

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.

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

Case No.: IPR2023-00315

PATENT OWNER'S RESPONSE TO PETITION

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35 U.S.C. § 312 (a)(3).....	10, 13, 14
37 C.F.R. §§ 42.22(a)(2)	10, 13, 14

List of Exhibits

Exhibit No.	Description
2001	Declaration of Matthew A. Turk, PhD
2002	Curriculum Vitae of Matthew A. Turk, PhD
2003	Best Practices and FAQs for Filing Requests for Reexamination Compliant with 37 CFR 1.510 and 1.915, PTAB, May 2010
2004	Petition challenging U.S. Patent No. 9,955,551, Volkswagen Group of America, Inc. v. Yechezkal Evan Spero, IPR2023-00318, Paper 1, December 22, 2022
2005	Petition challenging U.S. Patent No. 9,955,551, Volkswagen Group of America, Inc. v. Yechezkal Evan Spero, IPR2023-00336, Paper 1, December 22, 2022
2006	Second Declaration of Matthew A. Turk, PhD
2007	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on August 2, 2023, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies LLC</i> , IPR2023-01586
2008	Intentionally left blank
2009	Intentionally left blank
2010	Jianzhong Jiao and Ben Wang, “Etendue Concern for Automotive Headlamp Using LEDs,” SPIE Proceedings Vol. 5187, (January 2004) (Available at https://www.spiedigitallibrary.org/conference-proceedings-of-spie/5187/0000/Etendue-concerns-for-automotive-headlamps-using-white-LEDs/10.1117/12.504363.short)
2011	Michael Bass, <i>Handbook of Optics</i> 3 RD Edition Volume II, (McGraw-Hill, 2010) (Available at https://www.worldcat.org/title/555545456)
2012	Ben Wang and Jianzhong Jiao “Studies for Headlamp Optical Design Using LEDs,” SAE Technical Paper Series 2004-01-0434, (March 2004) (Available at https://www.sae.org/publications/technical-papers/content/2004-01-0434/)
2013	Ben Wang and Jianzhong Jiao “Optical Transform Limitations in Headlamp Photometric Performance,” SAE Technical Paper Series 2005-01-0861, (April 2005) (Available at https://www.sae.org/publications/technical-papers/content/2005-01-0861/)

Exhibit No.	Description
2014	Intentionally left blank
2015	Jianzhong Jiao and Ben Wang “High-Efficiency Reflector Optics for LED Forward Lighting,” SPIE Proceedings Vol. 6670, (September 2007) (Available at https://www.spiedigitallibrary.org/conference-proceedings-of-spie/6670/66700M/High-efficiency-reflector-optics-for-LED-automotive-forward-lighting/10.1117/12.730524.short)
2016	Navigant Consulting “Energy Saving Estimates of Light Emitting Diodes in Niche Lighting Applications” Building Technologies Program Office of Energy Efficiency and Renewable Energy U.S. Department of Energy (September 2008) (Available at Energy Savings Estimates of Light Emitting Diodes in Niche Lighting Applications (Technical Report) OSTI.GOV.)
2017	PCT Publication No. WO 86/05147 to Flaaten
2018	Transcript of Deposition of Jianzhong Jiao, Ph.D. taken on August 23, 2023
2019	Alliance for Automotive Innovation website retrieved September 11, 2023 https://www.autosinnovate.org/about/our-members
2020	Michael Bass, <i>Handbook of Optics</i> 3 RD Edition Volume V, (McGraw-Hill, 2010) (Available at https://www.worldcat.org/title/557121959 .)
2021	Texas Instruments/Digikey “How DLP Technology Works,” (Available at https://www.digikey.com/en/product-highlight/t/texas-instruments/dlp-technology .) (Accessed September 12, 2023.)
2022	Texas Instruments “Introduction to +/- 12 Degree Orthogonal Digital Micromirror Devices (DMDs) (Available at https://www.ti.com/lit/an/dlpa008b/dlpa008b.pdf?HQS=dis-dk-null-digikeymode-dsf-pf-null-ww&DCM=yes&distId=10) (Accessed September 12, 2023.)
2023	Certified File Wrapper of Reexamination Application 90/014815 dated January 11, 2023

Patent Owner submits the following (“Response”) to the Petition (Paper 2) for *Inter Partes Review* of claims 24-55 (“Challenged Claims”) of U.S. Patent No. 9,955,551 (“the ’551 Patent”) filed by Volkswagen Group of America, Inc., (“VW” or “Petitioner”), and the Board’s Decision of Institution (“DI”, Paper 11).

I. Introduction

From both a macro and micro-level, the Petition proofs are insufficient to establish unpatentability. By conflating claims and presenting arguments for a representative claim, the Petition frequently omits entire limitations-- *e.g.*, in independent claims 32 and 48-- resulting in incomplete proofs. For the Ground 1 challenges of independent claims 24, 32 and 40, the Petition relies on Beam’s controls that blank or darken sections, ignoring the plain meaning of the claim terms *emission* and *illumination*, which require non-zero emission levels. Further, for all independent claims, the Petition interchanges teachings between incompatible LED and non-LED light modulator embodiments.

Separate from the deficiencies with the independent claim proofs, the dependent claims add a multitude of precise control features which the combinations fail to teach. For example, for claims 26-29, 34-37, 42-45, and 50-53, the Petition relies on maximum intensity forward illumination teachings in Beam and Karlsson-- that require no further adaptation-- to satisfy limitations that a controller “*accommodate the upcoming road curvature by adaptation of a light*

pattern¹².”

Compounding the deficiencies, Petitioner’s motivation to combine arguments are vague and conclusory with respect to both how and why a person of ordinary skill in the art (“POSA”) would have combined features of disparate LED and non-LED embodiments or teachings directed to different problems described in the applied references. Petitioner identifies no rational reason to combine the references in the specific ways it alleges and completely glosses over the impact of the state of the art as of the invention date relative to the requisite skill, motivation, and predictable results for a POSA. Contemporaneous evidence years **after** the invention date, including numerous publications from Petitioner’s own expert, make it clear that the technical challenges posed by the proffered combinations would have been well beyond the capability of a POSA at the time of the invention. The proffered combinations require incompatible and excessive modifications to the prior art — which neither the Petition nor the expert declaration justify. The proffered combinations further render the primary references unsuitable for their stated purposes-- the changed camera perspective in the Ground 1 and 2 combinations, resulting from use of Beam’s boresighted

¹ For ease of reference, claim language will be italicized.

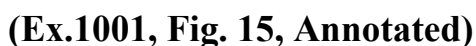
² Emphasis added by Patent Owner unless indicated otherwise.

camera, destroys Satonaka's coordinate mapping algorithm and in turn Beam's anti-glare functionality. and for Grounds 3 and 4, the Petition's misinterpretation of Karlsson's glare-reduction window in Figure 14, interferes with Karlsson's overarching "optimum illumination" strategy. Finally, save conclusory statements, the Petition impermissibly fails to address the detailed objective evidence of non-obviousness presented in the '551 Patent file history. As a result, all of Petitioner's asserted grounds lack sufficient evidence of obviousness.

For these reasons, and others explained below, the Board should find that all Challenged Claims remain patentable.

II. Overview of the '551 Patent - The Claimed Invention is Directed to an Adaptive Multi-LED Headlight System with Finely Controlled Light Delivery

The '551 Patent discloses "a novel multi-light source approach to the design and construction of solid-state lighting fixtures (vs. solid state lamps), which is termed a 'Digital Lighting Fixture', due to the control of individual lighting element 'digits' to provide the 'correct' lighting solution for the situation at hand." (Ex.1001, 11:8-13.) The '551 Patent further explains that "[t]he terminology 'digital' as used herein refers to the discrete nature of the multiple LED lamps provided in the luminaire, whereby, 'digital' control results from the individual control of the discrete, *i.e.*, 'digital' lighting elements, the LEDs, in the luminaire." (*Id.* at 2:65-3:3.)



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and dimmable elements which can be addressed by control electronics to effect intensity, spectrum and spatial distribution of intensity and spectrum, yields a lighting fixture (vs. lamp) of unparalleled performance.” (*Id.*, 11:56-62.) The ’551 Patent describes using a digital light fixture (DLF) to provide multiple functions, for example “[i]n a DLF it is possible to combine a task light having a very narrow ‘spot’ beam at the correct aiming with a general area lighting ‘flood’ beam into one fixture.” (*Id.*, 22:14-16.) Similarly, the ’551 Patent explains how to use its “digital lighting” in the context of headlamps to “provide the optimal lighting solution in real-time” (*Id.*, 57:31-37) — whether that be for predictive curve illumination (*Id.*, 51:52-56), to preserve forward illumination while preventing glare (*Id.*, 52:54-65), or both (*Id.*, 53:34-45).

The Challenged Claims include independent claims 24, 32, 40 and 48. Independent claim 24 is representative and reproduced below with emphasis added:

24. An illuminating device having automatic control of light provided to an illuminated area comprising:

a structure for incorporating illuminating device elements, wherein the structure comprises a motor vehicle;

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;

electronic circuitry apparatus for the controlled powering of the LEDs and other of the illuminating device elements;

one or more processors;

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;

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

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

determine first coordinates corresponding to an other vehicle, based on the coordinate-specific information;

select a cluster of the LEDs that emit light toward at least a portion of the other vehicle based on the LEDs having emission aimings associated with the first coordinates; and

change **emission** of the selected cluster of LEDs **relative to emission** of other LEDs not included in the cluster to create headlamp illumination that preserves a first level of illumination illuminating past the other vehicle while **preventing glare** to a driver of the other vehicle.

(Ex.1002 at 993, 1011, claim 24.)

The '551 Patent describes a multitude of sensor-based techniques for observing a scene, analyzing a scene, determining varied illumination for a scene, etc. This can include determining what objects are within the scene and what illumination should correlate to those objects. (Ex.1001, 44:36-45:44.) The '551 Patent notes the general applicability of the varied concepts across embodiments and specifically notes that techniques described elsewhere at least correspond to headlamps. (*Id.*, 52:66-53:4.) The '551 Patent explains that, by using “digital” headlamps with known light directionality of discrete source elements, such as LEDs, it is possible to “continue to illuminate far ahead (in high beam) without blinding oncoming traffic.” (*Id.*, 52:60-61.) This allows for determination of “what exact aiming is the maximum allowable for any given traffic situation and the road layout.” (*Id.*, 52:64-65.)

The '551 Patent also recognizes that different “objects” may be in the field of view in a variety of lighting situations, and that different light output may be appropriate to accommodate these different objects. (*Id.*, 44:36-45:44.) In the

context of headlamps, it can, for example, determine types of objects, *e.g.*, without limitation, whether something is a vehicle or a sign, and respond differently to each object, such as reducing illumination of the vehicle and increasing illumination of the sign. These accommodations can be made at the same time because of the discrete nature of the directional light sources – “use the controller and properly aimed SLS to follow and illuminate distant overhead and roadside signs for a longer time, yet not blind oncoming traffic due to the narrow beam.” (*Id.*, 53:1-4.) This is a headlamp embodiment employing, among other things, the described notion of “task lighting” – contemplation of varied illumination needs within an illuminated scene.

The dependent claims add additional unique limitations, *e.g.*, Predictive Curve Limitations: a controller enabled to “*accommodate the upcoming road curvature by adaptation of a light pattern*” (claims 26-29, 34-37, 42-45, 50-53); and Non-Contiguous Limitations: “*select[ing] a cluster of the LEDs that emit light toward at least a portion of the other vehicle*” where “*the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs*.” (Claims 25/33/41/49).

Thus, the '551 Patent provides a comprehensive solution for the control and use of light and extends the application to headlamps that can accommodate other traffic without glaring, predictively illuminate road curvatures, and differentially

illuminate objects in a scene based on object recognition. All of this lends itself to the complete headlamp solution contemplated and described in the '551 Patent— a solution where “[a]t any instant in time the intensity, spectrum and beam pattern of the headlamp may be varied as a function of the drivers [sic] intent, lay of the road and environmental factors.” (Ex.1001, 51:49-52.) The marrying of the '551 techniques with the headlamp embodiments results in a headlamp with highly controllable emission elements that, “[w]hen combined with devices capable of detection changes in the surrounding environment the flexible DLF is capable of changing the illumination so as to provide the optimal lighting solution in real-time.” (*Id.*, 57:33-37.)

III. Level of Ordinary Skill

Patent Owner does not dispute Petitioner’s proposed level of ordinary skill. (See Pet. at 7.)

IV. Claim Construction

No claim construction is necessary because Patent Owner’s arguments do not hinge on the outcome of an actual controversy about claim interpretation. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed to the extent necessary to resolve the controversy”).

V. Claims 32, 33, 41 and 48-49: The Complete Omission of Elements Constitutes a Fatal Failure of Proof Under 35 U.S.C. § 312(a)(3) and 37 C.F.R. §§ 42.22(a)(2)

For its unpatentability proofs, the Petition uses Claim Comparison Tables in Appendix A to combine the independent claims and present a universal set of arguments for “similar” elements: “[t]he only differences between these claims are the stored instructions — and even the instructions recite similar or patentably indistinct elements.” (Pet. at 21.) The Petition is thus replete with references to arguments for “similar” claims. (Pet. at 22-33, 39, 51-53, 58-66, 71-72, 81-83.) For dependent claims 33, 41 and 49 and independent claims 32 and 48, this approach leads to a complete failure to address certain claim limitations.

For claim 33, save one new argument, the Petition refers back to arguments made in reference to claim 25: “The remaining elements of claim 33 are patentably indistinct from the elements of claim 25, and are disclosed or rendered obvious by Karlsson for the same reasons.” (Pet. at 42-43; 74-75.) In so doing, the Petition however omits any mention of the *wherein the data includes image data* language of claim 33 — which is not part of claim 25 — and fails to provide any explanation for why that language is immaterial. (Pet. at 69-71, 74-75; Ex.2006, ¶100.) Claims 41 and 49 include the same claim language and suffer from the same defect. Though both claims include the *wherein the data includes image data* language, the Petition omits any analysis for that language, relying on incomplete referential

arguments to claims 25, 30 and 33; no explanation is provided for why that language is immaterial. (Pet. at 45, 46-47; 77, 78-79; Ex.2006, ¶¶45, 77; 46-47;78-79.)

And, while Appendix A compares claims 32 and 48 with representative claim 24, for both claims, limitations are either reproduced incorrectly in Appendix A or simply omitted from the patentability analysis. Once again, the Petition fails to address the language differences or provide any explanation for why they do not matter.

Independent claim 32 requires “*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 target.*” (Ex.1002, 993.) As illustrated in the following table, Petitioner’s reproduction of claim 32 in the Appendix is missing this claim language:

Claim 32 (Ex.1002, 993-994)	Petitioner’s Incorrect Reproduction of Claim 32 (Pet. at 116-117)
32. An illuminating device having automatic control of light provided to an illuminated area comprising:	32. An illuminating device having automatic control of light provided to an illuminated area comprising:
* * *	* * *

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 target , at least one of said cameras in communication with power, and in communication with at least one of the one or more processors;	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
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The Petition fails to include any argument as to how the combinations satisfy the actual language of claim 32 or why the language difference is immaterial. (Pet. at 28-31; 62-64; Ex.2006, ¶¶98-99.)

Finally, claim 48 requires enabling the controller to “*illuminate a portion of at least one object . . . by selecting a first cluster of the LEDs to emit first light directed towards a first area . . . the first light determined based at least in part on classifying the object based at least in part on the data.*” (Ex.1002, 0995.)

Petitioner identifies this limitation as claim [48.9a] at page 128 of the Petition. However, Petitioner’s analysis of claim 48 ends with claim limitation [48.8]. The

Petition thus fails to include any argument as to how the combinations satisfy claim limitation [48.9a] or why the language difference between representative claim 24 and claim 48 is immaterial. (Pet. at 45-46; 78; Ex.2006, ¶102.)

When a Petition insufficiently pleads unpatentability and fails to meet the particularity requirement of 35 U.S.C. § 312, the failure is fatal. Under an almost identical set of facts — when Microsoft’s Petition “did not grapple with the claim 29 language” but instead relied on referential arguments to claim 1, the Federal Circuit found the pleadings to be irreparably deficient:

The Board did not abuse its discretion in concluding that Microsoft's complete failure to address the language differences and explain why they do not matter [and thus how the claim limitations were met] was a failure to meet the particularity requirements for what must be in the petition and cannot be left to be filled in on reply.

Microsoft Corp. v. IPA Techs. Inc., No. 2021-1412, 2022 WL , at *6 (Fed. Cir. Apr. 1, 2022) (*citing* 35 U.S.C. § 312 (a)(3)), 37 C.F.R. §§ 42.22(a)(2).).

If a limitation is not properly addressed in the Petition, the PTAB and the Federal Circuit have repeatedly denied Petitioner the ability to proffer new arguments on reply. *See, MModal LLC v. Nuance Commc'ns, Inc.*, 846 F. App'x 900, 906 (Fed. Cir. 2021) and *Verizon Bus. Network Servs. Inc. v. Huawei Techs. Co. Ltd.*, No. IPR2020-01080, 2022 WL 129091 (P.T.A.B. Jan. 12, 2022).

Petitioner’s failure to complete its proofs for claims 32, 33, 41 and 48-49

constitutes irreparable error under 35 U.S.C. § 312 (a)(3) and 37 C.F.R. §§ 42.22(a)(2).

VI. The Challenged Claims are Patentable

A. Ground 1 – Beam and Satonaka

1. Independent Claims:

Petitioner must show where each claim limitation is found in the prior art. *See e.g., Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1361 (Fed. Cir. 2012). Failure to do so defeats a claim of obviousness. (*Id.*) To establish a prima facie obviousness rejection, all of the claimed features must be taught or suggested by the prior art. *See In re Royka*, 490 F.2d 981, (CCPA 1974).

Obviousness is a question of law based on the following underlying factual inquiries:

- (A) Determining the scope and content of the prior art;
- (B) Ascertaining the differences between the claimed invention and the prior art;
- (C) Resolving the level of ordinary skill in the pertinent art, and
- (D) Secondary Considerations of Non-Obviousness

Graham v. John Deere Co., 383 U.S.1, 17 (1966).

a. Claim 24 – The Beam-Satonaka Combination does not teach a controller enabled to “*change emission of the selected cluster of LEDs relative to emission of other LEDs not included in the cluster*”

Claim 24 requires a controller enabled to “*change emission of the selected cluster of LEDs relative to emission of other LEDs not included in the cluster ...*”

The plain meaning of emission is “something sent forth by emitting” (www.merriam-webster.com/dictionary/emission) or “the production and discharge of something, especially gas or radiation” (www.google.com, Oxford Languages). Thus, claim 24 requires an emission (**something** sent forth) from both the selected cluster of LEDs and the other actively emitting LEDs not in the selected cluster (a relativistic comparison). This plain meaning is consistent with the ‘551 Patent specification which teaches three different operating states for the light emitting elements: 1) “operating at full power”; 2) “operating at a fraction of” full power at a reduced intensity and 3) “not operating”. (Ex.1001, 19:26-33; Ex.2006, ¶104.) Per the ‘551 Patent, shutting off a light element is distinct from reducing intensity of the light element. (Ex.1001, 65:31-35.)

Petitioner incorrectly relies on Beam’s disclosure that “the area of the beam that would dazzle the driver will be darkened” for teaching ‘*chang[ing] emission,*’ as claimed. (Pet. at 35). Beam does not teach “chang[ing] emission,” it teaches zeroing or blanking emission. (Ex.2006, ¶105.) Beam generates a darkened area of

reduced illumination by blanking or inactivating associated LEDs so they are not “active emitters,” it does not reduce the intensity of LEDs to *change emission*. Beam teaches a binary system – “dimmed” emitters that are blanked to become inactive and active emitters that output “maximum intensity” emission “at all times”: the controller 108 “uses the data to determine the size and position of the light emitters to be dimmed. The output of the active emitters is projected through the optical system.” (Ex.1005, 5:13-16.) This understanding further comports with Beam’s teaching about attenuating (blanking) light (*Id.*, 4:36-57), an area of a beam being “darkened” (*Id.*, 2:60-62), and the description of both “dimming” an area and describing that area as a “blanked” area. (*Id.*, 6:23-27; Ex.2006, ¶104.)

While Petitioner relies on Beam’s disclosure: “illumination in the shaded areas being reduced significantly to protect the vision of the oncoming drivers” (Ex.1005, 4:23-24), the reduced illumination results from blanking a cluster of LEDs such that the cluster is inactive and not emitting light; any residual illumination in the shaded areas is the result of spillover light. Because Beam teaches a binary system, where the changed LEDs are zeroed or blanked, the system no longer produces emission, Beam fails to teach “*chang[ing] emission of the selected cluster of LEDs relative to emission of other LEDs not included in the cluster*” as required by Claim 24. (Ex.2006, ¶105.)

b. Claim 32 – Petitioner fails to address the sensors “*positioned to capture an image of at least one target*” limitation

As detailed in Section V *supra*, because the Petition omits any analysis as to how the proffered combination teaches the language “*positioned to capture an image of at least one target*” in claim 32 or why the language is immaterial, the claim 32 proof is fatally deficient. (Ex.2006, ¶98-99.)

c. Claim 32 – The Beam-Satonaka Combination does not teach a controller enabled to “*create a beam of diminished illumination*” or the ability to “*follow. . .the at least one target with the diminished illumination.*”

Independent claim 32 requires a controller enabled to “*create a beam of diminished illumination illuminating at least a portion of the at least one target with non-glaring illumination, created within a broader field of illumination having different intensity than the beam.*” Petitioner relies on Beam’s disclosure at 2:56-3:3, 4:21-25, 4:57-5:2 for satisfying this limitation. (Pet. at 40.) Petitioner describes Beam’s disclosure as teaching “reducing the intensity of the area of the beam.” (*Id.*) As explained below, Beam teaches blanked or no illumination, not “*diminished illumination*” that is still “*illuminating*” something. (Ex.2006, ¶106.)

Beam discloses that “[b]y controlling an area determined by analyzing the position of the lights sensed ahead, the area of the beam that would dazzle the driver will be darkened.” (Ex.1005, 2:56-3:3.) Beam discloses darkening areas by

blanking microbeams: Controller 108 selectively commands reduction of the energy of the microbeams falling on a particular object or objects by “command[ing] spatial light modulator 203 in illuminator 109 to either divert the selected microbeams or to attenuate them.” (Ex.1005, 4:53-57, Figs. 1-2.) Further, Beam discloses that “[a]s the positions of both vehicles move, the blanked area tracks the location of the oncoming vehicle, dynamically varying in position and in size.” (*Id.*, 6:24-27.) Beam discloses darkening areas by controlling a spatial light modulator 203 or LEDs to “blank” microbeams emitted by a light source. (*Id.*, 4:36-40; Ex.2006, ¶107.)

The plain meaning of illuminate is “to supply or brighten with light” or “to make luminous or shining.” (www.merriam-webster.com/dictionary/illuminate.) The claimed *beam of diminished illumination* is “created” by “*one or more changes to characteristics of first light of a cluster of the LEDs providing the first light.*” Because Beam discloses darkening/blanking the cluster of the LEDs providing the first light, Beam does not teach a controller enabled to “*create a beam of diminished illumination illuminating*” as claimed. (Ex.2006, ¶108.)

Additionally, Beam has no ability to associate detected light with a particular target. Beam simply detects illumination sources within the field-of-view and blanks all associated microbeams around the illumination sources. Each subsequent detection of light is performed anew, with no relationship to a prior

detection and thus the Beam-Satonaka combination fails to teach a controller enabled to “*follow the at least one target with the diminished illumination*” as the “*target changes location,*” per claim 32. (Ex.2006, ¶108.)

Because the Beam-Satonaka combination fails to teach all claimed features, claim 32 is non-obvious over the combination. *See In re Royka*, 490 F.2d at 981.

d. Claim 40 – The Beam-Satonaka Combination does not teach a controller enabled to “*diminish glaring illumination . . . by a first change . . . [and] a second change . . . [that] decrease intensity of first emission from the first cluster and second emission from the second cluster relative to a third emission.*”

Independent claim 40 is directed to decreasing the intensity of emission from first and second clusters of LEDs to a lower, non-zero intensity. For example, claim 40 requires a controller that can:

diminish glaring illumination of the first other vehicle by a first change to one or more characteristics of first light of at least the first cluster;

* * *

diminish glaring illumination of the second other vehicle by a second change to one or more characteristics of second light of at least the second, different cluster,

wherein the first and second changes decrease intensity of first emission from the first cluster and second emission from the second

cluster relative to a third emission, from the at least one headlamp, illuminating an area between the first and second portion.

The claimed “*decrease[d] intensity of first emission... and second emission . . . relative to a third emission*” indicates a relativistic level of emission from the first, second and third cluster. Emission is a discharge of light, and is not achieved by a darkened light, *i.e.*, non-emission. (Ex.2006, ¶¶109-110.)

Similar to claim 32, Petitioner relies on Beam’s disclosure with reference to the spatial light modulator 203 at 2:56-3:3, 4:57-59 for satisfying this limitation. (Pet. at 43 *citing* claim 24.10 analysis.) Petitioner describes Beam’s disclosure as teaching darkening or reduced emission. (Ex.2006, ¶110.)

The plain meaning of emission requires “an act or instance of emitting.” ([www.merriam-webster.com/dictionary/emission.](http://www.merriam-webster.com/dictionary/emission)) As detailed in VI(A)(1)(c) *supra*, Beam’s disclosure of blanking, or providing no light, does not teach a controller enabled to “*diminish glaring illumination . . . by a first change . . . [and] a second change . . . [that] decrease intensity of first emission from the first cluster and second emission from the second cluster relative to a third emission*” as claimed. (Ex.2006, ¶111.) Accordingly, the Beam-Satonaka combination fails to teach all claimed features of claim 40.

e. Claim 48 – The Beam-Satonaka Combination does not teach “*classifying the object*” limitation

As detailed in Section V *supra*, because the Petition omits any analysis as to how the proffered combination teaches the “*classifying the object*” limitation” in claim 48 or why the limitation is immaterial, the claim 48 proof is fatally deficient. (Ex.2006, ¶102.)

Additionally, the Beam-Satonaka combination fails to teach the “*classifying the object*” limitation as both references teach a coarser level of control limited to light source detection, without any ability to distinguish between types of light sources—a necessary predicate for object classification. The proffered combination is thus incapable of satisfying the “*classifying the object*” limitation of claim 48. (Ex.2006, ¶112-113.)

2. Dependent Claims:

a. Claims 25/33/41/49 – The Beam-Satonaka Combination does not teach “*select[ing] a cluster of the LEDs that emit light toward at least a portion of the other vehicle*” where “*the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs*.”

Claim 25 depends from claim 24 and is representative of claims 33, 41, and 49. Claim 24 requires a controller that is enabled to “*select a cluster of the LEDs that emit light toward at least a portion of the other vehicle*.” (“*vehicle*,” singular.) Claim 25 further requires that the “*the cluster includes a plurality of the LEDs and*

the cluster includes non-contiguous LEDs.” (Ex.2006, ¶114.)

Petitioner relies on Beam’s disclosure regarding glare reduction for **multiple** vehicles at 2:62-63 and Figure 1 for satisfying this limitation. For example, Petitioner states that “when there are two or more separated vehicle targets, as would be the case in most situations with **multiple** other vehicles present, Beam’s system would select a cluster of LEDs that are non-contiguous to cover all of the vehicle targets.” (Pet. at 36-37.) However, Beam’s teaching regarding multiple vehicles is not relevant to the claimed “*cluster*,” which is also claimed as the cluster being used to control light directed to a **singular** “*other vehicle*.” Thus, Petitioner’s analysis is directed at two clusters which are non-contiguous with each other and which both deal with different vehicles, but that is not “the cluster of **LEDs that emit light toward... the other vehicle**,” where **that** “*cluster includes non-contiguous LEDs*” as claimed. (Ex.2006, ¶115.)

The ’551 Patent discloses that by selecting a cluster of non-contiguous LEDs for illuminating a single “*other vehicle*,” the system may adjust the characteristics of the LEDs such that the emitted light is less offending when another vehicle is present. For example, the ’551 Patent discloses, with reference to Figure 15, that the “concept cluster shown by the dashed lines, is used to describe a control function and is not necessarily related to contiguous placement.” (Ex.1001, 53:28-30.) The cluster 276 includes LEDs “of different wavelengths, operating in unison

at different power levels [to] yield a variable light ‘color’.” (*Id.*, 53:37-39; Ex.2006, ¶116.)

The cluster may include a first LED 275 having a “blue, 470 nanometer” wavelength, and a second LED 277 having “an amber 590, nanometer wavelength” that are “coincidentally aimed” to collectively “yield a ‘white’ light similar to the yellow tint of sunrise at the correct power intensity setting for each lamp.” (*Id.*, 53:39-43.) As illustrated in Figure 15, LEDs 275 and 277 are spaced apart from each other and non-contiguous. Further, “when following another vehicle, assuming, as drivers have reported, that they find yellow incandescent colored headlamps less offending than the HID blue-white color, the external controller 279 which receives traffic data from sensors 280 would shift wavelength specific radiant power contributions of SLSs such that the resultant on the CIE chromacity diagram would be yellowish.” (*Id.*, 53:46-52.) However, when there is “no car immediately ahead or oncoming traffic, then assuming as drivers reported they see further with bluish light, then the energy of the 490 nanometer LED is increased, and the resultant color will shift to bluish white, allowing the driver to better ascertain road conditions further up ahead.” (*Id.*, 53:52-57; Ex.2006, ¶117.)

The Beam-Satonaka combination does not teach “*select[ing] a cluster of the LEDs that emit light toward at least a portion of the other vehicle*” where “*the cluster includes a plurality of the LEDs and the cluster includes non-contiguous*

LEDs” as claimed (Ex.2006, ¶118), and claims 25/33/41/49 are non-obvious over the combination. *See In re Royka*, 490 F.2d at 981.

Moreover, as detailed in Section V *supra*, because the Petition omits any analysis as to how the proffered combination teaches the “*wherein the data includes image data*” language in claims 33, 41 and 49 or why the language is immaterial, the claim 33, 41 and 49 proofs are fatally deficient. (Ex.2006, ¶¶100, 101, 103.)

b. Claims: 30/38/46/54 – The Beam-Satonaka-Kobayashi Combination Does Not Teach “*Optical Control Elements to control light emitted from one or more of the LEDs*”

Claim 30 is representative of claims 38, 46, and 54 and requires “*one or more optical control elements to control light emitted from one or more of the LEDs.*” Petitioner states that “Beam discloses these claims with at least beamsplitter 201 and spatial light modulator 203.” (Pet. at 39.) However, the Beam-Satonaka-Kobayashi Combination does not include Beam’s spatial light modulator 203 because “the lamp 202 and spatial light modulator 203 are replaced by an array of light sources 401.” (Pet. at 24 quoting Ex.1005, 5:3-6; Ex.2006, ¶119.)

Beam discloses that the beamsplitter 201 reflects received external light toward a light sensor: “Rays from the scene come in through optical system 106. A

portion of these rays is reflected by a beamsplitter 201 to sensor 107 which is illustrated as a camera in this embodiment.” (Ex.1005, 4:27-30.) Petitioner’s expert confirmed that the beamsplitter does not control the light emitted from the LEDs because “the beam splitter typically are processed with specific reflective coating so the emitting lights will be minimally affected . . . It's like one-way mirror. . . [in an] interrogation room and other people see you, you don't see them.” (Ex.2018 at 21:17-19; Ex.2006, ¶120.)

Petitioner further states that “reflectors and lenses can control the light from at least one of the microbeams (*e.g.*, emanating from its LEDs).” (Pet. at 39.) However, Beam’s disclosure of reflectors and lenses is in its background disclosure of prior art “systems which attempt to control the intensity profile of the beam by using a reflector or lens shaped to control the output beam in some predetermined way.” (Ex.1005, 1:63-65.) Petitioner does not explain how this general reference to prior art reflectors or lens relates to Beam’s system. (Ex.2006, ¶121.)

The Beam-Satonaka-Kobayashi Combination does not teach “*one or more optical control elements to control light emitted from one or more of the LEDs*” as claimed, and claims 30, 38, 46, 54 are not obvious over the combination. *See In re Royka*, 490 F.2d at 981.

c. Claims: 31/39/47/55 – The Beam-Satonaka-Kobayashi Combination Does Not Teach “*wherein the optical control elements include at least one of one or more reflectors, refractors or lenses.*”

Claim 31 is representative of claims 39/47/55 and requires “*wherein the optical control elements include at least one of one or more reflectors, refractors or lenses.*” Petitioner relies on Beam for satisfying this limitation and cites its analysis in Section VI.E for claims 30/38/46/54. (Pet. at 39.) However, Beam’s only disclosure of reflectors and lenses is with reference to the prior art (Ex.1005, 1:63-65) and Petitioner does not explain how this general reference to prior art reflectors or lenses relate to Beam’s system. The Beam-Satonaka-Kobayashi Combination does not teach all claimed features, and claims 31/39/47/55 are non-obvious over the combination. (Ex.2006, ¶125.)

3. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine Beam and Satonaka

a. Petitioner Fails to Explain Why, Absent Hindsight, a POSA Would Have Combined Beam and Satonaka

Under *KSR*, “if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *KSR*, 550 U.S. at 417. This is referred to as

the “known-technique” rationale and the Federal Circuit has clarified that “if there’s a known technique to address a known problem using ‘prior art elements according to their established functions,’ then there is a motivation to combine.” *Intel Corp. v. 61 F.4th 1373, 1381* (Fed. Cir. 2023) (quoting *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 799-800 (Fed. Cir. 2021)). In *Intel v. PACT XPP Schwiez AG*, when the prior art addressed the same, focused problem of cache coherency, the Federal Circuit expanded this “known technique” rationale, replacing the “improvement” requirement with a “suitable option” requirement, *i.e.*, “[i]t’s not necessary to show that a combination is the *best* option, only that it be a **suitable option**.” *PACT XPP Schwiez AG*, 61 F.4th at 1381. Here, because the applied prior art is directed to different types of systems that function in different ways to address different problems, the *Intel* case is inapposite. Moreover, given the state of the art, suitable versions of the proposed combinations would be beyond the skill of a POSA.

As LED headlamps were under development in the early 2000’s, a myriad of complex, interrelated technical issues were being solved at the time; thus, there were no “known techniques” to address known problems in the LED headlamp art using prior art elements “according to their established function.” *Qualcomm*, 21 F.4th at 799–800. LED headlamps are significantly different devices than conventional headlamps, and therefore in the early 2000’s LED headlamp design

posed a complex set of challenges and tradeoffs involving optics, heat management, white LED lumen output and packaging issues, all of which affected cost. (Ex.2006, ¶¶25-38; Ex.2007 at 50:2-9; Ex.2010 at 234, 237-238, 240, 242; Ex.2011 at 18.5, 18.6, 40.43; Ex.2012 at 3, 4, 6-7, 8, 10, 11; Ex.2013 at 10; Ex.2015 at 7; Ex.2016 at 66.) In the early 2000s, the efficiency of available white LEDs was a fraction of a conventional bulb, creating significant technical challenges for their use in headlight applications. For example, in 2004 and beyond, as Petitioner's expert points out, multiple LEDs (*e.g.*, more than 30) were required to generate lumen output similar to a typical tungsten filament halogen bulb because "currently available white LED's lumen output [was] around 30 lm (maximum), which [was] about 3% of the typical tungsten halogen bulb's light flux output (1000 lm for 9006 bulb)." (Ex.2012 at 3; Ex.2006, ¶31.)

Petitioner however glosses over the state of the art and further fails to explain how a POSA would have combined Beam and Satonaka, when the two systems adapt light in significantly different ways and generate a combination that would render Beam unsuitable for the purpose of providing anti-blinding light. By ignoring these issues, the Petition illustrates clear hindsight bias. (Ex.2006, ¶127.) Petitioner's hindsight theory undermines the Petition's alleged motivation for combining the applied references — to improve driving safety. (Pet. at 20.) Except for identifying elements of the Challenged Claims to engage in hindsight

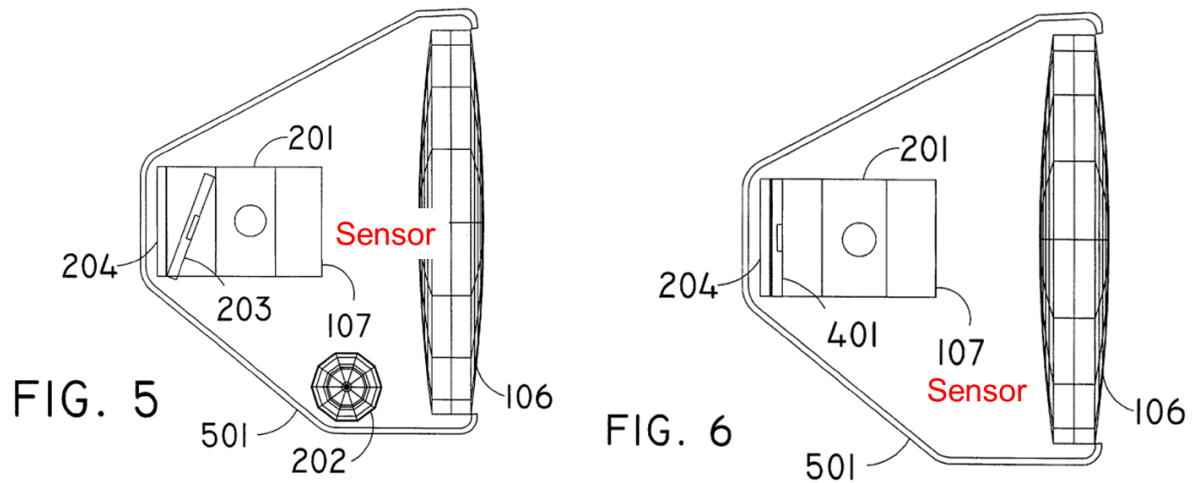
reconstruction, Petitioner fails to explain why it would have been obvious to combine Beam and Satonaka when the combination results in an unsuitable form of anti-blinding illumination. (Ex.2006, ¶128.) The only *actual* motivation to add Satonaka's algorithm was to meet the claim limitations. *TRW Automotive U.S. LLC v. Magna Electronics, Inc.*, IPR2015-00972, Paper 9, slip op. at 15, 17 (PTAB September 16, 2015). *See also Stryker Corp. v. Karl Storz Endoscopy America, Inc.*, IPR2015-00764, Paper 13, slip op. at 13 (PTAB September 2, 2015).

b. Petitioner Does Not Explain How a POSA Would Have Combined Satonaka's Remote Sensor Based Image Processing Algorithm with Beam's Co-located Sensor.

Petitioner must explain how and why a POSA would have modified or combined the prior art. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2006) (requiring articulated reasoning with rationale underpinning as to how or why a person of ordinary skill in the art would have combined or modified the teachings of the prior art); *Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017) (holding obviousness determination to be improper where the record lacked a "clear, evidence-supported account" of "how the combination" would work). *Adidas AG v. Nike, Inc.*, IPR2016-00922, Paper 21, 36 (October 19, 2017) (holding that challenged claims are patentable when the "Petitioner fails to explain why and how a person of ordinary skill in the art would combine" two references.)

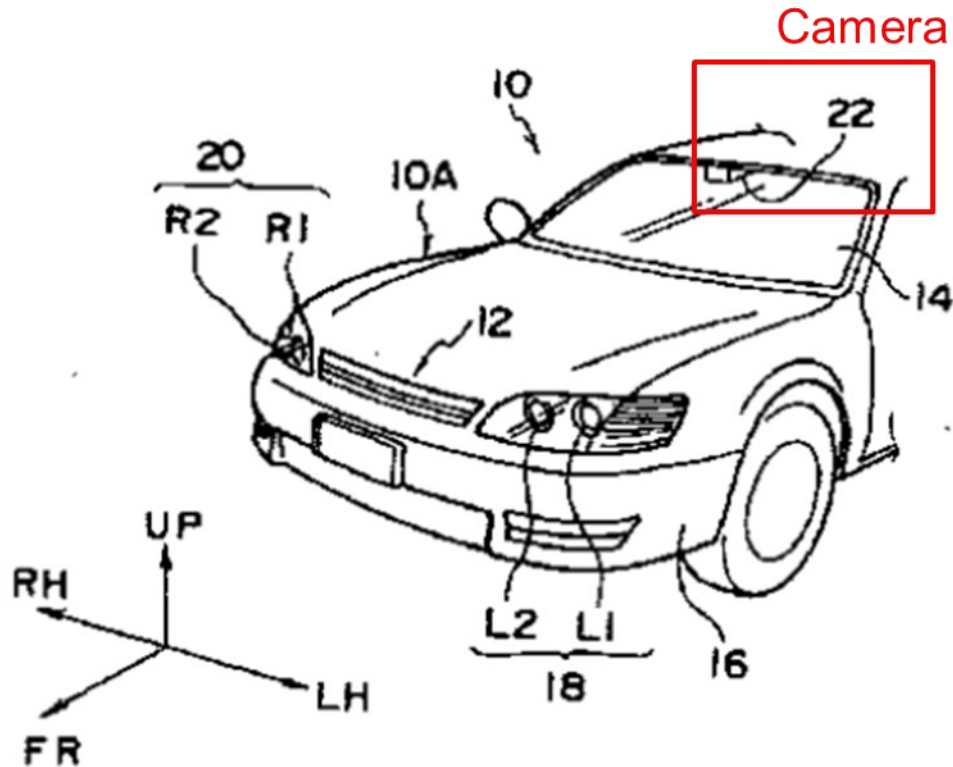
Petitioner states that “it would have been obvious to a POSA to modify Beam’s system to map each pixel with coordinates, as taught by Satonaka, to provide the algorithmic detail implicit in Beam.” (Pet. at 29.) “Thus, Beam’s camera would detect the claimed ‘coordinate-specific information,’ as modified by Satonaka.” (*Id.*) Petitioner fails to explain how an image from Beam’s co-located and boresighted camera would be used by Satonaka’s vehicle recognition zone image processing algorithm that uses a reference frame based on a remote camera located at the top center of the windshield and that expressly defines subsequent processing from the visual perspective of its mounting location. (Ex.2006, ¶130.)

Beam discloses, with reference to Figures 5 and 6 below, mounting the imaging sensor 107 within the headlight assembly. Beam explains that mounting the sensor within the headlamp assembly ensures accuracy “[t]he sensor will be co-located with the light source so that errors in alignment are automatically compensated.” (Ex.1005, 2:63-65; Ex.2006, ¶131.)



(Ex.1005, FIGs. 5, 6, Annotated)

Satonaka discloses headlamps 18 and 20 that are provided on the top part of the front bumper 16, and a camera 22 that is mounted “[a]t the top of this windshield glass 14 and inside of vehicle 10 (at the driver’s visual field position, or in other words, near the driver’s eyepoint).” (Ex.1014, [0017]; Ex.2006, ¶132.)



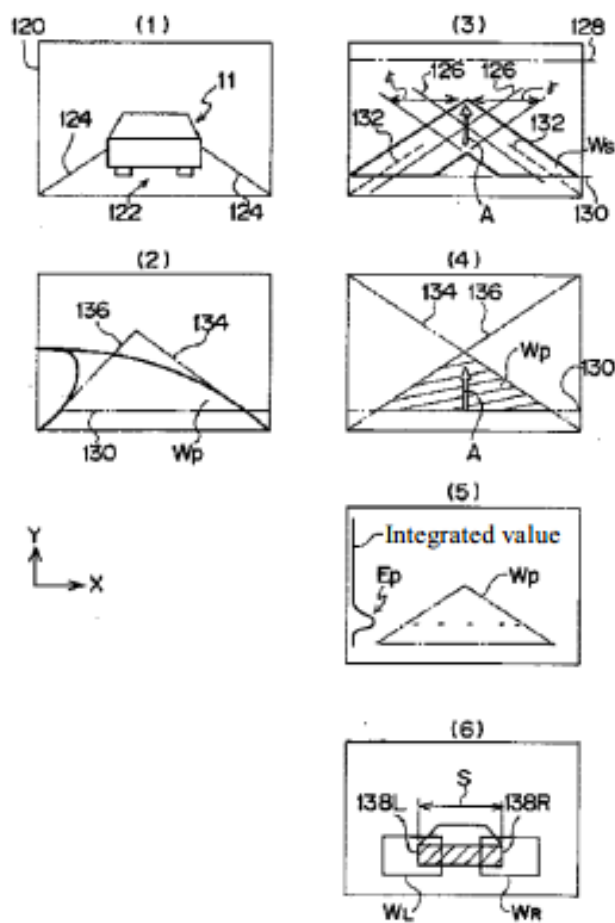
(Ex.1014, Fig. 1, Annotated)

Satonaka mounts a camera at the center of the windshield near the driver's eyeline. (14Ex.1014, [0016], Fig. 1.) From this perspective, the camera generally sees the road as the driver does, with preceding traffic centered between lane markers, and lane markers largely visible on either side of a vehicle. (*Id.*, Fig. 4, 12; Ex.2006, ¶133.)

Petitioner further states that "Satonaka provides details of how to implement the coordinate mapping of its pixels. . . This would have provided a POSA with an easily applicable example (from Satonaka) to be implemented on a structurally similar system (Beam)." (Pet. at 20.) However, the systems are not structurally

similar because the light sensors are located in different locations which significantly changes the coordinate mapping algorithm. (Ex.2006, ¶134.) For example, Satonaka discloses a strategy for processing the image captured at the driver's eyeline with reference to Figure 4. (Ex.1014, [0026].)

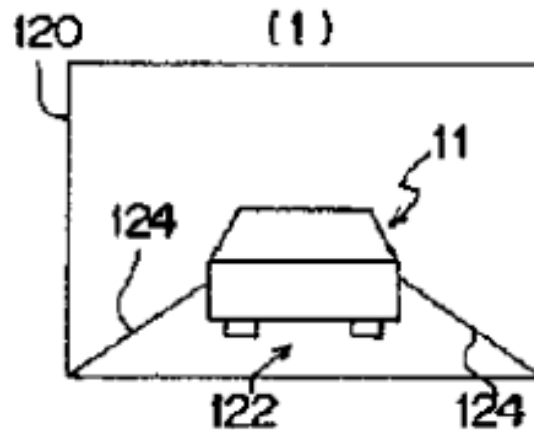
(FIGURE 4)



(Ex.1014, Fig. 4)

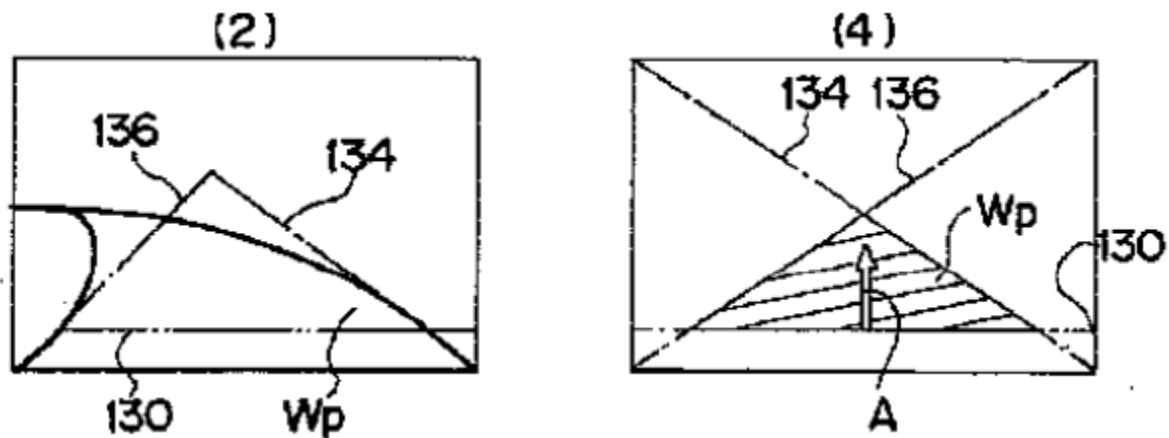
Satonaka discloses an image 120 “that was obtained by camera 22, [in which a] preceding vehicle 11 is positioned within white lines 124 on both sides of the

lane of road 122 on which vehicle 10 is traveling.” (Ex.1014, [0026].) As will be appreciated from Fig. 4(1), this image appears comparable to a driver’s perspective, a result of Satonaka’s intentional camera placement “near the driver’s eyepoint.” (Ex.1014, [0017]; Ex.2006, ¶135.)



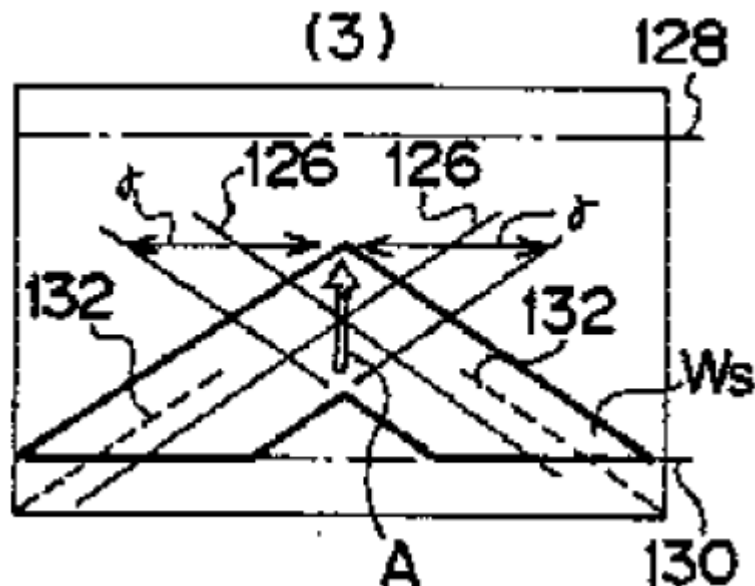
(Ex.1014, Fig. 4(1))

Next, Satonaka’s system “perform[s] white line candidate point extraction and colinear approximation processing” to winnow the image down to an area-of-consideration called the “vehicle recognition region W_P ,” which coincides with the lane of travel. (Ex.1014, [0027]; Ex.2006, ¶136.)



(Ex.1014, Figs. 4(2), 4(4))

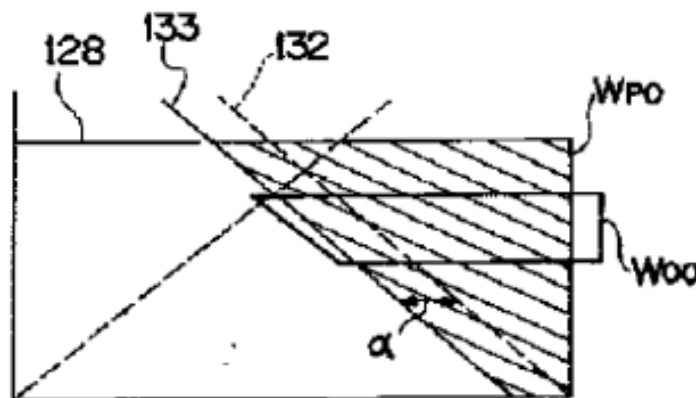
That is, from the camera perspective at the eyeline of the driver, where the preceding vehicle is visible between the also-visible lane lines, Satonaka derives a vehicle recognition region W_p that is bounded by the lane lines on either side, extended to intersection at an apex. (Ex.1014, Fig. 4(3); Ex.2006, ¶137.)



(Ex.1014, Fig. 4(3))

Satonaka then performs “detection processing” on illumination within W_P , which can include, at least, detection of light in some instances. (Ex.1014, [0030], [0031].) Then Satonaka treats the light in the bounded region as though it came from a vehicle — “If a continuous point ... is stably detected within the window regions, it will be adjudged that preceding vehicle 11 is present.” (Ex.1014, [0031].) Satonaka teaches **both** predicates, detected light and that the light be within the recognition region, in order to adjudge the presence of the vehicle. (Ex.2006, ¶138.)

Satonaka discusses further refinement of a second, oncoming vehicle recognition region W_{P0} , in order to refine the region to “region W_{00} that includes the region between the upper limit line and lower limit line [in Fig. 5] as determined in advance and in which there is high probability of the presence of oncoming vehicle 11A.” (Ex.1014, [0035]; Ex.2006, ¶139.)



(Ex.1014, Fig. 5)

Satonaka discloses processing an image 120, from the driver's viewpoint,

“that was obtained by camera 22, [in which a] preceding vehicle 11 is positioned within white lines 124 on both sides of the lane of road 122 on which vehicle 10 is traveling.” (Ex.1014, [0026].) If the viewpoint were shifted, for example, to a front left or right headlamp, a number of issues would occur. (Ex.2006, ¶¶140-141.)

First, as illustrated in the figures below, the perspective of the vehicle would shift horizontally and vertically downward due to the lower offset mounting location and it would be more difficult to perceive the lane markings from this position, reducing the accuracy of the algorithm. Further, for a left headlamp, the perspective of the lane markers would shift horizontally, the left-side marker would appear more vertical and the right-side marker would skew left. Similarly, for a right headlamp, the right-side marker would appear more vertical and the left-side marker would skew right. Petitioner never recognizes, let alone provides a solution for these issues. (Ex.2006, ¶142.)



Lower Left
Camera



Top Center
Camera



Lower Right
Camera

(Ex.2006, ¶142)

Further, Petitioner does not explain if the Beam-Satonaka combination uses a camera in the front left headlamp, the front right headlamp, or both. If the Beam-Satonaka combination uses a camera that is located in the front left headlamp, then the system would have the same limited functionality regarding detecting a preceding vehicle as a camera located in the front right headlamp, as illustrated in the preceding figures. If the combination uses both cameras, then Petitioner does not explain whether or how the information collected from both cameras is combined. Regardless, a camera located in either location has limited functionality regarding detecting a preceding vehicle. (Ex.2006, ¶143.)

Additionally, Satonaka does not include a mapping of coordinates to LEDs or lights in general. Nor does it even use its own coordinates directly to control lights. Importation of a new reference system of coordinates would require remapping the LEDs to the new coordinate system. (*Id.*) Although Petitioner never actually alleges that the coordinates are even actually used for control of anything, merely that they are stored, were a POSA to use them for control they would have to be correlated to lights in some manner. (*Id.*) This represents another fact Petitioner does not address, other than stating that one could “simply modify software instructions stored in the memory of Beam’s controller/processor (in view of Satonaka).” (Pet. at 20; Ex.2006, ¶144.)

Instead of recognizing and addressing these engineering issues with the

combination, Petitioner makes statements such as “this modification requires no physical changes,” and “Beam and Satonaka use the same basic architecture.” (Pet. at 20; Ex.2006, ¶145.)

Petitioner does not provide a clear, evidence-supported account of how the combination of Beam and Satonaka’s Software Implementation would work, *i.e.*, how an image from Beam’s co-located and boresighted camera would be used by Satonaka’s vehicle recognition zone image processing strategy—a processing strategy that is based on a remote camera being located at the top center of the windshield and viewing and processing the scene from that perspective. (Ex.2006, ¶¶130-145.) Therefore, the obviousness ground is improper. *See Personal Web Techs., LLC*, 848 F.3d at 994.

**c. Petitioner’s Proposed Combination Would
Render Beam Inoperable for Its Intended
Purpose of Providing Anti-Blinding Headlights**

If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 90 (Fed. Cir. 1984).

Satonaka describes a simplistic approach of detecting another vehicle with limited functionality. For example, as illustrated below, when the camera is located in the top-center camera location, the taillights of a preceding vehicle located

ahead are present in the vehicle recognition window, which is represented by a red triangle below. However, when the camera is located in the lower-left or lower-right headlamp position, the distorted shape of the vehicle recognition window prevents detection of the same preceding vehicle because both taillights are no longer located within the corresponding vehicle recognition window. (Ex.2006, ¶147.)



(Ex.2006, ¶147.)

The proposed combination would have had very limited appeal to a POSA because it would not work well in real-world conditions thereby destroying the anti-blinding utility of Beam's Anti-Blinding Headlight (AABH). (Ex.2006, ¶148.) Accordingly, a POSA would not have been motivated to make the proposed modification. *In re Gordon*, 733 F.2d at 902.

B. Ground 2 – Beam, Satonaka, and Kobayashi

- 1. Claims: 27/35/43/51 – The Beam-Satonaka-Kobayashi Combination Does Not Teach “*non-contiguous LEDs.*”**

Claims 27, 35, 43, and 51 each require “*non-contiguous LEDs.*” Petitioner references its analysis of claim 25 for satisfying this limitation, and states that “[i]n Beam, a POSA would have been motivated to adapt the LED light pattern to illuminate the road curve by altering, for example, the intensity or distribution of the LEDs so that the curved roadway is properly lit.” (Pet. at 52.) As explained above for claim 25, Petitioner relies on Beam’s disclosure regarding glare reduction for multiple vehicles, but this teaching is not relevant to the claimed “*cluster*” to control light directed to a singular “*other vehicle.*” Therefore the Beam-Satonaka-Kobayashi Combination does not teach the “*non-contiguous LEDs*” limitations of claims 27/35/43/51 for at least the same reasons given for claim 25. (Section VI.A.2.a.; Ex.2006, ¶150.)

2. Claims: 26-29, 34-37, 42-45, 50-53 – The Beam-Satonaka-Kobayashi Combination Does Not Teach a controller enabled to “*accommodate the upcoming road curvature by adaptation of a light pattern.*”

Claim 26 depends from claim 24 and is representative of claims 27-29, 34-37, 42-45, 50-53. Claim 26 requires that the controller is further enabled to “*accommodate the upcoming road curvature by adaptation of a light pattern of at least one of the at least one headlamps.*” Petitioner relies on Kobayashi’s disclosure that “the vehicle advancing direction is predicted” and “irradiation control of the [headlight] lamp is conducted in accordance with the course” for

satisfying this limitation. (Pet. at 49 quoting Ex.1008 at 17:51-61 and 18:1-8.) Petitioner states that “[b]y including an additional data source for Beam’s controller 108, Kobayashi’s map data, a POSA would have realized the safety enhancement to Beam’s AABH from increasing illumination based on the road curvature.” (Pet. at 52; Ex.2006, ¶152.)

Beam discloses a headlamp that provides “the equivalent of high beam headlights or brighter on at all times, greatly enhancing the ability to see at night” except for areas where incoming light is detected. (Ex.1005, 6:53-56.) Beam further discloses that “[t]he resulting beam is at full intensity except in areas that would dazzle a driver ahead.” (Ex.1005, 4:57-59.) Petitioner admitted in the Petition that this disclosure teaches providing a “Full Intensity” beam outside of the anti-glare region. “Thus, the first light in Beam (the reduced-intensity light) is formed in an illuminated area of different intensity (the full-intensity light).” (Pet. at 40-41.) Similar to the European approach to adaptive driving beam (ADB) technology, Beam expressly requires maximal use of the high-beam at all times except where blanked to avoid blinding oncoming traffic when needed. (Ex.2006, ¶153; Ex.2007, 69, 71.)

Since Beam discloses providing maximum intensity light everywhere it could be needed, there is nothing to “adapt” or modify toward the upcoming road curvature, rendering Kobayashi’s map data useless. (Ex.2006, ¶154.) Accordingly,

the combination of Beam and Kobayashi does not teach a controller enabled to “*accommodate the upcoming road curvature by adaptation of a light pattern of at least one of the at least one headlamps*” as claimed. The Beam-Satonaka-Kobayashi Combination does not teach all claimed features, and claims 26-29, 34-37, 42-45, 50-53 are non-obvious over the combination. *See In re Royka*, 490 F.2d at 985.

C. Ground 3 – Karlsson and Nakamura

1. Independent Claims:

a. Claims: 24/32/40/48 - The Karlsson-Nakamura Combination Does Not Teach “*one or more sensors, including one or more cameras*.”

Independent claims 24, 32, 40, and 48 require “*one or more sensors, including one or more cameras*.” Petitioner relies on Karlsson’s disclosure at 12:19-24 for satisfying this limitation. (Pet. at 62.)

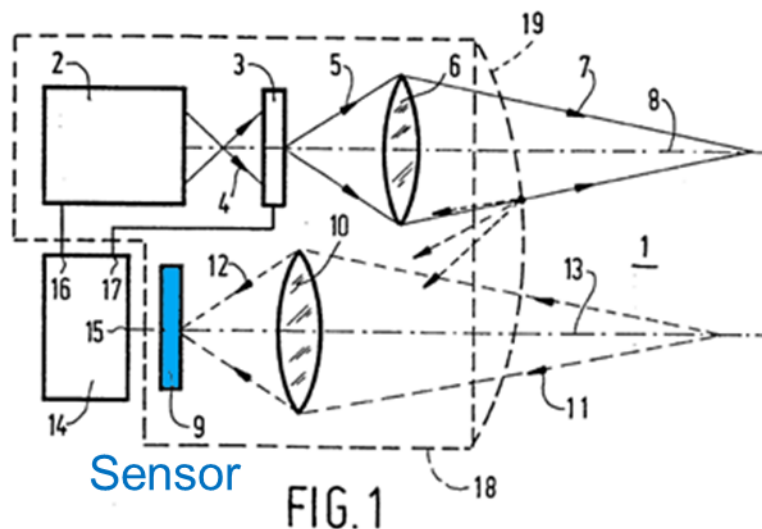
Karlsson discloses light-sensitive sensors 9, 23, that may be comprised of: a matrix of photo-diodes, like the spotlight sensors (S) described with reference to Figure 14, **or, alternatively**, a photo-sensitive plate as used in modern video cameras:

In the preferred embodiment of the invention, the 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.

They may for example be comprised of a **matrix** of photo diodes or
in the case of a light-sensitive sensor 23, a photo-sensitive plate as
used in modern video **cameras**.

(Ex.1010, 12:22-24; Ex.2006, ¶¶156-157.)

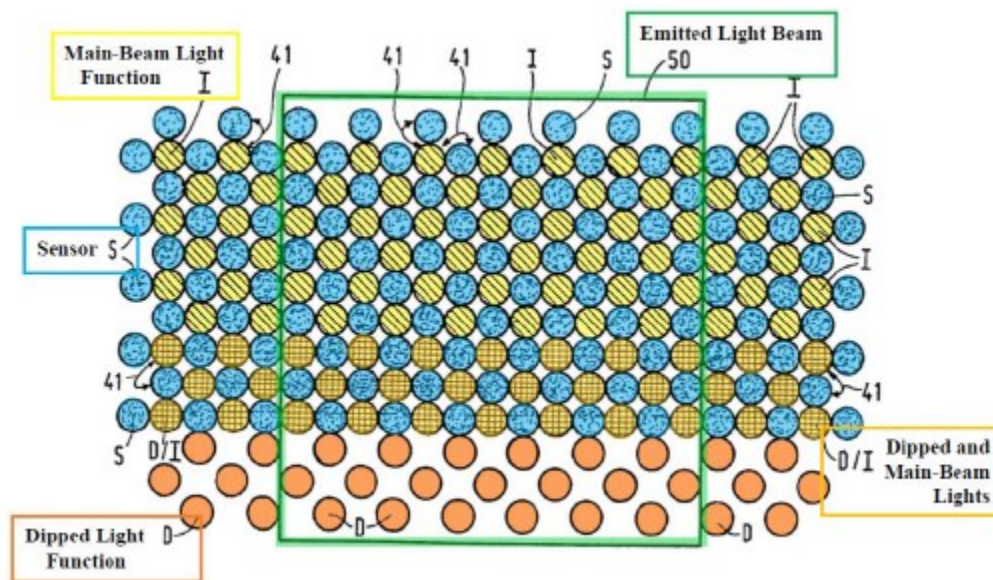
With reference to Figure 1, Karlsson discloses a lighting device 1 with
“sensor means consisting of a light-sensitive sensor 9 and a further lens 10
disposed on the side of sensor 9 that is exposed to the incident light, such that
incident light 11 on the lens 10 is formed into an incident light beam 12 on light-
sensitive sensor 9.” (Ex.1010, 8:19-23; Ex.2006, ¶¶158.)



(Ex.1010, Fig. 1, Annotated)

With reference to Figure 14, Karlsson discloses spotlight sensors (S) that
may be formed by “photosensitive transistors.” (Ex.1010, 19:34-35.) Karlsson
further discloses that “a preferred embodiment of the invention comprises spotlight

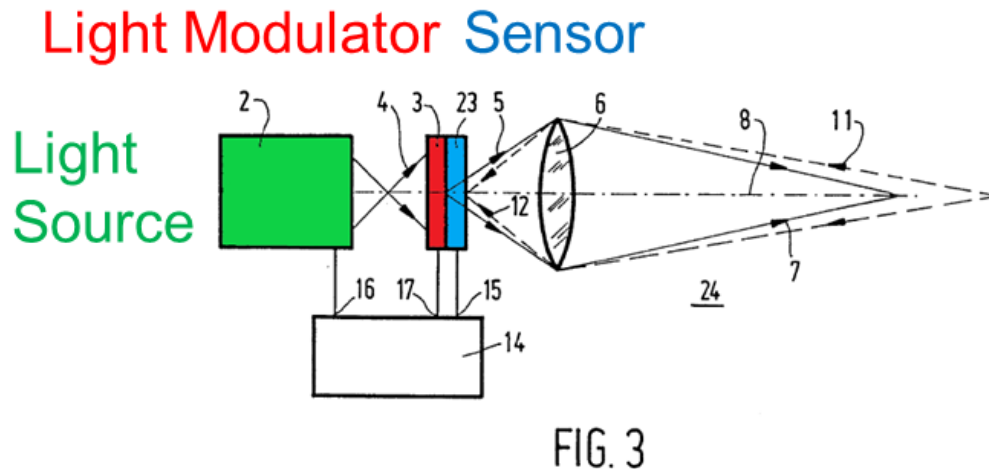
sensors in the form of, for example, photosensitive diodes, photo transistors or other light- sensitive semiconductor components, which are spatially distributed in a predetermined manner or at random so as to be capable of detecting light from desired directions or from all directions.” (*Id.*, 5:18-23.) Karlsson also discloses that “the term spotlight sensor used herein is understood to indicate a light-sensitive sensor of limited, physically light-sensitive dimensions, which generally detects light from a specific direction.” (*Id.*, 5:25-27; Ex.2006, ¶¶159.)



(Ex.1010, Fig. 14; Pet. at 68, Annotated)

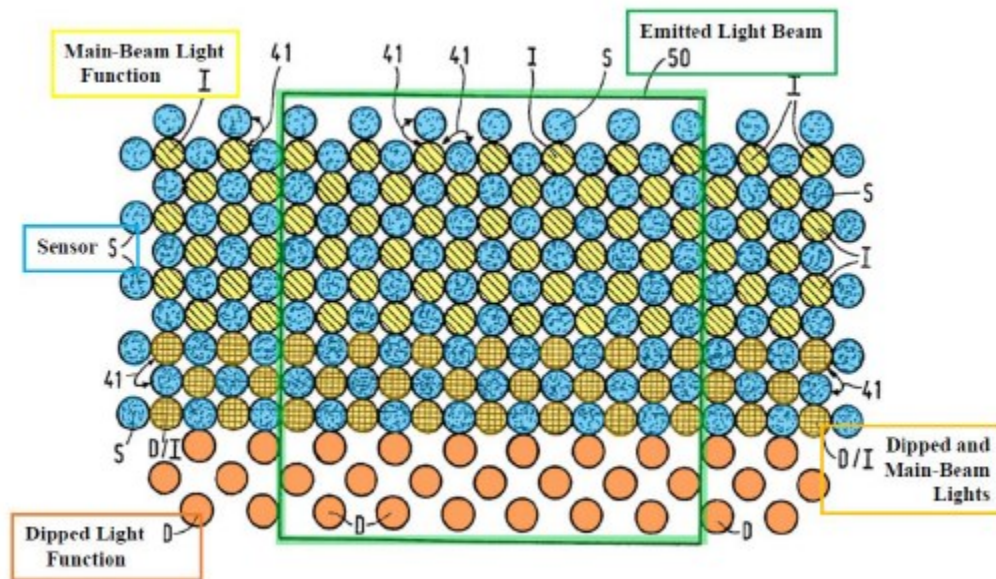
With reference to Figure 3, Karlsson discloses “a light-sensitive sensor 23 and light modulator means 3 are arranged between the light source 2 and the lens 6.” (Ex.1010, 11:10-11.) Notably, Karlsson does not disclose that the light source 2 described with reference to Figure 3 embodiment includes a plurality of LEDs.

(Ex.1010, 11:7-36; Ex.2006, ¶160.)



(Ex.1010, Fig. 3; Pet. at 67, Annotated)

Petitioner relies on Karlsson's matrix of photo diodes as illustrated in Figure 14 for satisfying various control limitations. (Pet. at 66, 68, 69, 73, 74, 75.) A matrix of photo diodes alone is not a camera. A camera also requires a lens to focus the received light, and to be able to deliver the sensed array for processing and imaging. A POSA would have known that a modern video camera in the early 2000s would have required many thousands of photosensors. (Ex.2006, ¶161.) Further, a camera would not have included photosensors interspersed with emitters because this would have resulted in low resolution data that could not be formatted into an image. Further, the lack of sensors in the lower region of the array results in no data in this region and Karlsson does not disclose image processing, at all, so it is clear that the spotlight sensors are limited to sensing light. (Ex.2006, ¶162.)



(Ex.1010, Fig. 14; Pet. at 14, 68, 69, 73, 74, 75, Annotated by Petitioner)

The Karlsson-Nakamura combination does not teach “*one or more cameras*” as claimed (Ex.2006, ¶163), and claims 24, 32, 40, and 48 are not obvious over the combination. *See In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

b. Claims: 24/32/40/48 – The Karlsson-Nakamura Combination Does Not Teach “*one or more sensors, including one or more cameras . . . for detecting coordinate-specific information about the illuminated area.*”

Petitioner again relies on Karlsson’s disclosure at 12:19-22 that the sensors 9 and 23 are “capable of precisely determining the direction and the intensity of the detected light 11” for satisfying this limitation. (Pet. at 63.) Petitioner admits “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.”

(Pet. at 55; Ex.2006, ¶165.)

Petitioner further states that:

A POSA would have therefore understood 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).

(Pet. at 63.)

Karlsson does not disclose storing the direction of the detected light 11 in a format as coordinates. (Ex.2006, ¶¶166-167.) On the contrary, with reference to Figure 14, Karlsson discloses an arrangement in which each sensor (S) of an array of spotlight sensors is electrically connected to an adjacent spotlight source to provide a switch to control the LEDs:

The spotlight sources and the spotlight sensors, ... may also be formed by LEDs and photosensitive transistors, respectively. Arrow 41 schematically indicates an electric connection between the spotlight sensors and spotlight sources D, I and D/I, which, for example, may consist of transistors or the like... Integration of LEDs and phototransistors on one carrier, for example, is also possible.

(Ex.1010, 19:34-20:5.)

With reference to the Figure 14 embodiment, Karlsson does not disclose a controller or storage means connected between the sensors (S) and the sources to store any coordinates, as proposed by the Petitioner. Instead, if each sensor is

functioning as a switch for the adjacent LED(s) to which it is electrically connected, then light detected by the sensor would cause a change to the electrical current to the LED and cause it to change state. (Ex.2006, ¶168.)

The Karlsson-Nakamura combination does not teach “*one or more cameras . . . for detecting coordinate-specific information about the illuminated area*” as claimed, and claims 24, 32, 40, and 48 are not obvious over the combination. *See In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

c. Claims: 24/32/40/48 - The Karlsson-Nakamura Combination Does Not Teach “*a plurality of individually controllable LEDs*” and “*one or more sensors, including one or more cameras*.”

Without explaining why a POSA would interchange two different embodiments, Petitioner relies on Karlsson’s LED embodiment at 11:29-32, 13:24-29 for satisfying the “*plurality of individually controllable LEDs*” limitation, and Karlsson’s light modulator embodiment at 12:22-24 for satisfying the “*one or more cameras*” limitation. (Pet. at 60, 62; Ex.2006, ¶171.)

Karlsson discloses “a lighting device comprising a plurality of controllable spotlight beams.” (Ex.1010, 13:24-25.) Like Beam, Karlsson teaches that the controllable spotlight beams may be provided by two disparate, alternative embodiments, 1) controllable LEDs, or 2) a single light source combined with a controllable light modulator. (*Id.*, 14:1-9.) Karlsson consistently presents the two

embodiments as alternatives: for “intermittently controlling the light intensity delivered by the lighting means, as discussed above, the light source or the light modulator means may be repeatedly controlled, for example in a pulsed manner, in a r[h]ythm not visible for the human eye, typically in the order of 100 Hz or higher.” (*Id.*, 12:25-29.)

The alternative embodiments notably rely on different sensors: a “matrix of photo diodes or in the case of a light-sensitive sensor 23, a photo-sensitive plate as used in modern video cameras.” (Ex.1010, 12:22-24.) Only the light modulator embodiment includes a camera. Karlsson illustrates the light-sensitive sensor 23 adjacent to the light modulator 3 in Figures 3, 5a, 7, 10. (Ex.2006, ¶¶172-173.)

A POSA would have understood that a light modulator is not needed with an array of LEDs because the LEDs themselves can be controlled or modulated and therefore a light modulator is redundant, and further unsuitable with an LED array as it decreases optical efficiency and adds expense and packaging challenges. (Ex.2006, ¶¶35, 174; Ex.1010, 12:25-29.) For example, comparably, Beam discloses an embodiment in which a conventional “lamp 202 and spatial light modulator 203 are replaced by an array of light sources 401” (Ex.1005, 5:3-6.) A POSA would thus not interchange the teachings of the LED array and light modulator embodiments. A POSA would have understood that the Karlsson-Nakamura combination does not teach a “*a plurality of individually controllable*

LEDs” compatible with the “*one or more cameras*” embodiment. Accordingly, claims 24, 32, 40, and 48 are not obvious over the combination. *See In re Royka*, 490 F.2d at 985.

d. Claim 40 –The Karlsson-Nakamura Combination does not teach a controller enabled to “*determine a second, different cluster of the LEDs illuminating at least a second portion of a second other vehicle.*”

Petitioner cites to its analysis in Sections VIII.D and VIII.I.1-2 for satisfying this limitation. (Pet. at 76.) Karlsson discloses protecting “traffic” from glare. (Ex.1010, 9:18-26.) Petitioner concludes that “[w]hen there are two or more separated vehicle targets, Karlsson’s system would select two areas of non-contiguous LEDs to form the dimmed cluster of LEDs to cover all of the vehicle targets.” (Pet. at 70.) Karlsson never teaches this — nor is it inherently how Karlsson would function. For example, Karlsson could alternatively form a large dark box encompassing all detected lights. Petitioner is essentially applying the claims and/or teachings of Beam to Karlsson without any justification for having done so. (Ex.2006, ¶35.) Therefore Petitioner’s analysis fails for not providing “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l v. Teleflex Inc.*, 550 U.S. at 418, 82 USPQ2d at 1396 (2007), *quoting In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

2. Dependent Claims:

- a. **Claims 25/33/41/49 – The Karlsson-Nakamura Combination does not teach “*select[ing] a cluster of the LEDs that emit light toward at least a portion of the other vehicle*” where “*the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs*.”**

Petitioner relies on Karlsson’s disclosure regarding forming random patterns of the light beam; and/or obviousness in view of Karlsson or Nakamura’s disclosure regarding not exposing traffic or other vehicles to glare for satisfying these limitations. (Pet. at 70-71; Ex.2006, ¶¶179-180.)

Karlsson discloses “a lighting device comprising a plurality of controllable spotlight beams is used advantageously for forming random patterns of the light beam to be emitted in an effective manner.” (Ex.1010, 13:24-27.) It is unclear what Karlsson teaches regarding these “random patterns”, however a POSA that is concerned with safety would not have been motivated to design a headlamp that forms random light patterns. (Ex.2006, ¶181.)

Additionally, Petitioner argues that Karlsson can handle multiple vehicles and thus achieves the non-contiguous limitation through use of separate clusters for each vehicle. Karlsson and Nakamura do not teach how to deal with multiple vehicles other than a presumption that Karlsson can deal with them somehow and Nakamura will deal with them by lowering the field of light to the rear of the nearest vehicle. Even if such a teaching were present, however, Petitioner’s

argument is not directed to the single cluster for the single vehicle including non-contiguous lights as claimed. (Ex.2006, ¶182.)

The '551 Patent discloses benefits associated with selecting a cluster of non-contiguous LEDs for illuminating a single “other vehicle.” For example, controlling LEDs to adjust light color in response to detecting another vehicle. (Ex.1001, 53:37-39.) The Karlsson-Nakamura combination does not teach “*select[ing] a cluster of the LEDs that emit light toward at least a portion of the other vehicle*” where “*the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs,*” as claimed, and claims 25/33/41/49 are non-obvious over the combination. (Ex.2006, ¶183.)

Moreover, as detailed in Section V. *supra*, because the Petition omits any analysis as to how the proffered combination teaches the “*wherein the data includes image data*” language in claims 33, 41 and 49 or why the language is immaterial, the claim 33, 41 and 49 proofs are fatally deficient. (Ex.2006, ¶¶100-101, 103.)

3. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine Karlsson and Nakamura

a. A POSA Would Not have been Motivated to Combine Karlson’s Disparate LED Array and Light Modulator Embodiments

As detailed in (VI)(C)(1)(c) *supra*, Petitioner’s proposed combination of

Karlsson and Nakamura combines incompatible features from Karlsson's alternative embodiments — Karlsson's LED array with the light-sensitive sensor 23, which may include “a photo-sensitive plate as used in modern video cameras,” from the light modulator embodiment, without explaining why a POSA would do so. (Pet. at 60, 62, 68, 69, 73, 74, 75; Ex.2006, ¶185.)

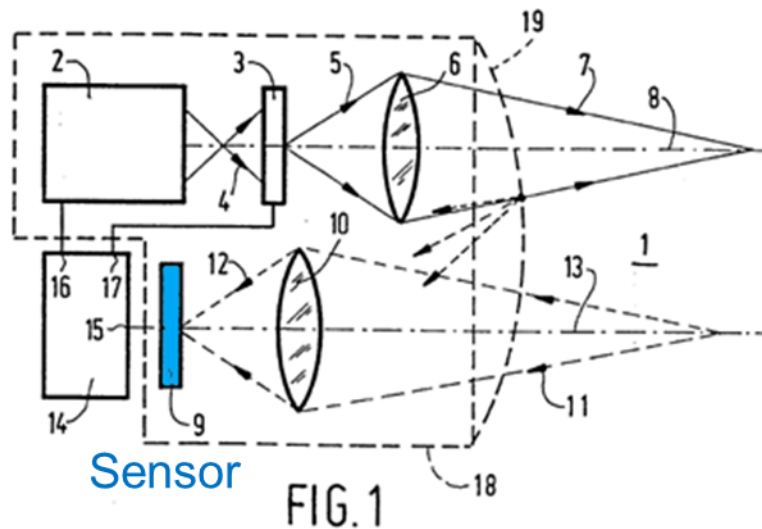
A POSA would not interchange the teachings of the LED array and light modulator embodiments to provide redundant modulation and reduced optical efficiency. (Ex.2006, ¶188.) (*See Abiomed v. Marquest Cardiovascular*, IPR2017-01204, IPR2017-01205, Paper 8 at 11, (The Board was “unpersuaded that the features of Aboul-Hosn's various embodiments are interchangeable or that one skilled in the art would have combined those features in the manner proposed by Petitioner.”) Accordingly, because a POSA would have understood that the Karlsson-Nakamura combination does not teach a “*a plurality of individually controllable LEDs*” compatible with the “*one or more cameras*” embodiment, claims 24, 32, 40, and 48 are not obvious over the combination. *See In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

b. Petitioner Does Not Explain How a POSA Would Have Combined Karlsson's Internal Sensors with Nakamura's Remote Sensor Based Image Processing

Petitioner states that “it would have been obvious to a POSA to modify

Karlsson’s system to map the image with coordinates, as taught by Nakamura, to provide the algorithmic detail implicit in Karlsson.” (Pet. at 63.) “Thus, Karlsson’s camera would produce the claimed ‘coordinate-specific information’ as modified by Nakamura.” (*Id.*) Petitioner fails to explain how light sensed by Karlsson’s lamp-located sensor would be used by Nakamura’s vehicle recognition zone image processing strategy that is based on a remote camera located at the top center of the windshield and that expressly defines subsequent processing from the visual perspective of its mounting location. (Ex.2006, ¶190.)

Karlsson discloses sensors disposed in a headlight. The system includes “a light-sensitive sensor 9 and a further lens 10 disposed on the side of sensor 9 that is exposed to the incident light, such that incident light 11 on the lens 10 is formed into an incident light beam 12 on light-sensitive sensor 9.” (Ex.1010, 8:19-23; Ex.2006, ¶191.)

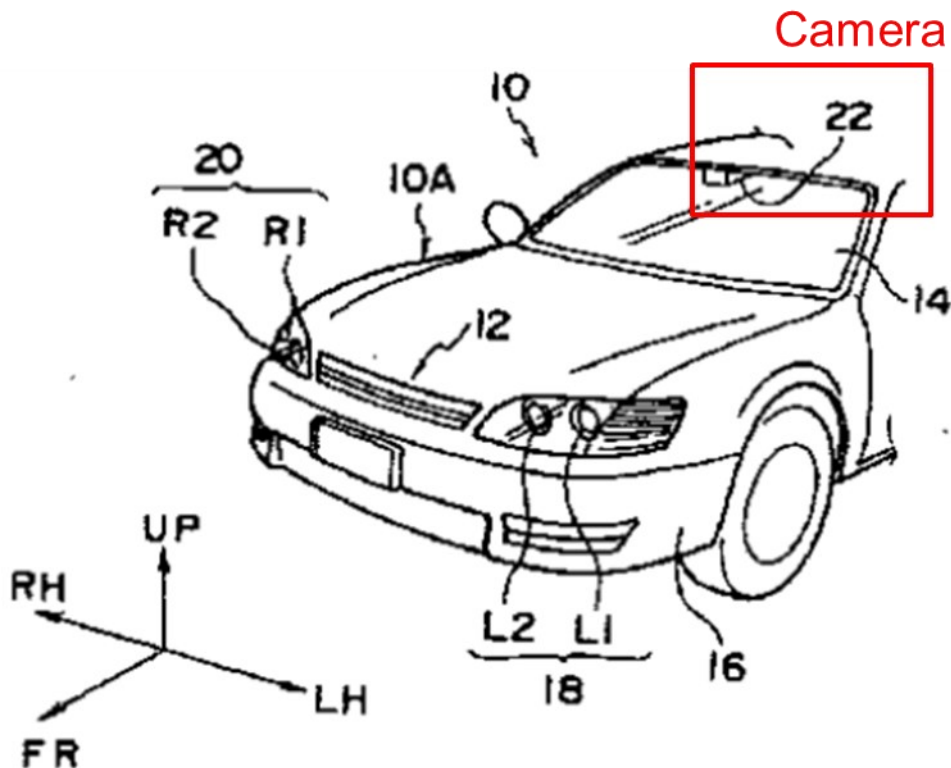


(Ex.1010, Fig. 1, Annotated)

Karlsson further discloses that the “sensor means and the lighting means according to the present invention can be advantageously combined into a single integrated lighting device, whereby the field of view of the light-sensitive sensors and the illumination field of the light beam to be emitted, will coincide.” (Ex.1010, 3:27-31.) Karlsson, like Beam, discourages mounting sensors remote from the headlights, *e.g.*, on a “windscreen [*sic* windshield],” – “the separate mounting of the headlights and the sensors is not to be preferred, because this requires additional assembly time, additional wiring, additional alignment operations and the like, which significantly adds to the cost of production, in particular in the case of mass production, for example in the automotive industry.” (*Id.*, 2:10-18; Ex.2006, ¶192.)

Nakamura discloses headlamps 18 and 20 that are provided on the top part

of the front bumper 16, and a camera 22 that is mounted “[a]t the top of this windshield glass 14 and inside of vehicle 10 (at the driver’s visual field position, or in other words, near the driver’s eyepoint).” (Ex.1013, [0012]³; Ex.2006, ¶193.)



(Ex.1013, Fig. 1, Annotated)

Nakamura, like Satonaka, mounts a camera at the center of the windshield near the driver’s eyeline. (Ex.1014, [0016].) From this perspective, the camera generally sees the road as the driver does, with preceding traffic centered between lane markers, and lane markers largely visible on either side of a vehicle. (*Id.*, Fig.

³ Nakamura and Satonaka have substantially similar disclosures.

4, 1; Ex.2006, ¶194.) If the viewpoint were shifted, for example, to a front left or right headlamp, a number of issues would occur.

First, as illustrated in the figures below, the perspective of the vehicle would shift vertically downward and horizontally due to the lower offset mounting location, which would skew the lane markings and corresponding area of analysis for detecting a vehicle by the algorithm. Further, for a left headlamp, the left-side marker would appear straighter and the right-side marker would skew left. Similarly, for a right headlamp, the right-side marker would appear straighter and the left-side marker would skew right. As shown in the photos, this may result in a vehicle being outside of the analysis area making the proffered combination unsuitable, particularly because Petitioner never recognizes, let alone provides a solution for these issues. (Ex.2006, ¶195.)



Lower Left
Camera



Top Center
Camera



Lower Right
Camera

(Ex.2006, ¶195.)

Further, Petitioner does not explain if the Beam-Satonaka combination uses

a camera in the front left headlamp, the front right headlamp, or both. If the Beam-Satonaka combination uses a camera that is located in the front left headlamp, then the system would have the same limited functionality regarding detecting a preceding vehicle as a camera located in the front right headlamp, as illustrated in the photos above. If the combination uses both cameras, Petitioner does not explain whether or how the information collected from both cameras is combined. (Ex.2006, ¶196.) Regardless, a camera located in either location has limited functionality regarding detecting a preceding vehicle.

Petitioner also fails to explain how the coordinates of Nakamura would be mapped to the LEDs of Karlsson. Karlson discloses a system largely focused on improvements to a prior art system for adaptive control, without much detail, if any, on how such control is implemented, choosing instead to primarily discuss alternative light and sensor sources and assembly strategies. (Ex.1010, 1:8-9, 2:2-9.) In fact, Karlsson’s lack of an actual description of control was cited by Petitioner as a reason to modify Karlsson — “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.” (Pet. at 55; Ex.2006, ¶197.)

Petitioner does not provide an evidence-supported account of how the combination of Karlsson and Nakamura’s Software Implementation would work, *i.e.*, how signals from Karlsson’s lamp-located sensor would be used by

Nakamura's vehicle recognition zone image processing strategy — a processing strategy that is based on a remote camera being located at the top center of the windshield and viewing and processing the scene from that perspective. (Ex.2006, ¶198.) Therefore, the obviousness ground is improper. *See Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017).

Furthermore, while Petitioner relies on “coordinate storage” in Nakamura, coordinate storage does not cure Karlsson's deficiency, as defined by Petitioner, of how to “determine which portions of the headlight beam need to be dimmed” *i.e.* “to determine which LEDs to be dimmed to avoid glare.” (Pet. at 55.) Reliance on Nakamura is misplaced as Nakamura does not contemplate LEDs and therefore does not control light in a similar fashion. Petitioner seems to be simultaneously taking contradictory positions that Karlsson's deficiency would lead a POSA to look to Nakamura, but then recognizes that Nakamura's coordinate information also does not identify portions of a headlight beam to dim, so Petitioner looks back to Karlsson to satisfy the admitted deficiency that was the basis for looking to Nakamura in the first instance. (Ex.2006, ¶199.)

Petitioner's motivation to combine also incorrectly assumes that Karlsson captures images (“like the images recorded in Karlsson,”) leaping from “sensors 9 and 23 are preferably designed to be capable of precisely determining the direction and the intensity of detected light” to “thus Karlsson discloses receiving an

image...” (Pet. at 55.) To the contrary, Karlsson never mentions storing or processing an image requiring Nakamura’s coordinate information, and Petitioner’s summary of Karlsson even notes that “Karlsson automatically varies the LED pattern in response to control signals from light-sensitive sensors.” (Pet. at 13.) Multiple embodiments of Karlsson disclose physical mappings between the spotlight sensors detecting light and the spotlight beams to be dimmed such that Nakamura’s coordinate information would be unsuitable for use in Karlsson’s system. Thus, Petitioner’s explanation lacks even a credible premise in assuming that there is an image in Karlsson to modify in the first place, or any explanation of how a determination of direction and intensity of light amounts to “receiving an image” that could utilize Nakamura’s coordinates. (Ex.2006, ¶200.)

D. Ground 4 - Karlsson, Nakamura, and Gotou

1. Claims: 26-29, 34-37, 42-45, 50-53 – The Karlsson-Nakamura-Gotou Combination Does Not Teach a controller enabled to “*accommodate the upcoming road curvature by adaptation of a light pattern.*”

Petitioner relies on Gotou for teaching this limitation, and states that “Karlsson’s modified system would incorporate map data from Gotou’s navigation system 30 into control means 14, and control the LEDs accordingly.” (Pet. at 81-82; Ex.2006, ¶202.)

Karlsson discloses a headlight assembly having a controllable lighting

pattern, that provides a high-beam or “main-beam” lighting pattern as a default setting. (Ex.1010, 1:1-7, 1:18-23.) Karlsson further discloses reducing the high beam to a partial beam, (*e.g.*, as depicted by a window 50 in Figure 14) under limited circumstances, in this case to avoid blinding oncoming drivers. For example, Karlsson discloses “retaining an optimum light for the driver of the vehicle” while automatically suppressing “that part of the light beam which might cause inconvenience to oncoming traffic.” (Ex.1010, 2:7-9.) Karlsson also notes that “main-beams are designed and optimized for long-range illumination” (Ex.1010, 1:19-20.) Karlsson seeks the **retention** of “optimum” light anywhere glare is not being accommodated. (Ex.1010, 2:7-10, 9:23-26; Ex.2006, ¶203.)

Karlsson discloses that the “light beam 7 ... [is] controlled in such a manner that **no light at all or light having a low intensity** is emitted in those directions from which light is detected ... [thus] **glaring or blinding of oncoming traffic is effectively prevented.**” (Ex.1010, 9:18-26.) Petitioner admits that this disclosure teaches that the “remaining areas of light beam 7 are left at full intensity (‘main-beam’ or ‘high beam’ in Karlsson’s terms), ‘permitting a light intensity which is generally higher than that of conventional dipped headlights.’) (Pet. at 72; Ex.2006, ¶204.) Petitioner continues the explanation and interpretation of Karlsson by admitting that:

A POSA would also have understood that positioning the main beam **(full intensity)** LEDs all around the **reduced illumination area** provides the **“optimum lighting effect”** for the driver because doing so maximizes the area that is fully illuminated. EX1003, ¶284; EX1010, 2:7-9. In the alternative, it would have been obvious to a POSA to configure Karlsson’s system to **surround** the reduced illumination area with **full illumination to the greatest extent possible** for the same reason, which would result in the claimed light distribution. EX1003, ¶¶285-286.

(Pet. at 73-74.)

“The greatest extent possible” that “surround[s]” a reduced illumination area, is, of course, use of the full LED array, to provide the driving beam 7. As Petitioner explains, this also “maximizes the area that is fully illuminated” to achieve “optimum lighting effect for the driver.” (*Id.*) Per Karlsson and Petitioner’s admissions, the only reasoned and consistent interpretation is that Karlsson uses full illumination “to the **greatest extent possible**” to achieve an “optimum lighting effect” by “maximizing the area that is fully illuminated”— *i.e.*, it uses the **entire array** just as Beam does, except for portions dimmed to avoid glare under Karlsson’s specified circumstances. (Ex.2006, ¶205.)

With reference to Figure 14, Karlsson states: “In this embodiment non-shaded spotlight sources indicated at D provide the **dipped light function in accordance with existing vehicle headlights**, whilst the single-shaded spotlight

sources indicated at I provide the main-beam light function of existing vehicle headlights.” (Ex.1010, 19:22-28.) As illustrated in Figure 14 below, the dipped light sources (D) and main-beam light sources (I) extend beyond window 50. Because the D and I “sources,” collectively, provide “existing vehicle” light beams, it follows that window 50 is created by blanking a subset of the overall beam “if desired,” *i.e.*, to reduce potential glare. (Ex.1010, 19:31-33; Ex.2006, ¶206.)

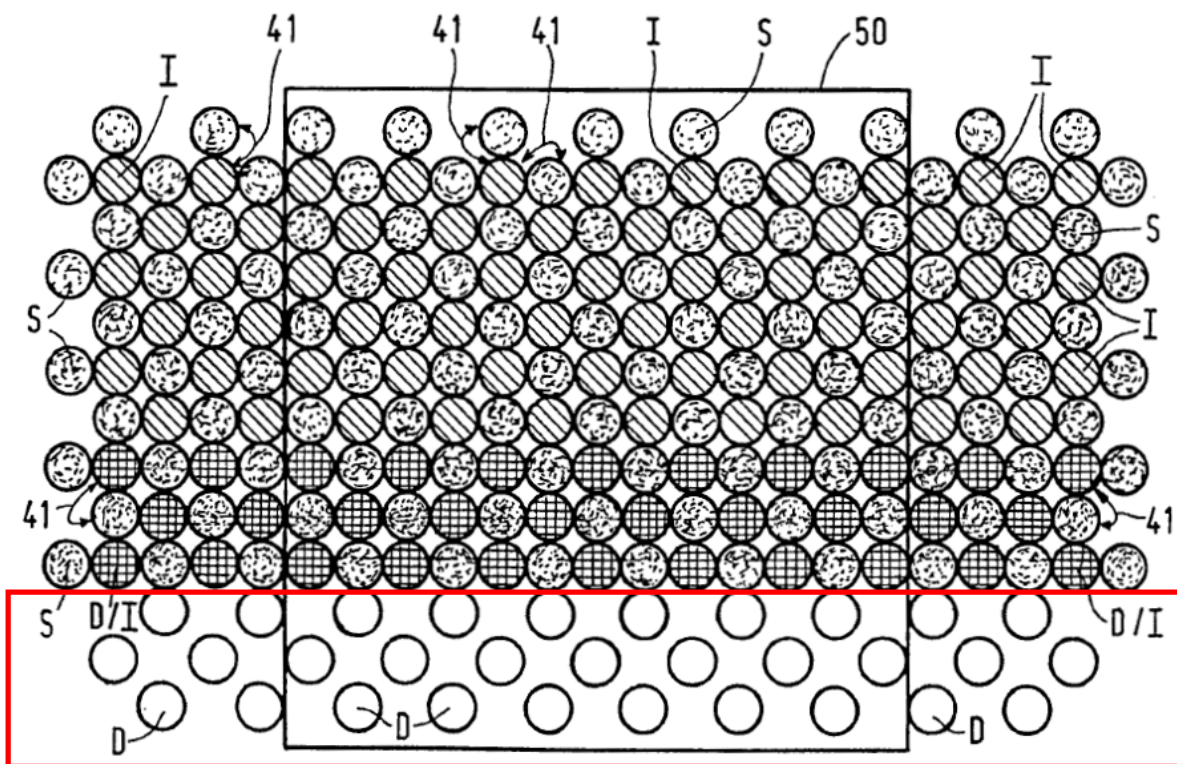


FIG. 14

(Ex.1010, Fig. 14 Annotated; Ex.2006, ¶206)

This interpretation further comports with Figure 16’s description of sensors,

used to prevent glare based on vehicle movement in situations, such as a curve, where another vehicle's lights may be difficult to detect due to relative positioning. If Karlsson's vehicle is pitched, *e.g.*, during sharp velocity changes or "overloaded," the light beam 7 is adapted for pitch — *i.e.*, certain LEDs are blanked causing the window 50 to vertically shift as described with reference to Fig. 14. (Ex.1010, 20:25-29.) If the vehicle is taking a curve, the light beam 7 is adapted to prevent glaring the opposite lane — *i.e.*, certain LEDs are blanked causing the window 50 to horizontally shift as described with reference to Fig. 14. (Ex.1010, 20:29-33; Ex.2006, ¶207.)

Under any of these situations, the resulting beam would be less (for the duration of the event) than the full normal beam of an incandescent lamp (being diminished in some regard, vertically or horizontally), except that Karlsson makes these glare-reduction adaptations to allow the main (high) driving beam to continue to operate everywhere else to maintain "optimum illumination" of the road ahead of the driver. (Ex.2006, ¶208.)

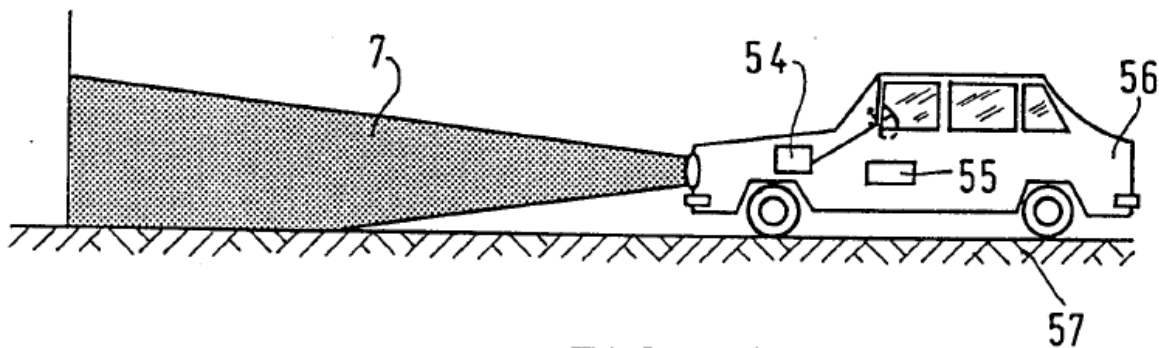


FIG. 16

(Ex.1010, FIG. 16)

The reduced illumination provided by window 50 also comports with Karlsson's desire to "retain an optimum lighting effect," per Flaaten — the base device, which Karlsson seeks to improve. (Ex.2017.) Karlsson explains that the Flaaten "prior art lighting device" "retain[s] an **optimum lighting** effect for the driver of the vehicle," by enabling "such control of the light that **only the portion of the light** that would inconvenience the driver of meeting cars **is removed, leaving as much as possible of the roadway and the surroundings illuminated.**" (Ex.1010 at 1-2; Ex.2017 at 1; Ex.2006, ¶209.)

Finally, there is nothing in Karlsson to suggest that window 50 is the actual beam that would be used for driving. On the contrary, as contemporaneous publications from Petitioner's expert establish, given the state of the art and the numerous technical challenges with incorporating extra LEDs to the headlamp

system, all LEDs in the Karlsson array would be used to achieve sufficient lumen output for driving. (Ex.2006, ¶210.)

As both parties agree, Karlsson discloses providing full or maximum intensity light in the remaining areas outside of the anti-glare region to the greatest extent possible, *i.e.*, everywhere it could be needed. Under such circumstances, there would be no reason to adapt the light pattern to accommodate road curvature, nor would there be remaining unlit LEDs with which to achieve the adaptation. Accordingly, the Gotou-Karlsson combination does not teach a controller enabled to “*accommodate the upcoming road curvature by adaptation of a light pattern of at least one of the at least one headlamps,*” as claimed, and claims 26-29, 34-37, 42-45, 50-53 are non-obvious over the combination. (Ex.2006, ¶211.)

2. Claims: 27/35/43/51 – The Karlsson-Nakamura-Gotou Combination Does Not Teach the “*Non-Contiguous LEDs*” Limitation

Claims 27, 35, 43, and 51 each require “*non-contiguous LEDs.*” Petitioner references its analysis of claim 25 for satisfying this limitation. (Pet. at 82.) The Beam-Satonaka-Kobayashi Combination does not teach the “*non-contiguous LEDs*” limitation for at least the same reasons given for claim 25. *See* Section VI.C.2.a. (Ex.2006, ¶212.)

VII. Secondary Considerations of Nonobviousness

Objective indicia, such as unexpected results, industry praise and long-felt

need, “can be the most probative evidence of nonobviousness in the record, and enable the court to avert the trap of hindsight.” *Crocs, Inc. v. ITC*, 598 F.3d 1294, 1310 (Fed. Cir. 2010). These objective criteria “turn back the clock and place the claims in the context that led to their invention” providing evidence of “how the patented device is viewed in the marketplace.” *Mintz v. Dietz*, 679 F.3d 1372, 1378 (Fed. Cir. 2012); *Spectralytics, Inc. v. Cordis Corp.*, 649 F.3d 1336, 1344 (Fed. Cir. 2011). “Thus evidence rising out of the so-called ‘secondary considerations’ must always when present be considered en route to a determination of obviousness. . . It is to be considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.” *In Re Cyclobenzaprine Hyd.*, | 676 F.3d 1063, 1076 (Fed. Cir. 2012).

During the reexamination of the ’551 Patent, Patent Owner detailed the long-felt need and industry praise for the glare-free adaptive beam technology claimed in the ’551 Patent. (Ex.2023, 67-83.) Patent Owner, *inter alia*, correlated each limitation of claim 24 with specific statements of industry praise through the Stam declaration, providing an explanation of the nexus between the two. (Ex.2023, 70-77, 728-734.) Dr. Turk has reviewed the objective evidence statements in the Stam declaration and concurs with the analysis. (Ex.2006, ¶¶215-216.) Without addressing the nexus analysis from the prosecution history, Petitioner simply concludes that “no nexus is present.” (Pet. at 84.).

Regarding long-felt unmet need, automotive companies and the industry at large have long recognized the two-fold need for 1) increased visibility at night and 2) avoiding the discomfort of glaring headlamps. (Ex.2023 at 734.) Indeed, since 2017, Petitioner individually and through the Alliance for Automotive Innovation, of which Petitioner is a member (Ex.2019), petitioned NHTSA for a change in regulations to allow adaptive driving beam (ADB) technology. As the Stam Declaration establishes, ADB technology as used in the Alliance filings and defined in the NHTSA proposed rule changes, falls within the scope of the claims. (Ex.2006, ¶216; Ex.2023 at 738, 739.) Per NHTSA, ADB technology uses advanced sensors and computing technology that more accurately and precisely detect the presence and location of other vehicles and shape the headlamps beams to provide enhanced illumination of unoccupied portions of the road and avoid glaring other vehicles. (*Id.*)

As part of its filings, the Alliance cited a report by the Institute of Highway Safety (IIHS) which found that between 2009 and 2016, pedestrian deaths in dark conditions increased 56% (Ex.2023 at 739) and concluded that “improved visibility benefits of ADB systems can help to decrease fatalities and injuries associated with these crashes.” (*Id.*) Additionally, the Transportation Lighting Alliance, published findings in 2014 concluding that the **application of ADB systems could reduce visibility-related nighttime crashes by six to seven percent compared to the**

visibility provided by [current] low beam headlamp systems.” (Ex.2023 at 737.)

Finally, as part of its proposed rulemaking in 2018, NHTSA provided an extensive summary of the need for ADB technology: “Research has shown that most drivers under-utilize the upper beams. The effects of this increase as speeds increase, because at higher speeds the need for great seeing distance increases. . . ADB has the potential to reduce the risk of crashes by increasing visibility without increasing glare. In particular, it offers potentially significant safety benefits in avoiding collisions with pedestrians, cyclists, animals and roadside objects.” (Ex.2023 at 737-739.)

Petitioner argues that Patent Owner does not produce a product, therefore there is no presumption of nexus. (Pet. at 84.) Yet, quoting *Fox Factory*, Petitioner admits that Patent Owner can still prove nexus “by showing that the evidence of secondary considerations is the direct result of the unique characteristics of the claimed invention.” *Fox Factory, Inc. v. Sram, LLC*, 944 F.3d 1366, 1373-74 (Fed. Cir. 2019). As explained in section II above, the ’551 Patent claims include multiple unique characteristics that are novel and nonobvious over the asserted art, such as “Predictive Curve Illumination” the subject of claims 26-29, 34-37, 42-45 and 50-53, “*adapting light emission based on the classification of objects*”, the subject of claim 48, and adapting light emission to provide at least two dark zones

with “light in-between,” the subject of claim 40. Objective evidence in the form of industry praise and long felt unmet need were correlated with all three claimed characteristics in the Stam Declaration. (Ex.2023 at 70-77, 728-734; Ex.2006, ¶217.)

In regards to industry praise, by way of example, the Stam Declaration identifies a 2014 Automotive News PACE Award for adaptive LED Matrix Beam technology—correlating the praised features of that technology to the claimed invention, specifically an “automatically adjusts a car's headlamps to deliver ‘glare free’ illumination, dimming or switching on and off light sources based on traffic conditions” with 1) “[i]ndividually controlled LEDs [that] also provide two or more dark zones with ‘light in-between,’ allowing continuous use of a vehicle's high-beams to maximize visibility and provide a safer driving experience” and 2) “intelligent lighting” technology to recognize cars that are being followed as well as oncoming traffic.” (Ex.2023 at 729-734; Ex.2006, ¶218.) Regarding the claimed Predictive Curve Illumination feature, Driving Vision News states: “The benefit of a glare-free function is not only to shadow out other cars but also to provide visibility for upcoming curves and dangerous situations; there is a clear safety gain by illuminating this curve in front of the driver.” (Ex.2023 at 727; Ex.2006, ¶218.)

Accordingly, the objective evidence, when considered as part of the totality of the evidence, supports a nonobviousness finding.

VIII. Petitioner's Parallel Petitions Raise Fairness, Timing, and Efficiency concerns under § 316(b)

The Board will consider whether multiple petitions challenging the same patent is fair and efficient, because "[b]ased on the Board's experience, one petition should be sufficient to challenge the claims of a patent in most situations." CTPG at 59. "Two or more petitions filed against the same patent . . . may place a substantial and unnecessary burden on the Board and the patent owner and could raise fairness, timing, and efficiency concerns. *See* 35 U.S.C. § 316(b)." CTPG at 59. Nonetheless, Petitioner filed three⁴ IPR petitions challenging the '551 Patent within two weeks: 1) The Petition ("Petition 1"), 2) IPR2023-00318, Paper 2 (Ex.2004, "Petition 2"), and 3) IPR2023-00336, Paper 2. (Ex.2005, "Petition 3".) In Petitions 1 and 2, Petitioner challenges all claims with the Beam/Satonaka group of grounds and with the Karlsson/Nakamura group of grounds. These grounds are cumulative and clearly redundant. Beam and Karlsson have similar disclosures and Satonaka and Nakaumra are literally used for the exact same teachings. The overlapping art among the petitions indicates that Petitioner could have dropped

⁴ Petitioner's co-defendants in the related litigation have filed four additional serial petitions challenging the '551 Patent: IPR2023-01039, IPR2023-01040, IPR2023-01225, and IPR2023-01296.

one of the redundant groups of grounds and consolidated Petitions 1 and 2 into one petition, while still challenging all claims. Clearly, Petitioner engaged in this gamesmanship to avoid having to rank the two grounds and justify why Petitioner was entitled to advance two grounds against each Challenged Claim. Petitioner's tactics flout the fairness and efficiency standards laid out in the CTPG at 59-60 and 35 U.S.C. § 316(b).

IX. Conclusion

Based on the totality of the evidence presented, Patent Owner respectfully requests that the Board finds all challenged claims not unpatentable.

Respectfully submitted,

Dated: September 13, 2023

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Certificate of Service

The undersigned hereby certifies that on September 13, 2023, a complete and entire copy of **PATENT OWNER'S RESPONSE TO PETITION AND ALL EXHIBITS**, was served via electronic mail to the attorneys listed below:

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Certificate of Compliance Pursuant to 37 C.F.R. § 42.24

This paper complies with the type-volume limitation of 37 C.F.R. § 42.24. The paper contains 13,911 words, excluding the parts of the paper exempted by §42.24(a).

This paper also complies with the typeface requirements of 37 C.F.R. § 42.6(a)(ii) and the type style requirements of § 42.6(a)(iii)&(iv).

Respectfully submitted,

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Appendix A
A. Listing of All Challenged Claims

No.	Element
24.p	24. An illuminating device having automatic control of light provided to an illuminated area comprising:
24.1	a structure for incorporating illuminating device elements, wherein the structure comprises a motor vehicle;
24.2	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;
24.3	electronic circuitry apparatus for the controlled powering of the LEDs and other of the illuminating device elements;
24.4	one or more processors;
24.5	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;
24.6	a controller, including at least one of the one or more processors,

No.	Element
	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
24.7	memory storing instructions that, when executed by one or more processors of the controller, enable the controller to:
24.8	determine first coordinates corresponding to an other vehicle, based on the coordinate-specific information;
24.9	select a cluster of the LEDs that emit light toward at least a portion of the other vehicle based on the LEDs having emission aimings associated with the first coordinates; and
24.10	change emission of the selected cluster of LEDs relative to emission of other LEDs not included in the cluster to create headlamp illumination that preserves a first level of illumination illuminating past the other vehicle while preventing glare to a driver of the other vehicle.
25.	25. The illuminating device of claim 24, wherein: the changed emission includes a change to at least one of intensity or

No.	Element
	color or a change of at least one LED of the cluster to a non-emitting state; and the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs.
26.	26. The illuminating device of claim 24, wherein the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller 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 at least one headlamps.
27.	27. The illuminating device of claim 26, wherein: the changed emission includes a change to at least one of intensity or color or a change of at least one LED of the cluster to a non-emitting state; the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs; and the memory further stores instructions that, when executed by one or

No.	Element
	more processors of the controller, enable the controller to accommodate the road curvature by changing illumination in at least a direction of the road curvature by adaptation of the light pattern in at least one of color, intensity or spatial distribution by modification of light associated with one or more of the LEDs.
28.	28. The illuminating device of claim 26, wherein the identification of the upcoming road curvature is based at least in part on map data and wherein the adaptation of the light pattern is based at least in part on the map data.
29.	29. The illuminating device of claim 26, wherein the identification of the upcoming road curvature is based at least in part on sensor data provided by one or more of the sensors of the vehicle and wherein the adaptation of the light pattern is based at least in part on the sensor data.
30.	30. The illuminating device of claim 24, further including one or more optical control elements to control light emitted from one or more of the LEDs.
31.	31. The illuminating device of claim 30, wherein the optical control

No.	Element
	elements include at least one of one or more reflectors, refractors or lenses.
32.p	32. An illuminating device having automatic control of light provided to an illuminated area comprising:
32.1	a structure for incorporating illuminating device elements, wherein the structure comprises a motor vehicle;
32.2	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;
32.3	electronic circuitry apparatus for the controlled powering of the LEDs and other of the illuminating device elements;
32.4	one or more processors;
32.5	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 target, at least one of said cameras in communication with power, and

No.	Element
	in communication with at least one of the one or more processors;
32.6	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
32.7	memory storing instructions that, when executed by one or more processors of the controller, enable the controller to:
32.8a	create a beam of diminished illumination illuminating at least a portion of the at least one target with non-glaring illumination, created within a broader field of illumination having different intensity than the beam, by one or more changes to characteristics of first light of a cluster of the LEDs providing the first light directed at the at least a portion and creating the beam,
32.8b	the beam diminished in intensity relative to the broader field of illumination illuminating at least above and on both sides of the beam; and

No.	Element
32.9	follow, based at least in part on data from one or more of the cameras, the at least one target with the diminished illumination as the at least one target changes location relative to the motor vehicle.
33.	33. The illuminating device of claim 32 wherein: the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller to select the cluster of LEDs based at least in part on known aimings of the first light associated with the first cluster having a correlation to the at least the portion, the known aimings based at least in part on at least one of known directionality of light emitted by the first cluster or known directionality of light emitted by the first cluster exiting the headlamp; the data includes image data; the one or more changes to characteristics of the first light include a change to at least one of intensity or color or a change of at least one LED of the cluster to a non-emitting state; and the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs.
34.	34. The illuminating device of claim 32, wherein the memory further

No.	Element
	stores instructions that, when executed by one or more processors of the controller, enable the controller 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 at least one headlamps.
35.	35. The illuminating device of claim 34, wherein: the one or more changes to characteristics of the first light include a change to at least one of intensity or color or a change of at least one LED of the cluster to a non-emitting state; the cluster includes a plurality of the LEDs and the cluster includes non-contiguous LEDs; the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller to select the cluster of LEDs based at least in part on known aimings of the first light associated with the first cluster having a correlation to the at least the portion, the known aimings based at least in part on at least one of known directionality of light emitted by the first cluster or known

No.	Element
	directionality of light emitted by the first cluster exiting the headlamp; and the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller to accommodate the road curvature by changing illumination in at least a direction of the road curvature by adaptation of the light pattern in at least one of color, intensity or spatial distribution by modification of light associated with one or more of the LEDs.
36.	36. The illuminating device of claim 34, wherein the identification of the upcoming road curvature is based at least in part on map data and wherein the adaptation of the light pattern is based at least in part on the map data.
37.	37. The illuminating device of claim 34, wherein the identification of the upcoming road curvature is based at least in part on sensor data provided by one or more of the sensors of the vehicle and wherein the adaptation of the light pattern is based at least in part on the sensor data.
38.	38. The illuminating device of claim 32, further including one or more

No.	Element
	optical control elements to control light emitted from one or more of the LEDs.
39.	39. The illuminating device of claim 38, wherein the optical control elements include at least one of one or more reflectors, refractors or lenses.
40.p	40. (New) An illuminating device having automatic control of light provided to an illuminated area comprising:
40.1	a structure for incorporating illuminating device elements, wherein the structure comprises a motor vehicle;
40.2	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;
40.3	electronic circuitry apparatus for the controlled powering of the LEDs and other of the illuminating device elements;
40.4	one or more processors;
40.5	one or more sensors, including one or more cameras, placed on the structure for detecting coordinate-specific information about the

No.	Element
	illuminated area and positioned to capture an image of at least two other vehicles, at least one of said cameras in communication with power, and in communication with at least one of the one or more processors;
40.6	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
40.7	memory storing instructions that, when executed by one or more processors of the controller, enable the controller to: determine a first cluster of the LEDs illuminating at least a first portion of a first other vehicle based at least in part on data from one or more of the sensors indicating a first position associated with the first other vehicle; diminish glaring illumination of the first other vehicle by a first change to one or more characteristics of first light of at least the first cluster;

No.	Element
	determine a second, different cluster of the LEDs illuminating at least a second portion of a second other vehicle based at least in part on the data indicating a second position associated with the second other vehicle; diminish glaring illumination of the second other vehicle by a second change to one or more characteristics of second light of at least the second, different cluster, wherein the first and second changes decrease intensity of first emission from the first cluster and second emission from the second cluster relative to a third emission, from the at least one headlamp, illuminating an area between the first and second portion.
40.8a	determine a first cluster of the LEDs illuminating at least a first portion of a first other vehicle based at least in part on data from one or more of the sensors indicating a first position associated with the first other vehicle;
40.8b	diminish glaring illumination of the first other vehicle by a first change to one or more characteristics of first light of at least the first cluster;
40.8c	determine a second, different cluster of the LEDs illuminating at least a

No.	Element
	second portion of a second other vehicle based at least in part on the data indicating a second position associated with the second other vehicle;
40.8d	diminish glaring illumination of the second other vehicle by a second change to one or more characteristics of second light of at least the second, different cluster,
40.8e	wherein the first and second changes decrease intensity of first emission from the first cluster and second emission from the second cluster relative to a third emission, from the at least one headlamp, illuminating an area between the first and second portion.
41.	41. The illuminating device of claim 40, wherein: the data includes image data; at least one of the first or second change to characteristics of light associated with at least one of the first or second cluster of LEDs includes at least one of a change to color, to intensity, or a change of at least one LED of the respective cluster to a non-emitting state; at least one of the first cluster or the second cluster includes a plurality of the LEDs and at least one of the first cluster or the second cluster

No.	Element
	includes non-contiguous LEDs; the determination of the first cluster includes selection of the first cluster based at least in part on known aimings of light associated with the first cluster having a correlation to the first position, the known aimings based at least in part on at least one of known directionality of light emitted by the first cluster or known directionality of light emitted by the first cluster exiting the headlamp; and the determination of the second cluster includes selection of the second cluster based at least in part on known aimings of light associated with the second cluster having a correlation to the second position, the known aimings based at least in part on at least one of known directionality of light emitted by the second cluster or known directionality of light emitted by the second cluster exiting the headlamp.
42.	42. The illuminating device of claim 40, wherein the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller to: identify an upcoming road curvature along a road on which the motor

No.	Element
	vehicle is traveling; and accommodate the upcoming road curvature by adaptation of a light pattern of at least one of the at least one headlamps.
43.	43. The illuminating device of claim 42, wherein: at least one of the first or second change to characteristics of light associated with at least one of the first or second cluster of LEDs includes at least one of a change to color, to intensity, or a change of at least one LED of the respective cluster to a non-emitting state; at least one of the first cluster or the second cluster includes a plurality of the LEDs and at least one of the first cluster or the second cluster includes non-contiguous LEDs; the determination of the first cluster includes selection of the first cluster based at least in part on known aimings of light associated with the first cluster having a correlation to the first position, the known aimings based at least in part on at least one of known directionality of light emitted by the first cluster or known directionality of light emitted by the first cluster exiting the headlamp; the determination of the second cluster includes selection of the second

No.	Element
	cluster based at least in part on known aimings of light associated with the second cluster having a correlation to the second position, the known aimings based at least in part on at least one of known directionality of light emitted by the second cluster or known directionality of light emitted by the second cluster exiting the headlamp; and the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller to accommodate the road curvature by changing illumination in at least a direction of the road curvature by adaptation of the light pattern in at least one of color, intensity or spatial distribution by modification of light associated with one or more of the LEDs.
44.	44. The illuminating device of claim 42, wherein the identification of the upcoming road curvature is based at least in part on map data and wherein the adaptation of the light pattern is based at least in part on the map data.
45.	45. The illuminating device of claim 42, wherein the identification of the upcoming road curvature is based at least in part on sensor data

No.	Element
	provided by one or more of the sensors of the vehicle and wherein the adaptation of the light pattern is based at least in part on the sensor data.
46.	46. The illuminating device of claim 40, further including one or more optical control elements to control light emitted from one or more of the LEDs.
47.	47. The illuminating device of claim 46, wherein the optical control elements include at least one of one or more reflectors, refractors or lenses.
48.p	48. An illuminating device having automatic control of light provided to an illuminated area comprising: and
48.1	a structure for incorporating illuminating device elements, wherein the structure comprises a motor vehicle;
48.2	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;

No.	Element
48.3	electronic circuitry apparatus for the controlled powering of the LEDs and other of the illuminating device elements;
48.5	one or more processors;
48.6	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;
48.7	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
48.8	memory storing instructions that, when executed by one or more processors of the controller, enable the controller to:
48.9a	illuminate a portion of at least one object, indicated by data from at least one of the one or more sensors, by selecting a first cluster of the

No.	Element
	LEDs to emit first light directed towards a first area including the at least the portion of at least one object, the first area determined based at least in part on the data, the first cluster selected based at least in part on known aimings of light associated with the first cluster determined to correspond to the first area, and the first light determined based at least in part on classifying the object based at least in part on the data; and
48.9b	control light emitted from the first cluster directed towards the first area to be different in at least one emission characteristic, based on the first light determination, from second light emitted from a second, different cluster of the LEDs, directed towards one or more illuminated second areas at a common elevation with the first area and laterally adjacent to the first area.
49.	49. The illuminating device of claim 48, wherein: the data includes image data; the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller to illuminate the at least the portion with light below at least a predefined glare level;

No.	Element
	the at least one object includes at least one of a pedestrian, a sign, or another vehicle; at least one of the first cluster or the second cluster includes a plurality of the LEDs and at least one of the first cluster or the second cluster includes non-contiguous LEDs; the control of the light emitted from the first cluster includes a change of at least one LED of the cluster to a non-emitting state; the at least one emission characteristic is different following modification by an optical control element; and the known aimings of light associated with the first cluster is based at least in part on known directionality of light emitted by LEDs of the first cluster exiting from the at least one headlamp.
50.	50. The illuminating device of claim 48, wherein the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller 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

No.	Element
	pattern of at least one of the headlamps.
51.	51. The illuminating device of claim 50, wherein: the memory further stores instructions that, when executed by one or more processors of the controller, enable the controller to illuminate the at least the portion with light below at least a predefined glare level; the at least one object includes at least one of a pedestrian, a sign, or another vehicle; at least one of the first cluster or the second cluster includes a plurality of the LEDs and at least one of the first cluster or the second cluster includes non-contiguous LEDs; the control of the light emitted from the first cluster includes a change of at least one LED of the cluster to a non-emitting state; the at least one emission characteristic is different following modification by an optical control element; the known aimings of light associated with the first cluster is based at least in part on known directionality of light emitted by LEDs of the first cluster exiting from the at least one headlamp; and the memory further stores instructions that, when executed by one or

No.	Element
	more processors of the controller, enable the controller to accommodate the road curvature by changing illumination in at least a direction of the road curvature by adaptation of the light pattern in at least one of color, intensity or spatial distribution by modification of light associated with one or more of the LEDs.
52.	52. The illuminating device of claim 50, wherein the identification of the upcoming road curvature is based at least in part on map data and wherein the adaptation of the light pattern is based at least in part on the map data.
53.	53. The illuminating device of claim 50, wherein the identification of the upcoming road curvature is based at least in part on sensor data provided by one or more of the sensors of the vehicle and wherein the adaptation of the light pattern is based at least in part on the sensor data.
54.	54. The illuminating device of claim 48, further including one or more optical control elements to control light emitted from one or more of the LEDs.
55.	55. The illuminating device of claim 54, wherein the optical control

No.	Element
	elements include at least one of one or more reflectors, refractors or lenses.