is directed to a vehicle headlamp with a left-right adjustable lighting region. Ex. 1012, codes (54), (57). Gotou’s device may adjust the lighting region based on a number of factors, including “direction indicating signal, steering angle signal, map information and information of the present position.” *Id.* at 2:5–7. Gotou describes a “light distributing control ECU 10” that receives information from a variety of sensors and “processes the information[] and signals to determine a requisite optical axis angle θ .” *Id.* at 3:52–63. Gotou’s

system uses the optical axis angle to control a motor driver that aims the lamp unit. *Id.* at 3:24–45, 3:63–67. Gotou describes that its controller generates “a curve pre-noticing signal” from map information and adjusts the optical axis angle “when the vehicle reaches the predetermined distance S before the curve entrance and the light distribution is deflected leftward at a proper timing before the curve.” *Id.* at 7:32–43.

Petitioner asserts that skilled artisans would have had reason “to modify Karlsson’s system to adjust light based on map data, as in Gotou, to further control Karlsson’s directional LEDs to illuminate roadway curves, thereby improving driver safety—an express purpose of Karlsson.” Pet. 76 (citing Ex. 1003 ¶¶ 342–343; Ex. 1010, 1:16–26, 4:17–21, 9:18–26).

Petitioner notes that Karlsson already includes the ability to detect steering-wheel angle “for determining when the car 56 is taking a bend, so that the light beam 7 can be adapted.” *Id.* (quoting Ex. 1010, 20:22–32). Petitioner reasons that using Gotou’s map data would improve Karlsson’s system “because it allows the system to predict turns farther in advance.” *Id.* at 77.

1. Accommodate upcoming road curvature by adaptation of a light pattern
(claims 58, 66, 74, 82)

Claim 58 depends from claim 56 and requires that the controller be able to “identify an upcoming road curvature along a road on which the motor vehicle is traveling; and accommodate the upcoming road curvature by adaptation of a light pattern of at least one of the headlamps.” Ex. 1035, 9:5–12. Other claims depending from other independent claims recite similar limitations (claims 66, 74, and 82). Petitioner’s contentions collectively address claims 58, 66, 74, and 82, relying on Gotou for the additional limitations. Pet. 76–79.

Patent Owner disputes Karlsson’s ability to accommodate curves because, in Patent Owner’s view, Karlsson discloses a default pattern of full illumination, only reducing its beam where oncoming traffic is detected. PO Resp. 62–67. Thus, according to Patent Owner, Karlsson lacks “remaining unlit LEDs with which to achieve the adaptation.” *Id.* at 67. We do not agree.

Most significantly, Karlsson discloses operating a light-source array by illuminating a subset of spotlight sources smaller than the full array. Karlsson’s Figure 14 is reproduced below:

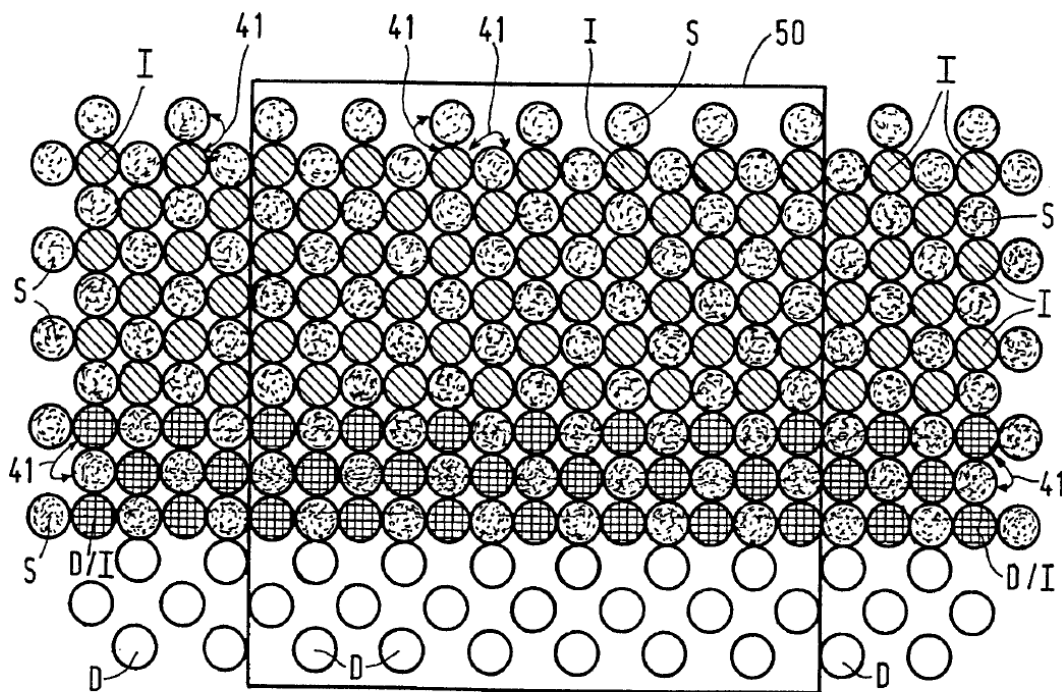


FIG. 14

Figure 14 depicts an array of spotlight sensors “S” interspersed with spotlight sources including those indicated with “D” providing “dipped light function,” those indicated with “I” providing main-beam function, and those indicated with “D/I” operative as both dipped and main-beam light.

Ex. 1010, 19:18–28. Figure 14 further depicts a window 50 representing the emitted light beam, and Karlsson discloses that the window “can shift in the plane of the drawings from the left to the right and from the top to the bottom.” Ex. 1010, 19:29–30.

Based on Karlsson’s description of a shifting window of illuminated spotlight sources, we find that Karlsson suggests operating with fewer than all sources active as a default state. Karlsson does not link its windowed operation to instances when a detected vehicle has caused nonwindowed portions to be dimmed. And understanding Karlsson’s windowed operation as a possible default is consistent with Karlsson’s disclosure of adapting its light beam “when the car 56 is taking a bend.” *Id.* at 20:22–32.

We credit Petitioner’s expert testimony, which recognizes that Karlsson’s moving window would create a number of light patterns, including “bending light” away from the vehicle’s center line. Ex. 1052 ¶¶ 161–162. That testimony is consistent with Karlsson’s disclosures described above. Patent Owner’s expert agreed that, with the shifting window, Karlsson describes variation including beam direction. Ex. 1053, 33:18–34:25. Although in his declaration, Patent Owner’s expert asserts that Karlsson’s window 50 is created by blanking portions of the overall beam only “to reduce potential glare” and that, in any situation, “the resulting beam would be less (for the duration of the event) than the full normal beam” (Ex. 2024 ¶¶ 215–217), those assertions are not as consistent with Karlsson’s disclosures and we do not find them persuasive.

Patent Owner argues the Petition asserted that, other than areas dimmed to prevent glare to oncoming vehicles, Karlsson maintains full intensity for the “remaining areas of light beam 7.” PO Resp. 63 (quoting

Pet. 66) (emphasis omitted). In Patent Owner’s view, maintaining full intensity outside of the dimmed area would leave no ability to shift light towards road curvatures. *Id.* at 66. We do not agree that configuring light beam 7 “to maximize the area fully illuminated” necessarily means using all of Karlsson’s light sources. Karlsson describes “desired emitted light beam 7” as the light that is projected on the target area. Ex. 1010, 8:15–17. Maximizing that beam may still be done within other bounds, such as those that leave margins for beam-direction adjustment. Karlsson’s disclosure of using a window to define the emitted light beam 50 is consistent with a particular desired beam pattern. As discussed above, using a windowed portion of the light sources allows Karlsson’s system to accommodate changes in beam direction, and we find that maintaining full intensity for the maximum extent of a desired beam pattern—i.e., dimming the smallest area possible to prevent glare to oncoming vehicles—is still consistent with using a windowed portion of light sources as the default. Accordingly, we agree with Petitioner that Karlsson’s system would be able to adjust light based on Gotou’s map data as asserted. Pet. 76–79.

2. Cluster including non-contiguous LEDs
(claims 67, 75)

Claim 67 depends from claim 64 and further requires that “the cluster includes non-contiguous LEDs.” Ex. 1035, 10:58–11:14. Claim 75 recites parallel limitations, with different dependency.

Patent Owner challenges Petitioner’s showing for the same reason discussed above regarding claims 65 and 73. For those same reasons, we reach the same conclusion for claims 67 and 75 that Petitioner has not proven unpatentability. *See supra* at 22 (§ II.B.7).

3. Conclusion

Petitioner provides additional contentions based on Karlsson's and Gotou's disclosures for claims 58–61, 66–69, 74–77, and 82–85. Pet. 76–81. Petitioner has not proven the unpatentability of claim 67 or 75 (*see supra* at 31 (§ II.C.2)). Other than as discussed, Patent Owner does not contest Petitioner's assertions regarding obviousness of claims 58–61, 66–69, 74–77, and 82–85 over Karlsson, Nakamura, and Gotou. *See* PO Resp. 10–13, 62–72. We have considered the full record, including evidence and arguments presented by Petitioner and Patent Owner on whether Karlsson, Nakamura, and Gotou disclose each limitation, whether skilled artisans had reason to combine the teachings as asserted, and whether objective indicia support nonobviousness. Based on the full record, we conclude that Petitioner has proven that the subject matters of claims 58–61, 66, 68, 69, 74, 76, 77, and 82–85 would have been obvious for the reasons provided in the Petition, Reply, and as discussed above. Pet. 76–82; Pet. Reply 18–26.

D. UNPATENTABILITY OVER BEAM AND SATONAKA

Petitioner additionally contends that the claims challenged based on Karlsson and Nakamura are unpatentable also over Beam and Satonaka. Pet. 17–46 (addressing claims 56, 57, 62–65, 70–73, 78–81, 86, and 87). Because we above determine that Petitioner has demonstrated unpatentability of claims 56, 57, 62–64, 70–72, 78–81, 86, and 87 over Karlsson and Nakamura, we need not address Petitioner's contentions for those claims based on Beam and Satonaka. We above determine that Petitioner has not demonstrated unpatentability of claims 65, 67, 73, and 75 over Karlsson and Nakamura, so we address Petitioner's contentions for those claims based on Beam and Satonaka.

1. Cluster including non-contiguous LEDs
(claims 65, 73)

The parties' positions regarding claim 65's requirement for a cluster including non-contiguous LEDs follow those discussed above. *See supra* at 22 (§ II.B.7). Although Petitioner relies on Beam's disclosures rather than Karlsson's, Petitioner relies on Beam disclosing that its "glare-reduction process 'can be done for any number of vehicles that fall in the headlight beam.'" Pet. 37 (quoting Ex. 1005, 2:62–63), 43 (addressing claim 65 by reference to claim 57). Like its Karlsson-based contentions, Petitioner asserts that, "when there are two or more separated vehicle targets, . . . Beam's system would select a cluster of LEDs that are non-contiguous to cover all of the vehicle targets." *Id.* at 37.

As discussed above, the "non-contiguous LEDs" limitation does not necessarily read on multiple clusters selected for multiple vehicles, because the claim language requires a "cluster of LEDs that emit light toward at least a portion of the [first] other vehicle" and Petitioner has not shown that a second cluster selected for a second vehicle is "of LEDs that emit light" toward the first vehicle. *See supra* at 22 (§ II.B.7); PO Sur-Reply 20. Accordingly, we conclude that Petitioner has not proven claim 65 or 73 unpatentable.

2. Conclusion

As discussed, we conclude that Petitioner has not proven unpatentability over Beam and Satonaka as to claim 65 or 73. Although Petitioner provides contentions for other challenged claims based on Beam and Satonaka (Pet. 17–46), we do not address those challenges because we

have already determined the claims are unpatentable over Karlsson and Nakamura (claims 56, 57, 62–64, 70–72, 78–81, 86, and 87).

E. UNPATENTABILITY OVER BEAM, SATONAKA, AND KOBAYASHI

Petitioner asserts a combination of Beam, Satonaka, and Kobayashi, to address dependent claims including light adaptation based on road-curvature (claims 58–61, 66–69, 74–77, 82–85). Pet. 46–52.

1. Cluster including non-contiguous LEDs
(claims 67, 75)

Patent Owner challenges Petitioner’s showing as to claims 67 and 75 for the same reason discussed above regarding claims 65 and 73. For the same reasons discussed, we reach the same conclusion for claims 67 and 75 that Petitioner has not proven unpatentability. *See supra* at 33 (§ II.D.1).

2. Conclusion

Although Petitioner provides contentions for other challenged claims based on Beam, Satonaka, and Kobayashi (Pet. 46–52), we do not address those challenges because we have already determined the claims are unpatentable over Karlsson, Nakamura, and Gotou (claims 58–61, 66, 68, 69, 74, 76, 77, 82–85).

F. FAIRNESS, TIMING, AND EFFICIENCY UNDER § 316(b)

Patent Owner argues that Petitioner filed three IPR petitions against the ’551 patent, but could have challenged the claims more concisely. PO Resp. 72–73. We determine that Petitioner’s approach was reasonable because dividing multiple challenges to multiple claims among multiple petitions will always involve some choice as to how to divide those challenges, and there is no requirement for Petitioners to choose the

approach that Patent Owner favors. Patent Owner has not identified a basis on which we should determine Petitioner fails to prove unpatentability. Accordingly, the argument is not persuasive.

G. PETITIONER’S MOTION TO EXCLUDE

Petitioner seeks to exclude the testimony of Patent Owner’s declarant, Dr. Turk (Exs. 2001, 2024), asserting that he does not meet the agreed level of ordinary skill in the art. Mtn. Exclude 1; *see supra* at 7 (§ I.F). In particular, Petitioner argues that the agreed level of skill requires “at least 2 years of industry experience in the area of automotive lighting and lighting-control systems” whereas Dr. Turk lacks such qualifications. Mtn. Exclude 3–6; *accord* Reply Mtn. Exclude 3–4 (arguing Dr. Turk “has no experience with a vehicle headlamp company, an LED (or any other light source) company, or lighting design, or awards/patents for a vehicle forward lighting system” (citing Opp. Mtn. Exclude 4–5)).

We determine that granting Petitioner’s Motion to Exclude would not change the outcome here. For the claims on which Patent Owner has prevailed, our determination that Petitioner fails to meet its burden does not depend on Dr. Turk’s testimony, but instead relies on the claim language as compared to Petitioner’s assertions. *See supra* at 22 (§ II.B.7), 31 (§ II.C.2), 33 (§ II.D.1), 34 (§ II.E.1). For the claims on which Petitioner has prevailed, excluding Dr. Turk’s testimony would not change the outcome. Thus, the motion is moot as to Dr. Turk’s declarations. Accordingly, we dismiss Petitioner’s motion.

III. CONCLUSION¹²

As discussed above, we conclude that Petitioner has proven claims 56–64, 66, 68–72, 74, 76–87 unpatentable, but has not proven any of claims 65, 67, 73, and 75 unpatentable. In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
56, 57, 62–65, 70–73, 78–81, 86, 87	103	Beam, Satonaka ¹³		65, 73
58–61, 66–69, 74–77, 82–85	103	Beam, Satonaka, Kobayashi ¹⁴		67, 75

¹² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

¹³ As noted above, we do not reach this ground beyond claims 65 and 73, because we determine the other claims unpatentable over Karlsson and Nakamura.

¹⁴ As noted above, we do not reach this ground beyond claims 67 and 75, because we determine the other claims unpatentable over Karlsson, Nakamura, and Gotou.

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
56, 57, 62–65, 70–73, 78–81, 86, 87	103	Karlsson, Nakamura	56, 57, 62–64, 70–72, 78–81, 86, 87	65, 73
58–61, 66–69, 74–77, 82–85	103	Karlsson, Nakamura, Gotou	58–61, 66, 68, 69, 74, 76, 77, 82–85	67, 75
Overall Outcome			56–64, 66, 68–72, 74, 76–87	65, 67, 73, 75

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 56–64, 66, 68–72, 74, and 76–87 of the '551 patent are unpatentable;

FURTHER ORDERED that Petitioner has not shown by a preponderance of the evidence that any of claims 65, 67, 73, and 75 are unpatentable;

FURTHER ORDERED that Petitioner's Motion to Exclude Evidence is dismissed as moot; 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.

IPR2023-00318
Patent 9,955,551 B2

For PETITIONER Volkswagen Group of America, Inc.:

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EXHIBIT B

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE OFFICE OF THE UNDER SECRETARY OF COMMERCE
FOR INTELLECTUAL PROPERTY AND DIRECTOR OF THE
UNITED STATES PATENT AND TRADEMARK OFFICE

VOLKSWAGEN GROUP OF AMERICA, INC. and
PORSCHE CARS NORTH AMERICA, INC.,
Petitioner,

v.

YECHEZKAL EVAN SPERO,
Patent Owner.

IPR2023-00318¹
Patent 9,955,551 B2

Before KATHERINE K. VIDAL, *Under Secretary of Commerce for
Intellectual Property and Director of the United States Patent and
Trademark Office.*

ORDER

¹ Porsche Cars North America, Inc., which filed a petition in IPR2023-01296, has been joined as a party to this proceeding.

The Office received a request for Director Review of the Final Written Decision for the above-captioned case. *See* Paper 36; Ex. 3100. The request was referred to me.

Upon consideration of the request, it is:

ORDERED that the request for Director Review is denied; and

FURTHER ORDERED that the Patent Trial and Appeal Board's Final Written Decision in this case is the final decision of the agency.

IPR2023-00318
Patent 9,955,551 B2

For PETITIONER Volkswagen Group of America, Inc.:

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