

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. 10,894,503

Case No.: IPR2023-00197

PATENT OWNER'S RESPONSE TO PETITION

TABLE OF CONTENTS

Table of Authorities	v
List of Exhibits.....	vii
I. Introduction.....	1
II. Overview of the '503 Patent - The Claimed Invention is Directed to an Adaptive Multi-LED Headlight System for Spatially Differentiated Light Distribution Based on the Detection of a Vehicle in the Field of View 3	
III. Prior Art.....	8
A. Beam.....	8
B. Karlsson.....	12
1. Like Beam, Karlsson Operates At Full Intensity Except When Avoiding Glare	12
C. Thominet	13
D. Harbers	13
IV. Level of ordinary skill	14
V. Claim Construction.....	14
VI. The Petition's 41 Sub-Grounds Are Excessive, Underdeveloped and Suffer From a Lack of Particularity Under 35 U.S.C. § 312(a)(3); the Petition Presents Serious Due Process and Fairness Issues	15
A. Ground 1 includes Grounds 1A-1E.....	16
B. Ground 2 includes Grounds 2A-2F	18
C. Ground 3 includes Grounds 3A-3I.....	19
D. Ground 4 includes Grounds 4A-4I.....	20
E. Ground 5 includes Grounds 5A-5G	21
F. Ground 6 includes Grounds 6A-6E.....	23
VII. Claims 60- 62 and 64: 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).....	26
VIII. The Challenged Claims are Patentable.....	30

A.	Grounds 1A-1E: The Proffered Combination Fails to Teach the Aiming Limitations in [20.2]	30
1.	Grounds 1A-1B: Beam Does Not Teach Directional Light Sources Having Different Aimings	30
2.	Grounds 1C-1E: Even Combined, Beam and Thominet Fail to Teach the Aiming Limitation	35
a.	Sub-ground 1C does not meet the limitations of the claims	35
b.	Petitioner’s Motivation to Combine is Flawed for 1C	36
c.	The Ground 1C Combination Is Unsuitable As It Reduces Forward Illumination	37
d.	Ground 1D-1E Absent Thominet’s Software, the Combination Is Incapable of Achieving Segmentation	38
e.	Grounds 1D-1E- The Petition Offers No Rationale For the Addition of Thominet’s Optional Curved Array	39
(1)	The Petition Omits the Needed Proofs	39
(2)	The Optional Curved Array Is Lacking Both a General and Specific Motivation to Combine	40
(3)	Ground 1C Lacks a Cogent Explanation of “How” the Combination Results in a Functional System	43
B.	Grounds 1A-1E: Neither Beam Nor Beam-Thominet Teach the Detected Vehicle Limitations of Claim 20	47
1.	Grounds 1A-1E Lack the Ability to Detect a Vehicle	48
2.	Because a Vehicle is Not a Species of the Light Genus, Genus/Species Law Does Not Apply	49
C.	Grounds 1A-1E: The Proffered Combinations Also Fail to Teach the Output Limitations in [20.11-20.13]	52
D.	Grounds 1A-1E : Beam Does Not Determine Illumination of the First and Second Subsections in [20.9]/[59.7]	52

E.	Ground 1- Dependent claim 25	53
F.	Ground 2: Even combined, Beam, Thominet, and Stam Fail to Teach the “Predefined Illuminance” Limitation in Claims 59 and 63-64, And Beam’s Failings Further Render the Proofs Deficient	54
1.	Sub-grounds 2A and 2D Inherit Deficiencies of Sub-ground 1C.....	54
2.	Sub-grounds 2B and 2E Inherit Deficiencies of Sub-ground 1D	54
3.	Sub-grounds 2C and 2F Inherit Deficiencies of Sub-ground 1E.....	55
4.	Sub-grounds 2A-2F All Inherit Beam’s Failures.....	55
5.	Grounds 2D-2F: There Is No Motivation to Combine Blanked Subsections With A Predefined Illuminance Level.....	56
6.	Petitioner Fails to Prove at Least Limitations 58.8-58.9	56
G.	Ground 3: Dependent Claims 21-23 The Beam-Thominet-Kobayashi Combination Does Not Teach All Claim Limitations	58
1.	Grounds 3A-3I Inherit Deficiencies of Sub-grounds 1C-1E	58
2.	Sub-grounds 3A-3I All Inherit Beam’s Failures	58
3.	Beam-Thominet-Kobayashi Is Never Shown to “Increase” Illumination as Required in Claims 21-23	58
H.	Ground 4: Even Combined, Beam, Thominet, Stam and Kobayashi Fail to Teach Claims 60-62	61
1.	Sub-grounds 4A-4I Inherit Deficiencies of Sub-grounds 1C-1E	61
2.	4A-4I Are Duplicative of Ground 2, Sections 1-3.....	61
3.	The Ground 4 Argument Omits Material Limitations in Claims 60-62	61
I.	Ground 5- Karlsson or Karlsson-Harbers Applied to Claims 20-25 and 59-64.....	61

1.	Grounds 5F-5G There is no Motivation to Merely Use the Curve of Harbers	62
2.	Absent Harbers’ Software, Ground 5E Lacks the Ability to Segment and Presents Color-Shifting Issues	62
3.	Grounds 5C-5D/5F Are Unmotivated Combinations Due to the Unaddressed Issues Arising From Conflicting Control Strategies.....	63
4.	Ground 5F Lacks Necessary Particularity	63
J.	Karlsson’s Failings Alone Are Sufficient To Defeat All Proposed Grounds Utilized Against Claims 20-25 and 59-64.....	64
K.	Grounds 5A-5B, 5F-5G: Karlsson Does Not Teach Directional Light Sources Having Different Aimings	65
L.	Grounds 5C-5G: Even Combined, Karlsson and Harbers Fail to Teach the Aiming Limitation in All Claims	67
M.	Ground 5A-5G: Karlsson Fails to Teach the Detected Vehicle Limitation	69
N.	Ground 6 – Even Combined, Karlsson, Harbers, and Gotou Fail to Teach Claims 21-23 and 60-62	71
1.	Grounds 6A-6E inherit issues from 5C-5G	71
2.	Grounds 6A-6E inherit issues from Proofs of Claims 20 and 59 Reliant On Karlsson	71
3.	Combining Gotou with 6A, 6B, 6D Results in Multiple, Incompatible Control Functions	72
4.	Ground 6E Has No Directional Control	73
5.	Grounds 6B-6C Suffer From Color Shifting Issues	74
IX.	Conclusion	75
	Certificate of Service	76
	Certificate of Compliance Pursuant to 37 C.F.R. § 42.24	77
	Appendix A	78
A.	Listing of All Challenged Claims	78

Table of Authorities

Cases

<i>Adaptics Ltd v. Perfect Co.,</i> IPR2018-01596 (PTAB March 6, 2019)	17, 19, 24
<i>EnergySource Minerals, LLC. v. TerraLithium LLC,</i> IPR2019-01607 (PTAB May 4, 2020)	24
<i>Ethicon LLC v. Intuitive Surgical Inc.,</i> 2021 WL 3716397 (Fed. Cir. 2021)	40
<i>Harmonic Inc. v Avid Tech., Inc.,</i> 815 F.3d 1356, (Fed. Cir. 2016)	24
<i>Intel Corp. v. PACT XPP Schwiez AG,</i> 61 F.4th 1373, (Fed. Cir. 2023)	38, 42, 43
<i>InVue Sec. Prods., Inc. v. Mobile Tech., Inc.,</i> IPR2019-00078, (PTAB May 1, 2019)	24
<i>Microsoft Corp. v. IPA Techs. Inc.,</i> 2022 WL 989403, (Fed. Cir. Apr. 1, 2022)	26, 28
<i>MModal LLC v. Nuance Commc'ns, Inc.,</i> 846 F. App'x 900 (Fed. Cir. 2021)	30
<i>Pernix Ireland Pain DAC v. Alvogen Malta Operations Ltd.,</i> 323 F. Supp. 3d 566 (D. Del. 2018)	51
<i>Persion Pharm. LLC. v. Alvogen Malta Operations Ltd.,</i> 945 F.3d 1184 (Fed. Cir. 2019)	51
<i>SAS v. Iancu,</i> 138 S. Ct. at 1355, 1357 (2018)	15
<i>Verizon Bus. Network Servs. Inc. v. Huawei Techs. Co. Ltd.,</i> IPR2020-01080 (PTAB Jan. 12, 2022)	30

<i>VirnetX Inc. v. Apple Inc.</i> , 665 F. App'x 880 (Fed. Cir. 2016)	51
--	----

<i>Xerox Corp v. Bytemark, Inc.</i> , IPR2022-00624, (PTAB August 24, 2022)	68
--	----

Statutes

35 U.S.C. § 312(a)(3)	15, 24, 26, 27, 28, 30
-----------------------------	------------------------

35 USC § 314(a)	25
-----------------------	----

Other Authorities

Consolidated Trial Practice Guide	25
---	----

Rules

37 C.F.R. § 42.22(a)(2)	26, 28, 30
-------------------------------	------------

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. 10,894,503, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00197, Paper 1, November 30, 2022
2005	Petition challenging U.S. Patent No. 10,894,503, <i>Volkswagen Group of America, Inc. v. Yechezkal Evan Spero</i> , IPR2023-00328, Paper 2, December 16, 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	Petition challenging U.S. Patent No. 9,995,551, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies LLC</i> IPR2023-00318, Paper 2, December 22, 2022
2009	Declaration of Dr. Jiao, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies LLC</i> IPR2023-00318, Exhibit 1003.
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

Exhibit No.	Description
	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/)
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, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies LLC</i> , IPR2023-00315, IPR2023-00318.
2019	Intentionally left blank
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	Intentionally left blank.

Exhibit No.	Description
2024	Intentionally left blank.
2025	Transcript of Deposition of Jianzhong Jiao, PhD taken on October 3, 2023, <i>Volkswagen Group of America, Inc. v. Torchlight Technologies</i> , IPR2023-00197

Patent Owner submits the following (“Response”) to the Petition (Paper 1) for *Inter Partes Review* of claims 20-25 and 59-64 (“Challenged Claims”) of U.S. Patent No. 10,894,503 B2 (Ex.1001, “the ’503 Patent”) filed by Volkswagen Group of America, Inc., (“VW” or “Petitioner”), and the Board’s Institution Decision (“DI”, Paper 13).

I. Introduction

This Petition — one of three directed to the ’503 Patent — presents six formal Grounds to challenge 12 claims. Incredibly, by sprinkling a plethora of “alternatively, additionally or either” arguments, the six Grounds conservatively incorporate 41 sub-grounds. Given the permutations of intermingled argument, the Petition is difficult to fully unpack and respond to — raising serious fairness and due process issues that epitomize the challenges that arise from a lack of particularity. To avoid further prejudice, Patent Owner groups the 41 Grounds to identify common arguments, so each Ground is responded to, and provides a multi-page chart to decode the Grounds. Exacerbating the Petition-level problems, the proposed combinations further lack particularity in both combination and application. Because Petitioner expressly relies on the reference combinations to map claim limitations without acknowledging any shortcomings or deficiencies in the references, it is not clear which teachings of each reference is combined for any given claim.

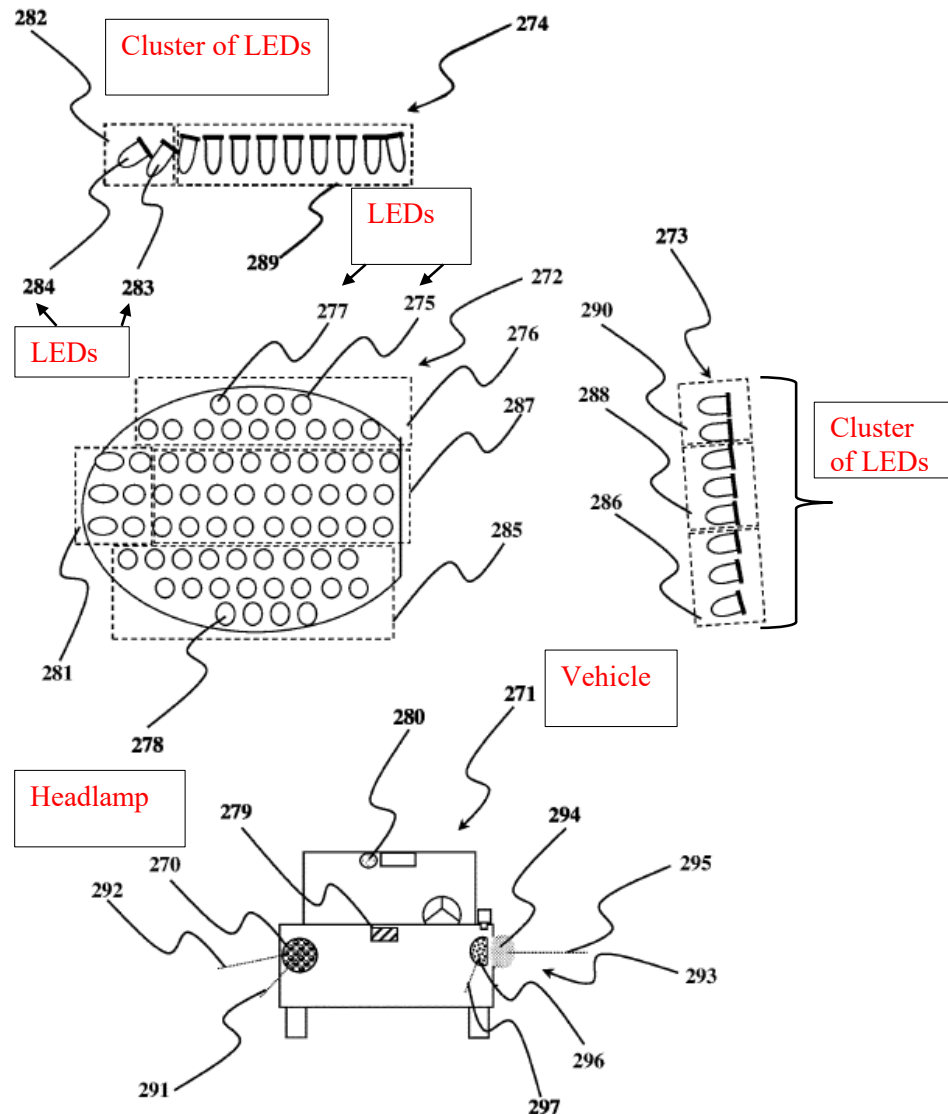
On the merits, Petitioner often conflates claims and presents arguments for a representative claim — leading to omission of entire limitations and incomplete proofs for claims 61, 62 and 64. All independent claim grounds lack directional light sources having different aimings and lack the ability to section a field of view and differentially illuminate sections that include a detected vehicle. Additionally, the dependent claims include a multitude of precise control features which the combinations fail to teach.

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 derived the alleged combinations. Petitioner identifies no rational reason to combine the references in the specific ways it alleges, such as when removal of software for a hardware alternative removes all functionality 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. The proffered combinations require incompatible and excessive modifications to the prior art — which neither the Petition nor the expert declaration justify — often due to contemporaneous conflicting functionality. The proffered combinations further render the primary references unsuitable for their stated purposes.

In sum, Petitioner has failed to meet its burden of proof.

II. Overview of the '503 Patent - The Claimed Invention is Directed to an Adaptive Multi-LED Headlight System for Spatially Differentiated Light Distribution Based on the Detection of a Vehicle in the Field of View

The '503 Patent is directed to “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, 11:11-16.) The '503 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.*, 2:67-3:5; Ex.2006, ¶47-48.)



(Ex.1001, FIG 15, Annotated)

“The added controllability offered by breaking the total light output up into discrete (‘digital’) specifically aimable 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.*, 11:61-67, emphasis added; Ex.2006, ¶47-48.)

More specifically, the '503 Patent describes methods of using a multi-LED light source to segment a field of view and deliver varied, optimized illumination to the different segments within the field of view based on the presence of a detected object therein, “covering a wide scope of applications”, including transportation. (*Id.*, 11:18-21, 4:20-24, 50:40-41; Ex.2006, ¶47-48.) A room lighting example describes how the invention uses the multi-LED light source “with finely controlled light delivery to assist people to better see objects or carry out visual tasks such as reading:” (Ex.1001, 65:2-16; Ex.2006, ¶47-48.) “Using machine vision technology known in the art such as neural networks training and other pattern recognition techniques the vision system has sensor, algorithmic and computational means for identifying devices or objects.” (Ex.1001, 52:58-53:8, 64:52-55; Ex.2006, ¶47-48.)

Additionally, a spatially differentiated illumination pattern can be determined to differently illuminate segments of a field of view based on the detection of an object:

Using color and pattern recognition techniques it is possible to determine what is a sign. It is then possible to provide the equivalent of “task lighting” and 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.

(Ex.1001, 53:3-8.)

The claimed invention of the '503 Patent is thus directed to multi-LED headlight systems that precisely determine anti-glaring illumination output to optimize illumination for the vehicle operator under a myriad of driving situations, whilst reducing glaring illumination for oncoming vehicles.(Ex.2006, ¶52.)

The Challenged Claims include independent claims 20 and 59. Independent claim 20 is representative and reproduced with emphasis added to the Aiming Limitation, Detected Vehicle Limitation and the Output Limitation (defined below):¹

20. A vehicle headlight system comprising:

one or more headlamps affixed to a vehicle, each headlamp including at least three directional light sources aimed at different angles relative to the vehicle, the light sources configured to have one or more controllable light characteristics, wherein a first light source of the more than one light sources at a first angle is less visually

Aiming
Limitation

¹ Petitioner asserts the '503 Patent Claims are not entitled to the earliest claimed priority date. (Pet. at 4.) Petitioner's argument is irrelevant because all applied references predate the earliest claimed priority date of the '503 Patent. Therefore, Patent Owner does not further address Petitioner's assertions in this response but reserves the right to do so if they become relevant.

disturbing to traffic than a second light source of the more than one light sources aimed at a second angle, different from the first angle;

control circuitry configured to adjust the at least one light characteristic of at least one of the directional light sources;

one or more sensors configured to sense information defined as pertinent to determining illumination output from the one or more headlamps and communicating the sensed information to a processor as sensor data;

the processor, in communication with at least the sensors and the control circuitry, configured to:

process the sensor data to determine, within a field-of-view, at least a first subsection including a detected vehicle and at least a second subsection not including the detected vehicle,

**Detected
Vehicle
Limitation**

determine optimal use of the differently aimed directional light sources to maximize vehicle operator visibility in at least the second subsection, while minimizing a disturbing effect, resulting from the illumination output, on the vision of other traffic in at least the first subsection, and

**Output
Limitation**

direct the control circuitry to adjust the directional light sources to achieve the determined optimal use.

(Ex.1001, claim 20.)

The dependent claims include additional innovative features that specify illumination strategies for a myriad of driving situations — for example, increasing

illumination in a direction of the road curvature or a turn (claims 21 and 23)
(Ex.2006, ¶54.)

III. Prior Art

A. Beam

Beam discloses a complete but generalized solution for “Adaptive/Anti-Blinding Headlights” (AABH) and is directed to a system that provides a multiplicity of microbeams that “operate at maximum intensity at all times” allowing “the driver to have the equivalent of high beam headlights or brighter on at all times, greatly enhancing the ability to see at night.” (Ex.1005, 6:11-12, 6:40-44, 6:54-56; Ex.2006, ¶¶60-69.) The AABH system in Beam is provided via two distinct embodiments: 1) Figures 2 and 5, where emission from a single lamp is controlled by a spatial light modulator (SLM); and 2) the Figure 4 and 6 embodiment, where an LED array **replaces** the single lamp and SLM of Figures 2 and 5, and emission is controlled through blanking or termination Ex.1005, 5:3-6.) (Ex.2006, ¶¶60-69)

In both instances, Beam’s strategy is the same – to darken, i.e., blank, light aimed at a discrete area. The location of the blanked area is determined based on detected light (Ex.1005, 4:53-59.), and a headlamp beam maximally illuminates the remainder of the space ahead of the vehicle. (Ex.1005, 3:25-28.) While spillover light may result in non-zero illumination within the area to be blanked,

the controller blocks or terminates emission aimed at the area, respectively using the SLM in Fig. 2 or controlling certain LEDs in Fig. 4. (Ex.1005, 4:48-52; Ex.2006, ¶¶60-69.)

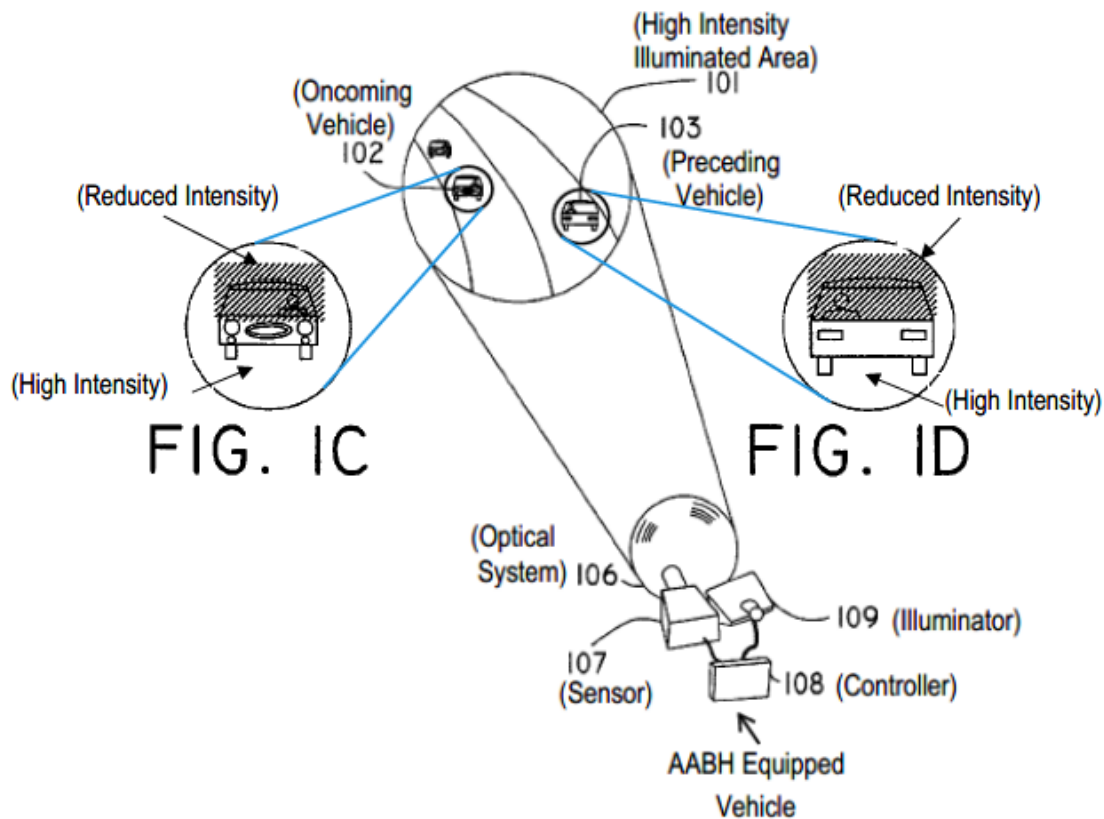
In the SLM embodiment of Fig. 2, because Beam only has a single light source responsible for the whole scene, the SLM selectively attenuates segments of lamp emission called microbeams, to **prevent** exitance of the attenuated microbeams. (Ex.1005, 5:61-66.) The SLM adjusts the angular position of attenuated microbeams to redirect them back within the lamp, which has the effect of preventing certain microbeams from exiting the headlamp – effectively blanking those beams. (Ex.1005, 4:41-50.) The headlamp continues to provide unblocked, maximal light, from the light source, for the remainder of the scene. (Ex.1005, 6:40-44 Ex.2006, ¶¶60-69.)

In the LED array embodiment, Beam **replaces** the lamp 201 and SLM 203 with an LED array 401 that achieves comparable results (Ex.1005, 5:3-6.) The LED array can effectively “self-attenuate” by terminating emission from single LEDs, rendering the SLM, used for attenuation, superfluous. (Ex.1005, 5:3-16, Fig. 4 Ex.2006, ¶¶60-69.)

Beam determines which portions of emission to block for Fig. 2 or which LEDs to extinguish for Fig. 4. Both approaches have several effects — light aimed at a region (determined by drawing a box above two detected light sources) is

blanked and remaining light (unblocked lamp emission or emission from unextinguished LEDs) is left uncontrolled to maximally illuminate the scene. However, neither embodiment discloses changing the emitted direction of any of the microbeams. (Ex.1005, 5:3-16, Fig. 4. ; Ex.2006, ¶¶60-69)

Accordingly, Beam provides significantly **reduced** illumination only in those portions of the headlight beam that would otherwise dazzle or annoy other drivers. (Ex.1005, 3:8-15, 6:40-44.) This is accomplished by “**darken[ing]** those microbeams that would otherwise illuminate areas near to the source of the impinging beam, thus eliminating the blinding of a driver in an oncoming vehicle, while continuing to provide intense forward illumination.” (Ex.1005, 1:14-19, Claims 4, 5; Ex.2006, ¶¶60-69.) This is further confirmed in Figures 1C-1D, below, which identify the shaded areas, which are blanked or darkened, as having “reduced intensity” relative to the remaining high intensity illumination areas. (Ex.1005, 4:10-25 Ex.2006, ¶¶60-69.)



(Ex.1005, FIGs. 1, 1C, 1D, Annotated)

Beam is clear, beginning with the title and extending throughout the detailed description and claims, that it is an anti-blinding system that **darkens or blanks** individual microbeams to —prevent certain emission based on the detected light, e.g., from an oncoming vehicle, preceding vehicle streetlight and/or any other light source. Beam thus binarily toggles between high/maximum intensity and blanking. (Ex.2006, ¶113.) Despite contradictory statements, Petitioner admits as such. *See*, IPR2023-00328 at 44, 21, where Petitioner equates blanking with 1) “**prevent[ing]** illuminating certain areas” and 2) “**extinguishing** multiple rays of light”; the Jiao deposition testimony is in accord, repeatedly equating

“blanking, dimming and reduced in intensity.” (Ex.2025 at 9, 10, 12, 13.)

B. Karlsson

Karlsson discloses a “Lighting Device Having a Controllable Lighting Pattern,” wherein light sensors are interspersed with the LED “spotlight beams” to provide anti-blinding functionality, and the LEDs are dimmed during light sensor measurements so light from the LEDs doesn’t interfere with detecting light from oncoming traffic. (Ex.1010, Abstract, 2:10-29; Ex.2006, ¶87.) Karlsson also discloses a movable window of light that can be used to address glare resulting from vehicle pitching. (Ex.2006, ¶¶88-102.)

1. Like Beam, Karlsson Operates At Full Intensity Except When Avoiding Glare

Despite a lack of detail about control, a consistent and reasoned interpretation emerges from the Karlsson reference when viewed in totality along with the referential prior art, contemporaneous evidence and Petitioner’s own admissions (detailed in Section VII.A.1.a. below): Karlsson, like Beam, forms emitted beam 7 (Fig 1) by using the entire beam array at full intensity, except when avoiding glare, at which point, window 50, of reduced illumination (Fig. 14) is created to address glare situations. (Ex.2006, ¶88.) Per Karlsson, this configuration creates a light beam that is “optimally adapted,” where main beams are optimized for long range illumination (Ex.1010, 1:19-20, 9:18-26) and “constant” main beam

usage is “highly desirable” (*Id.*, 1:21-24, 9:18-26). Karlsson’s removal of situational glare permits this. (Ex.2006, ¶88.)

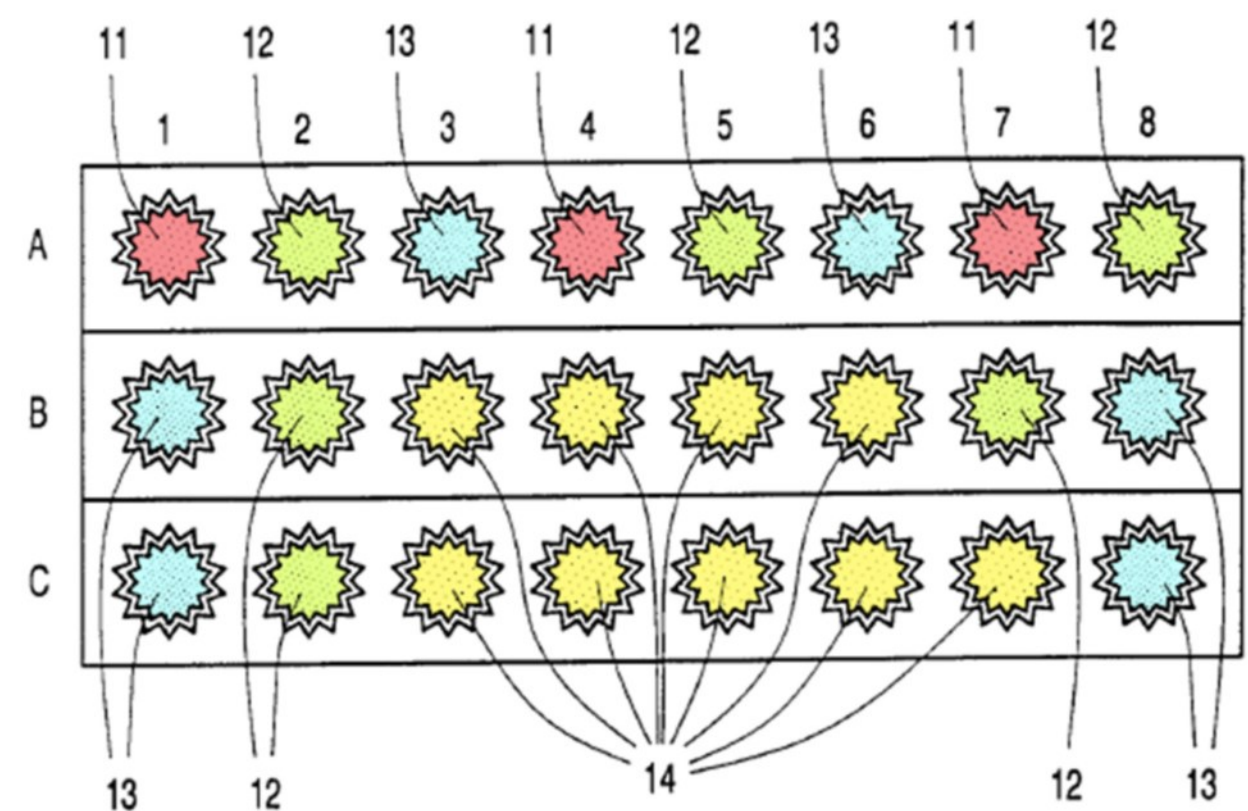
C. Thominet

Like Beam, Thominet discloses an array of LEDs with independently controllable intensity. However, unlike the Beam AABH system that uses the entire LED array to provide high beam illumination across the field of view (other than in areas of detected incoming light), Thominet discloses the concept of assigning different LEDs within the LED array to provide “different illumination functions (low beam, high beam, low sight, large width).” (Pet. at 15; Ex.2006, ¶71)

While Thominet discloses that LEDs can be arranged in one plane or distributed “over a concavely curved surface or a stepped surface,” Thominet does not suggest any advantages, disadvantages, functional differences or other reasons to select any of the possible arrangements for any particular application. (Ex.1006, claim 8, [0018] ; Ex.2006, ¶71.)

D. Harbers

Harbers discloses a headlamp system having fixed, planar LED arrays with groups of LEDs associated with different illumination functions. (Ex.2006, ¶103-107.) Harbers also uses different colored LEDs in its array. (*Id.*, 7:1-5, 50-67).



[Ex.1011, FIG 2]

IV. Level of ordinary skill

Patent Owner does not dispute the Board’s reframing of Petitioner’s proposed level of ordinary skill; the modification should have no effect on the analysis. (See Pet. at 9.)

V. Claim Construction

Patent Owner agrees that, within the context of the ’503 Patent, the plain meaning of *light source* is “any system that is capable of receiving an electrical signal and producing light in response to the signal.” (DI, 8.)

VI. The Petition’s 41 Sub-Grounds Are Excessive, Underdeveloped and Suffer From a Lack of Particularity Under 35 U.S.C. § 312(a)(3); the Petition Presents Serious Due Process and Fairness Issues

As the Supreme Court explained in *SAS*, “the petitioner is master of its complaint” and “the petitioner’s contentions . . . define the scope of the litigation all the way from institution through to conclusion.” *SAS v. Iancu*, 138 S. Ct. at 1355, 1357 (2018). In this case, Petitioner chose to present 41 Sub-Grounds within the nominal framework of six Grounds. The utter lack of particularity is detailed below in a multi-page summary that explains the implications of each of the “additionally, alternatively and either” styled arguments — providing a tally of the Sub-Grounds that Patent Owner was able to discern after a myriad of exhaustive reviews.

While Patent Owner previously noted multiple lumped/sub-grounds within each of Petitioner’s enumerated “Grounds,” Patent Owner did not fully appreciate the extent of the problem until attempting to respond to all purported grounds for all claims. Patent Owner apologizes for not better appreciating this issue in its Preliminary Response, or its Request to the Director.

Patent Owner lists below the alternative sub-grounds in the Petition. While the Expert Declaration is also replete with “additionally or alternatively” styled statements because Petitioner excluded those words from its Petition, Patent Owner

assumes Petitioner will not attempt to rely on these alternative combinations in its Reply². Based solely on the combinations seemingly described in the Petition, Patent Owner identifies at least **forty-one sub-grounds** to address **twelve claims**.

Patent Owner outlines the origin of each of these sub-grounds below, along with an accounting.

A. Ground 1 includes Grounds 1A-1E

Petitioner states that Beam “explicitly or implicitly discloses every feature in claims 20 and 24-25.” (Pet. at 23.) This argument includes two sub-arguments, one for each of Beam’s embodiments — 1) SLM+Lamp and 2) LED Array. (*Id.*, 23-24, EX1003, ¶¶118-120.)

Ground 1A	Beam SLM+Lamp
Ground 1B	Beam LEDs

Petitioner next states that it would have been obvious to implement Thominet’s directional beam regions through “**either** software **or** hardware.” Thominet’s software is described as an additional control technique for Beam,

² Patent Owner notes that if Petitioner relies on the “additionally and alternatively” statements in the Expert Declaration, then the total number of grounds spirals to **well over one-hundred**, given the exponential compounding effect resulting from using these combinatorial phrases.

pointing to Beam’s SLM 203 in illuminator 109. (Pet. at 26.) Ultimately, this ground is described as being “implemented with Beam’s controller 108/illuminator 109(including SLM 203).” (*Id.*, 29; Ex.1003, ¶126.)

Ground 1C	Beam_SLM+Lamp	Thominet_Software (SW)
-----------	---------------	------------------------

Then, Petitioner states that “**additionally or alternatively**, a POSA would have sought to incorporate known components ... of Thominet’s ... light sources ... into Beam’s system (with flat array of light sources).” (Pet. at 30.) To be clear, “additionally or alternatively” is the same as “and/or,” and this creates three possible alternatives each time it is used, A, B, A+B. (*See Adaptics Ltd v. Perfect Co.*, IPR2018-01596, Paper 20 at 18 (PTAB March 6, 2019) (informative). Even worse, Petitioner presents two possible hardware (HW) modifications, either “substitution” of Thominet’s array for Beam’s or “modification” of Beam’s substrate. (Pet. at 32.) Accordingly, **both** possibilities have to be considered “additionally or alternatively” to the software combination. Making the situation incredibly complicated is the fact that the software sub-grounds were presented with respect to an SLM+Lamp embodiment of Beam, and the Hardware modifications are done with respect to the LED array of Beam, meaning that the “additional” versions of the “additional or alternative” sub-grounds seem to implicate usages of **both** light sources.

Put another way, if:

- A is Beam_SLM+LAMP+Thominet_SW and
- B is Beam_LED+HW+Thominet_HW then
- A+B (“additionally”) is SLM+LAMP+LED+Thominet_HW (**both light sources**).

Also, in the “both light source” “additional” combinations, Thominet_HW is either replacing **or** modifying Beam’s LED, which, as noted above, exists in **addition** to the Lamp+SLM in those combinations. Since no LED+SLM combination, as well as no Lamp+LED+SLM, was ever described for Beam, Patent Owner is going to forego **listing** of these combinations.

The “alternative” modifications actually presented using the Thominet HW were all to Beam’s LED array (either through “replacement” or curving) and this brings the sub-grounds for Ground 1 to a total of **five**.

Ground 1D	Beam_Control		Thominet_Array
Ground 1E	Beam_LEDs		Thominet_Curve

B. Ground 2 includes Grounds 2A-2F

Ground 2 fails to disclose **which** “Beam-Thominet” combination (1C-1E) “discloses every feature in claims 59 and 63-64,” and likewise **which** Beam-Thominet ground is being combined with Stam. (Pet. at 53-64.) Ultimately, this

results in **six** additional sub-grounds for Ground 2, bringing the total to **eleven**:

2A	Beam Lamp+SLM	<u>Thominet SW</u>		
2B	Beam Control		<u>Thominet Array</u>	
2C	Beam LEDs		<u>Thominet Curve</u>	
2D	Beam Lamp+SLM	Thominet SW		Stam
2E	Beam Control		Thominet Array	Stam
2F	Beam LEDs		<u>Thominet Curve</u>	Stam

Beam alone was never stated as an applicable sub-ground.

C. Ground 3 includes Grounds 3A-3I

Ground 3 also fails to specify **which** Beam-Thominet sub-ground is being combined with Kobayashi. (Pet. at 64.) Then, Petitioner uses an “and/or” clause when describing which “components” of Kobayashi to include (“road profile calculating means 2 and/or vehicle advancing direction means 3”) creating **three** possible sub-combinations (*Id.*, 65; *see Adaptics Ltd.*, IPR2018-01596, Paper 20 at 24.) – noting impact of “and/or” clauses in rejections. Thus, Petitioner created combinations combining:

- 1) Sub-grounds 1C-1E with Map-Data and Kobayashi Road Profile Means 2;
- 2) Sub-grounds 1C-1E with Map-Data and Kobayashi Means 2 “**and**” Advancing Direction Predicting Means 3;
- 3) “**or**” Sub-grounds 1C-1E with Map-Data and Kobayashi Means.

This creates **nine** sub-grounds within Ground 3, bringing the total to **twenty**.

(Pet. at 64-76.)

3A	Beam_Lamp+SLM	Thominet Software		Map-Data	Means 2	
3B	Beam_Control		Thominet LEDs	Map-Data	Means 2	
3C	Beam_LEDs		Thominet Curve	Map-Data	Means 2	
3D	Beam_Lamp+SLM	Thominet Software		Map-Data		Means 3
3E	Beam_Control		Thominet LEDs	Map-Data		Means 3
3F	Beam_LEDs		Thominet Curve	Map-Data		Means 3
3G	Beam_Lamp+SLM	Thominet Software		Map-Data	Means 2	Means 3
3H	Beam_Control		Thominet LEDs	Map-Data	Means 2	Means 3
3I	Beam_LEDs		Thominet Curve	Map-Data	Means 2	Means 3

D. Ground 4 includes Grounds 4A-4I

Ground 4 also fails to specify **which** Beam-Thominet-Stam combination is being combined with Kobayashi, and thus imports each of sub-grounds 2D-2F into the possible “and/or” combinations explained for Kobayashi. (Pet. at 76.) This brings the Sub-Ground total to **twenty-nine** with **nine** more sub-grounds having been created.

4A	Beam_Lamp+SLM	Thominet Software		Stam	Map-Data	Means 2	
4B	Beam_Control		Thominet LEDs	Stam	Map-Data	Means 2	
4C	Beam_LEDs		Thominet	Stam	Map-	Means	

			Curve		Data	2	
4D	Beam_Lamp+SLM	Thominet Software		Stam	Map-Data		Means 3
4E	Beam_Control		Thominet LEDs	Stam	Map-Data		Means 3
4F	Beam_LEDs		Thominet Curve	Stam	Map-Data		Means 3
4G	Beam_Lamp+SLM	Thominet Software		Stam	Map-Data	Means 2	Means 3
4H	Beam_Control		Thominet LEDs	Stam	Map-Data	Means 2	Means 3
4I	Beam_LEDs		Thominet Curve	Stam	Map-Data	Means 2	Means 3

E. Ground 5 includes Grounds 5A-5G

Ground 5 states “Karlsson explicitly or implicitly discloses every feature recited in claims 20...,” establishing at least one Karlsson only ground. (Pet. at 76.) Karlsson is also described as including “LEDs... and **may** also be made up of... light modulator means” — the use of a “may” clause requires Patent Owner to treat this argument as two separate Sub-Grounds (Pet. at 77.)

5A	Karlsson_LEDs
5B	Karlsson_LEDs+Modulator

Turning to the Harbers combination, Petitioner states that it would have been obvious to implement Harbers beam segments “through **either** software **or** hardware...” creating at least two more sub-grounds (Pet. at 80.)

For the software aspect, Petitioner argues that the Harbers known techniques

of using multiple beam segments for different functions would be implemented with Karlsson's spotlight beams 34 (including light modulator means 3), resulting in one software combination (with 5B) due to the explicit modulator 3 recitation. (Pet. at 84.)

5C	Karlsson_LEDs+Modulator	Harbers_ControlSW
----	-------------------------	-------------------

On the hardware side, Petitioner **again** argues that “**additionally or alternatively**” it would have been known to incorporate Harbers' opto-electronic elements 11-14 into Karlsson's system “with lighting means 2, 3.” (Pet. at 85.) Because the “substitution” is stated as being for “Karlsson's lighting means 2, 3,” any combinations using Harbers LED array swapped for only Karlsson's LEDs 2 are not implicated. (*Id.*, 86.) “Modifications” as noted below, are made to the array 2 of the “lighting means 2, 3.” (*Id.*, 87.) **Seven** total new grounds result from this section, bringing the overall total to **thirty-six**.

5D	Karlsson_Control	Harbers_ControlSW	Harbers_Array (replacement for both 2 and 3 of Karlsson)	
5E	Karlsson_Control		Harbers_Array (replacement for both 2 and 3 of Karlsson)	
5F	Karlsson_LEDs+Modulator	Harbers_ControlSW		Harbers Curve
5G	Karlsson_LEDs+Modulator			Harbers

				Curve
--	--	--	--	-------

F. Ground 6 includes Grounds 6A-6E

Finally, in Ground 6, Petitioner argues that a POSA would have been further motivated to modify “Karlsson-Harbers” to adjust light as in Gotou, but again fails to specify which of the five combinations of Karlsson-Harbers are to be modified with Gotou — adding Gotou to each of sub-grounds 5C-5G. (Pet. at 113-114.)

6A	Karlsson_LEDs+ Modulator	Harbers_ControlSW			Gotou
6B	Karlsson_Control	Harbers_ControlSW	Harbers_Arra y (replacement for both 2 and 3 of Karlsson)		Gotou
6C	Karlsson_Control		Harbers_Arra y (replacement for both 2 and 3 of Karlsson)		Gotou
6D	Karlsson_LEDs+ Modulator	Harbers_ControlSW		Harbers Curve	Gotou
6E	Karlsson_LEDs+ Modulator			Harbers Curve	Gotou

In sum, even under a conservative reading — excluding arguments based on Petitioner’s loose language, very badly presented sub-grounds, or alternative arguments in the Jiao Declaration (Ex.1003), the Petition includes a total of **forty-one** Sub-Grounds.

A Petition must identify “with particularity” the challenged claims, the grounds, and the supporting evidence. 35 U.S.C. § 312(a)(3); *see also Harmonic Inc. v Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016).

Petitioner’s alternative/lumped arguments within each ground are contrary to USPTO policy: “Do NOT ‘suggest’ other proposed rejections in... ‘disclaimer-type’ language” and “Do NOT lump together multiple proposed rejections based on different grounds.” (Ex.2003 at 3.) Such arguments multiply the challenges and “place[] an undue burden on Patent Owner and undercuts its ability to effectively respond...” *EnergySource Minerals, LLC. v. TerraLithium LLC*, IPR2019-01607, Paper 10 at 14 (PTAB May 4, 2020).

This [lack of particularity] require[s]... Patent Owner to scour the Petition to discern Petitioner’s evidence as to each of [the arguments]. [A] Petition that requires... Patent Owner to do so lacks particularity and is tantamount to impermissibly shifting Petitioner’s burden under 35 U.S.C. § 312(a)(3).

InVue Sec. Prods., Inc. v. Mobile Tech., Inc., IPR2019-00078, Paper 7 at 15 (PTAB May 1, 2019); *see also Adaptics Ltd.*, IPR2018-01596, Paper 20 at 24 (“[T]he lack of particularity results in voluminous and excessive grounds,” and “in the interests of efficient administration... and integrity of the patent system and as a matter of procedural fairness to Patent Owner, the entire petition should [have

been] denied under 35 U.S.C § 314(a).”)

This lack of particularity is compounded by Petitioner’s other two petitions challenging the ’503 Patent that suffer the same lack of particularity issues — meaning **Petitioner has asserted at least 149 grounds.** (See Patent Owner’s Responses in IPR2023-00197, IPR2023-00328, IPR2023-00335.) Patent Owner was forced to expend a massive amount of energy identifying and finding ways to deal with large groups of grounds, to which all grounds contributed. Simply because Patent Owner succeeded in this task does not undercut the prejudice in any way — the task itself was prejudicial.

However, "one petition should be sufficient... [while t]wo 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... and efficiency concerns." Consolidated Trial Practice Guide (“CTPG) at 59. “[T]he Board finds it unlikely that circumstances will arise where three or more petitions by a petitioner with respect to a particular patent will be appropriate.” (*Id.*)

This is especially true here, where in all three Petitions, Petitioner challenges the same claims with Beam/Thominet and then again with Karlsson/Harbers. Petitioner asserts that either Beam or Karlsson teaches all limitations at issue and then alternatively relies on Thominet and Harbers respectively to add software or hardware. Petitioner could have easily consolidated the three petitions into one or

two by removing redundant grounds and/or grounds asserting additional art.

In each IPR, Patent Owner was substantially and unnecessarily burdened by having to identify the sub-grounds hidden within each enumerated ground, and having to address the grounds on multiple fronts because it is unclear which of the multiple sub-grounds Petitioner is relying on. This lack of particularity cannot be fixed on reply. *Microsoft Corp. v. IPA Techs. Inc.*, 2022 WL 989403, at *6 (Fed. Cir. Apr. 1, 2022) (Affirming Board’s post-institution lack of particularity finding and refusal to consider Petitioner’s reply arguments to the contrary).

Petitioner’s arguments should be rejected based on finding of lack of particularity.

VII. Claims 60- 62 and 64: 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 frequently alleges that claims are “patentably indistinct” and that “minor phrasing differences do not affect the substantive application of the prior art.” (Pet. at 8, 55, 56, 57, 58, 64, 76, 112, 120, 123.) Problematically, Petitioner: a) fails to identify the differences in language; and b) fails to even suggest why the differences are inconsequential. For example, see the comparison of claim 64 with referential claim 25 (the differences are in bold):

Claim 25	Claim 64
----------	----------

<i>The system of claim 20, wherein at least one of the one or more headlamps further includes at least one of reflectors, refractors, or lenses usable to alter emitted light from at least one of the light sources.</i>	<i>The system of claim 59, wherein at least one of the one or more headlamps further includes at least one of reflectors, refractors, or lenses usable to alter the light emitted from at least one of the light sources as part of the instructed adjustment.</i>
---	---

For claim 64, as the **entire** argument, Petitioner merely state s– “Claims 64 and 25 are patentably indistinct. *Supra* Section VI.D; EX1003, ¶¶293-295 The Petition not only fails to present proofs for the omitted element and fails to establish that the omitted element is immaterial.

Requiring the *reflector, refractor or lenses* to be *usable as part of the instructed adjustment*, means there is some active utilization of at least one of those objects when an adjustment is instructed. The omitted element is material; the failure of proof constitutes an irreparable and fatal error. 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., 2022 WL 989403, at *6(citing 35 U.S.C. § 312 (a)(3), 37 C.F.R. § 42.22(a)(2)).

As with the claims in *Microsoft*, the claims here have material differences on their face, differences ***completely unaddressed*** by Petitioner except with the conclusory statement that “the claims are patentably indistinct.” As such, it is Petitioner’s **initial burden** to **prove** that “differences in claim language” are immaterial to patentability or at least as to how the art was applied “and explain why they do not matter”. And that must be done at the **onset**, so that Patent Owner has a chance to respond: this is not a curable defect that can be addressed in Reply (*Id.*).

This fatal defect applies to the following claims (in the rightmost two columns) which were rejected by analogy, with the **unaddressed, materially different** language noted in bold. The leftmost two columns display the claim language that **was** addressed.

Claim	Language	Claim	Language
25	... reflectors, refractors, or lenses usable to alter emitted light from at least one of the light sources.	64	... reflectors, refractors, or lenses usable to alter the light emitted from at least one of the light sources as

			part of the instructed adjustment.
21	... processor is further configured to ... direct the control circuitry to adjust the directional light sources to increase illumination in a direction of the road curvature.	60	... processors is further configured to ... determine light output that aims illumination in a direction of the road curvature.
22	... processor is further configured to ... to direct the control circuitry to increase illumination illuminating the turn.	61	... processors is further configured to ... determine light output that illuminates the turn.
23	Same as 22	62	Same as 61

In Grounds 2 and 5, Petitioner merely argues that “Claims 64 and 25 are patentably indistinct” from claim 25. (Pet. at 64.) Likewise, in Grounds 4 and 6, Petitioner merely argues that “claims 60 and 21 are patentably indistinct,” “claims 61 and 22 are patentably indistinct,” and finally notes that claims 61-62 are identical.. (Pet. at 76, 123). The above chart establishes that claims 60-62 and 64 are not patentably indistinct from their respective referential claim. Referential claims 21-23 and 25 provide an **instruction** for the control circuitry; by contrast, claims 60-62 and 64 require the processor to **determine light output** — the claims have material differences on their face, differences *completely unaddressed* by Petitioner.

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); *Verizon Bus. Network Servs. Inc. v. Huawei Techs. Co. Ltd.*, IPR2020-01080, Paper 39 at 36 (PTAB Jan. 12, 2022).

Petitioner's failure to complete its proofs for claims 60-62 and 64 constitutes irreparable error under 35 U.S.C. § 312 (a)(3) and 37 C.F.R. § 42.22(a)(2).

VIII. The Challenged Claims are Patentable

Given the myriad of “alternatively, either/or” type arguments or referential arguments, charts are provided in Section VI that lay out the origins of each ground.

A. Grounds 1A-1E: The Proffered Combination Fails to Teach the Aiming Limitations in [20.2]

Independent Claim 20 of the Challenged Claims requires the Aiming Limitation: *each headlamp including at least three directional light sources aimed at different angles [or in 59.2 having different aimings] relative to the vehicle.* Notwithstanding Petitioner's contradictory positions, noted below, regarding the teachings in the applied references, the Aiming Limitation in all Challenged Claims is not met. (Ex.2006, ¶119.)

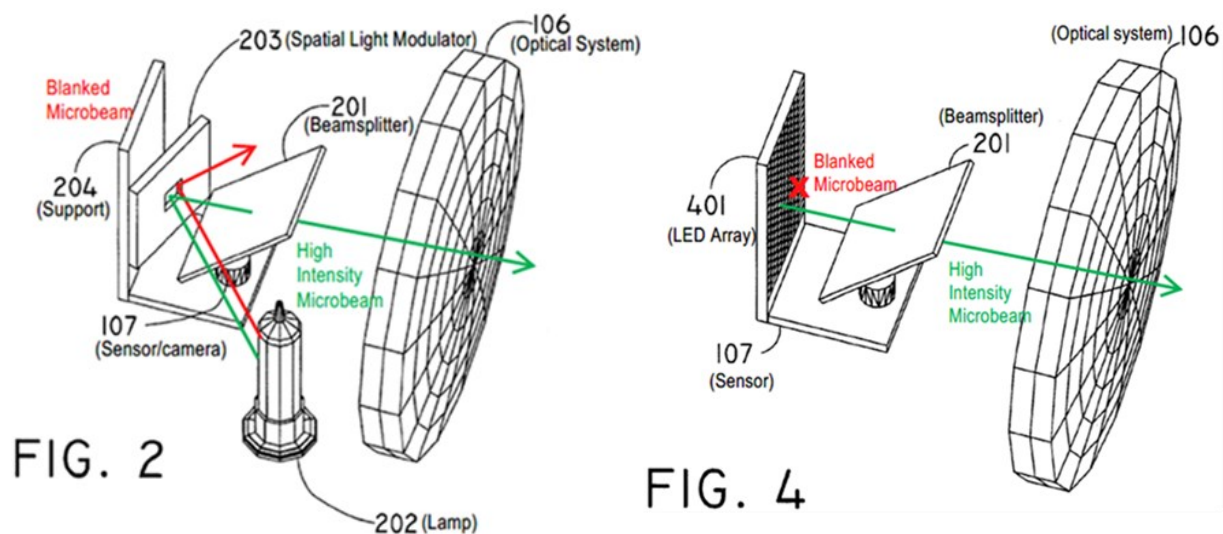
1. Grounds 1A-1B: Beam Does Not Teach Directional Light Sources Having Different Aimings

In Grounds 1A-1B, to satisfy limitations [20.2]/[59.2], Petitioner improperly asserts “each light source of the array has its own independent angular position (angle/aiming), that combines to form the headlamp beam; so, Beam’s array of light sources 401 form at least three directional light sources having different angles/aimings.” (Pet. at 24;Ex.2006, ¶119.) The array, however, is planar with commonly aimed sources and the light source Petitioner shows for Fig. 2 is singular (and omni-directional); neither meets the claim limitations. (Ex.2006, ¶119.)

Petitioner takes two distinctly contradictory positions to satisfy the Aiming Limitations — arguing on the one hand for purposes of claim construction that the position that the light source “includes any headlamp light source” (citing various emitters, as well as discussing “microbeam sources” and “spotlight sources” in the same breath, implying at least that even Petitioner understood its correlation between emitter and “source” and then its Expert undermines its own previously-stated understanding to now assert that “each microbeam is a directional ‘source’”. (Ex.1003, ¶147; Ex.2006, ¶120.) This flawed logic is also advanced with respect to limitations [20.3] and [20.4] — where Petitioner conflates the microbeam with the *light source*. (Pet. at 36-37.) Moreover, as no other explanation is provided beyond a citation to Section VI (an invitation to search 27 pages for additional argument), the Expert Declaration provides the only actual explanation. (Ex.2006, ¶120.)

Notwithstanding Petitioner’s machinations, and as reflected in the Institution Decision, a beam of light cannot constitute a *light source*: “We do not agree with Petitioners’ analysis because we find that the ‘microbeams’ are the light itself, not the light source, as we have construed that term.” (DI, 11; Ex.2006, ¶122.)

Absent Petitioner’s contrived construction of *light source*, the fundamental flaw in Grounds 1A-1B is fully exposed: neither embodiment has the claimed *at least three directional light sources*, since the source in Fig. 2 is just a single directional lamp and the sources in Fig.4 are in a planar array. (Pet. at 14, 24; Ex.2006, ¶123.)



(Ex.1005, FIGs. 2, 4, Annotated)

As the Board correctly concluded, and as Beam literally states, the lamp 202 and SLM 203 in the Figure 2 embodiment is replaced in the Figure 4 embodiment with an LED array 401 having LEDs fixed in place — with no ability to provide

independent angular positioning. (Ex.2006, ¶124; DI, 11-12.) Beam's AABH system is thus incapable of operating as Petitioner contends; the Board agreed as much, in the Institution Decision:

We, however, find nothing in the cited portions of Beam, or in the Jiao Declaration (which simply parrots the Petition), to suggest that the individual light sources in array 401 of Figure 4 are aimed at different angles. Most of the material cited by Petitioner, including the “angular position” language, is describing the Beam's Figure 2 embodiment, not the Figure 4 embodiment.

(DI, 12-13.)

Thus, the proof for 1B is based on largely inapplicable evidence that fails to demonstrate the elements of claims 20 and 59 to which it was applied in at least 20.2/59.2. While Petitioner may attempt to circle back to the 27 pages it cited— **no** other argument was sufficiently developed beyond the Figures actually presented for 20.2/59.2 and four paragraphs of the Declaration. (Pet. at 34-36, 56; Ex.1003, ¶¶146-149; Ex.2006, ¶125.)

Because the Figure 2 SLM embodiment [Ground 1A], includes a single light source 202, it fails to satisfy the *three directional light source* limitation in both claims 20 and 59. (Ex.2006, ¶126.)

The Figure 4 LED array embodiment in Beam [Ground 1B] also fails to satisfy the Aiming Limitation and is fundamentally flawed as being founded in an

unsupported construction of “source.” (Ex.2006, ¶127.) Significantly, Beam neither teaches any mechanism to adjust the physical aiming of the LED nor any mechanism for the LEDs to *have different aimings* under [59.2]. Indeed, per claim 20, Beam is incapable of controlling the angular position of each LED—the LEDs are fixed in place within the X-Y matrix. (Ex.1005, 5:3-16; Ex.2006, ¶127.)

During his deposition, Petitioner’s expert argued for the first time that Beam’s light source requires an SLM:

by looking at his [Beam] specification as well as Figure 4 and 6 and his claim 4, that the light source must include both emitter and spatial light modulator, especially if you look at Figure 6. And Figure 6 is alternative Figure 5. You have to have a modulator in order to work as microbeam.

(Ex.2025 at 21; Ex.2006, ¶128.)

Neither the Petition nor paragraphs 146-149 of the Declaration advance this argument, which in addition to being incorrect is contrary to at least prior portions of the declaration below. (Ex.2006, ¶129.)

In the Petition and Expert Declaration, Petitioner correlates “microbeam source” with LEDs, with no requirement of an interposed modulator or SLM (presented as merely an option):

Beam uses the term ‘microbeam,’ as light emitted from a ‘microbeam source,’ which includes ‘*individual, controllable, light-emitting*

diodes’ (LEDs). So, for clarity, when I refer to Beam’s system and its LEDs, a POSA would have understood that **all instances of “microbeam” in Beam’s disclosure correlate with ‘individual, controllable, light-emitting diodes (LEDs)’**. Relatedly, as Beam uses the term ‘source,’ a POSA would have understood that the term ‘source’ **may** include not only the emitter but also **may** include lenses/optics, packaging, etc.

(Ex.1003, ¶76; Pet. at 13; Ex.2006, 130.)

2. Grounds 1C-1E: Even Combined, Beam and Thominet Fail to Teach the Aiming Limitation

In Grounds 1C- 1E Petitioner hedges its arguments to add the teachings of Thominet, in case “Patent Owner argues, incorrectly, that Beam does not disclose [20.2]/[59.2].” (Pet. at 25.) Ultimately, the addition of Thominet in Grounds 1C-1E is of little use; the combinations are riddled with issues.(Ex.2006, ¶131.)

a. Sub-ground 1C does not meet the limitations of the claims

For Ground 1C Petitioner combines Beam’s controller 108/illuminator 109(including SLM 203) — with the “control technique” in Thominet: “using multiple directional beam regions for different functions.” (Pet. at 26, 29.) This ground only uses Beam’s hardware, and, moreover, only the Lamp+SLM combination) (*Id.*, 26-27;Ex.2006, ¶132.) Thus, in Ground 1C as in Ground 1A because the Figure 2 SLM embodiment includes a single light source 202, it fails

to satisfy the *three directional light source* limitation in all claims. (Ex.2006, ¶132.)

b. Petitioner’s Motivation to Combine is Flawed for 1C

Petitioner’s Ground 1C motivation to combine arguments are equally flawed. Thominet’s semiconductor system with multi-function controls and Beam’s SLM embodiment do not constitute “similar systems” that a POSA would have “readily applied. . .in the same way.” (Pet. at 29.) In Beam’s SLM embodiment, illustrated in Fig. 2 (perspective view) and Fig. 5 (top view), light from lamp 202 falls on spatial light modulator (SLM) 203, is controlled so that the associated individual microbeams are either 1) reflected by SLM 203 at full intensity through beam splitter 201 and out through headlamp optical system 106, or 2) “blanked (attenuated by being either absorbed or deflected [by SLM 203] to an absorbing surface” so that they do not exit the headlamp optical system 106. (Ex.1005, 4:36-40, 5:65-66; Ex.2006, ¶133.)

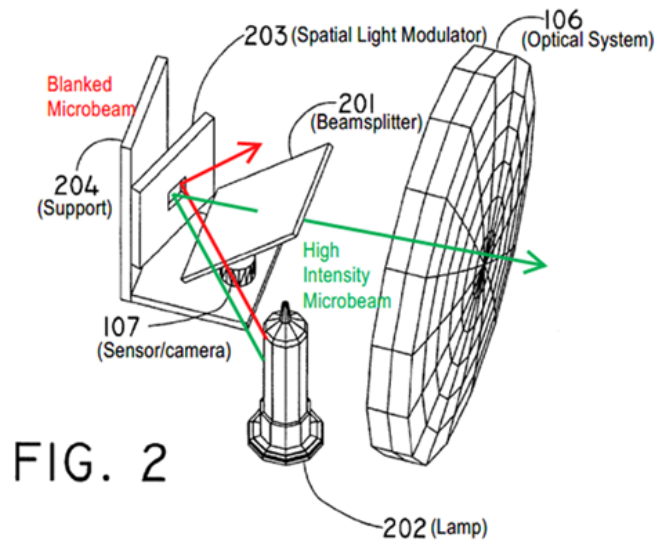


FIG. 2

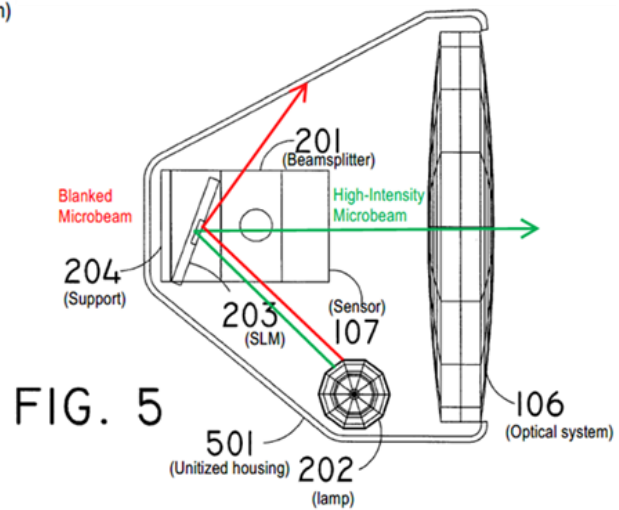


FIG. 5

(Ex.1005, FIGs. 2, 5, Annotated)

By contrast, Thominet’s software assigns different LEDs within the LED array to provide “different illumination functions (low beam, high beam, low sight, large width).” (Pet. at 15.) More specifically, the different illumination functions in Thominet are provided by LEDs “arranged in partial quantities in different defined partial regions of [the] matrix” and these partial regions are “operatable independently from one another.” (Ex.1006, claim 1; Abstract, ¶20.) Thus, in terms of the system hardware, control functions and defined output—the Beam SLM embodiment and Thominet’s software implementation are wholly dissimilar systems. (Ex.2006, ¶134.)

c. The Ground 1C Combination Is Unsuitable As It Reduces Forward Illumination

Moreover, if Thominet’s preassigned software were combined with Beam’s utilization of selective blanking, the combination would result in significantly

diminished forward illumination; entire beam segments would be preassigned for different functions and thus unavailable for forward illumination. (Ex.2006, ¶135.) Because the combination presents an **unsuitable** option, it fails even the relaxed “known techniques” rationale advanced in *Intel Corp. v. PACT XPP Schwiez AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023). As such, contrary to Petitioner’s assertions for Ground 1C, a POSA would **not** have “readily applied” Thominet’s LED software implementation to Beam’s SLM embodiment because the combined systems are fundamentally incompatible, without a complex revamp of the software controls, that would not be routine or within the skill of a POSA. (Ex.2006, ¶134-136.)

**d. Ground 1D-1E Absent Thominet’s Software,
the Combination Is Incapable of Achieving
Segmentation**

Finally, in Grounds 1D-1E Petitioner attempts to “additionally or alternatively” argue that “a POSA would have sought to incorporate known components (hardware implementation)”—"Beam’s array of light sources 401 and Thominet’s differently angled/aimed semiconductor sources 10 on curved surface 12.” (Pet. at 30, 32.) Because the “additionally” version is a combination that would require both embodiments of the system (Fig. 2 from software combination, fig 4 from hardware combination) it is never explained with particularity as noted above (*See*, Section VI(A); Ex.2006, ¶137.) This leaves the “alternatively”

combined options that use Thominet’s hardware and Beam’s control software.

In both “hardware” alternatives, the absence of Thominet’s software controls means that there is no proven automatic control and no proven segmentation and thus the stated motivation to combine is missing from the combination. (Ex.2006, ¶138.) Essentially what is being added is a new curved version of an LED array that cannot achieve any of the obviousness rationale. (Ex.2006, ¶138.) Without Thominet software, Beam has no need for this array. (Ex.2006, ¶138.)

Assuming *arguendo*, that the combination could achieve Thominet’s segmentation, Beam’s utilization of selective blanking would still render the combination unsuitable, similar to the explanation for §VIII.A.2.e(3), *infra*.

e. Grounds 1D-1E- The Petition Offers No Rationale For the Addition of Thominet’s Optional Curved Array

(1) The Petition Omits the Needed Proofs

For Grounds 1D-1E, the of Thominet’s hardware with Thominet’s array substituting for Beam’s LED array, the Petition completely fails to explain why a POSA would select the “concavely_curved surface or stepped surface” option in Thominet over the “one plane” arrangement — when Thominet is silent as to any link between the choice of surface arrangement and functionality. As noted above, the lack of software otherwise strips out the motivation to combine, even if it were valid – there is no proven segmentation and no proven automatic control.

Accordingly, in 1D and 1E, all that is left is a curved array from Thominet (1D) or simply using the curve concept to modify Beam (1E.)(Ex.2006, ¶140.)

As the Board posits, it “appears that differently angled light sources may not be necessary to achieve the benefits of the secondary references’ lighting schemes.” (DI at 19-20.) On this point, the Board specifically invited the parties to address 1) whether Petitioner’s rationale for combining the primary references to use the secondary reference lighting schemes is sufficient to support modifying the primary reference to use the secondary references’ curved substrate; and 2) whether the law requires a specific or separate motivation to include what may be an optional aspect of the secondary references. (*Id.*)

**(2) The Optional Curved Array Is
Lacking Both a General and Specific
Motivation to Combine**

Regarding both questions, the Federal Circuit’s decision and analysis in *Ethicon v. Intuitive Surgical* is instructive. *See Ethicon LLC v. Intuitive Surgical Inc.*, 2021 WL 3716397 (Fed. Cir. 2021). On the issue of whether a POSA would have had a “general” motivation to combine the primary and secondary references, the Federal Circuit engaged in a detailed analysis of the various functions offered by the base Tierney reference versus the Whitman secondary reference to assess whether Petitioner had sufficiently established a use for the functionality ascribed to the Whitman reference. (*Id.* at 2, 6.) The Federal Circuit next engaged in a

separate, detailed analysis as to whether a separate, specific motivation to combine existed for Whitman’s optional shifter mechanism with Tierney. (*Id.* at 7.)

Here, neither the Petition nor the accompanying Jiao Declaration offer any evidence as to why in the “hardware combination” of Grounds 1D-1E, a POSA would have even a general motivation to combine Thominet’s curved hardware with the Beam system. (Ex.2006, ¶142.) Indeed, rather than providing a motivation, Petitioner makes it clear that the “hardware combination” **shares** the same generic motivation as the “software implementation”: “Like the software implementation, this hardware combination—Beam’s array of light sources 401 and Thominet’s differently angled/aimed semiconductor sources 10 on curved surface 12 — would have provided Beam’s system with different spatial distributions for different driving situations... thereby **improving driver safety.**” (Pet. at 32; Ex.2006, ¶142.)

This assertion also fails to explain why the addition of Thominet’s differently angled LEDs on curved surface 12 improves driver safety. Merely stating the proposed combination results in “improving driver safety,” without providing the necessary factual underpinnings to support achieving these results is no different than stating that the combination “would have been obvious.” Similar to *Personal Web Technologies*, Petitioner’s “reasoning seems to say no more than that a skilled artisan, once presented with the two references, would have

understood that they *could be* combined.” (*Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993 (Fed. Cir. 2017.); Ex.2006, ¶¶143-147.) Thus, as to the Board’s first question, because the Petition is devoid of any general explanation as to why Thominet’s curved surface 12 would be combined with Beam’s system, the motivation to combine is *per se* insufficient. (Ex.2006, ¶¶143-147.)

As to the second question, while in practice the Federal Circuit underwent a two-part analysis in *Ethicon* that suggests that a motivation to combine should be established for an optional element, the case does not suggest a bright line rule. If the Board chooses to adopt the *Ethicon* framework, it becomes clear that no specific motivation exists for the curved substrate as an optional aspect. The Petition offers no explanation for why a POSA would select an optional curved substrate over the similarly functioning flat substrate in Thominet, especially when the primary reference also includes a flat substrate. Moreover, given the absence of Thominet’s software, there would be no segmentation or automatic control.

By recycling broad-based, generic motivation to combine statements for each of Grounds 1D-1E, Petitioner failed to provide either a general or specific motivation to combine that supports modifying the primary reference to use the secondary references’ optional curved substrate. Petitioner has simply fallen short of meeting its burden of proof.

While Petitioner may point to the *Intel* case, as relaxing the “improvement”

requirement with a “suitable option” requirement, that argument merely obfuscates the issues: 1) *Intel* doesn’t relax Petitioner’s burden to articulate a motivation to combine, which *ex post facto* hand waving can’t cure; and 2) while the Federal Circuit recently expanded the “known technique” rationale, replacing the “improvement” requirement with “a **suitable option**” requirement, it did so under a set of facts that supported a modified standard-- namely a situation when all the prior art addressed the same, focused **problem** [of cache coherency]. *Intel Corp.*, 61 F.4th at 1381). Here, because the applied prior art is directed to different types of headlight systems that function in different ways to address different focused problems — in Beam, providing a comprehensive anti-glare solution versus Thominet’s effort to provide multiple, different functions for LEDs within an array — the *Intel* case is inapposite.

Except for the hindsight need to map the applied references to the claims, Petitioner provides no plausible explanation for why a POSA would add an optional curved substrate to Beam. (Ex.2006, ¶¶143-147.)

**(3) Ground 1C Lacks a Cogent
Explanation of “How” the
Combination Results in a Functional
System**

Compounding the problems, in the Ground 1C “software” combination, the Petition also fails to explain how the addition of Thominet’s software, attempting

to automatically segment a beam that Beam is trying to fully operate, would result in a functional system. (Ex.2006, ¶148.)

Even if Ground 1C was otherwise unflawed, the combination would result in a non-functional system. As Petitioner correctly points out in Thominet, “semiconductor light sources 10 arranged on curved surface 12 provide beam regions 22, 24, 26, 28 for different driving situations.” (Pet. at 31; Ex.2006, ¶¶149-150.) What Petitioner fails to mention however, is that each of the beam regions are predefined for specific functions and controlled as a unit — rendering Thominet fundamentally incompatible with Beam. (Ex.2006, ¶¶149-150.) When combined, the two systems are going to attempt conflicting usages of the SLM, when one wants to segment light and the other wants to use the full array. (Ex.2006, ¶¶149-150.)

The use of Thominet’s clustered regions for predefined functions, when coupled with Beam’s LED array, would compromise the ability of the combined system to deliver forward illumination. Because groupings of LEDs would be assigned to predefined functions, e.g., to produce light of different colors (for a signal function and a headlight), a concentric high beam, a horizontally dispersed light beam with wider front illumination or to provide “one-side oriented light”, in operation, entire LED clusters would be unavailable to provide forward illumination. Considering the relevant state of the art, and limitations surrounding

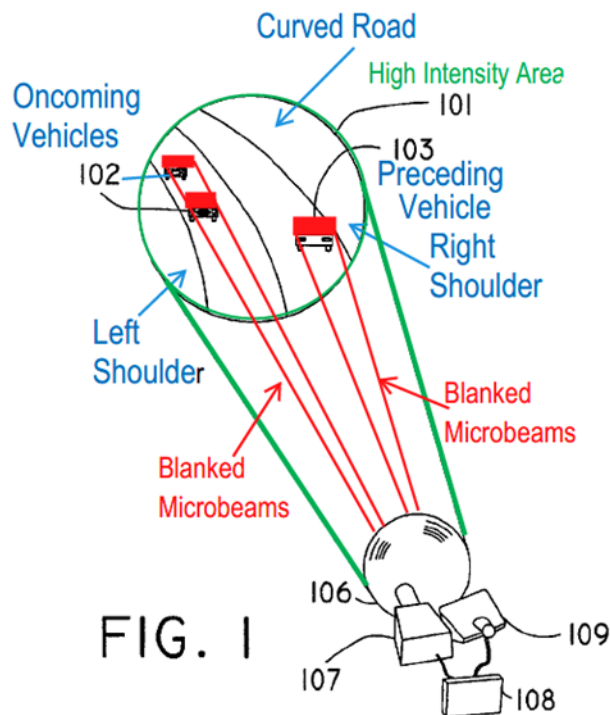
white LED lumen output, which Petitioner’s expert Dr Jiao repeatedly discussed in articles from 2007 — to 2015, a combined system that relies on only certain segments of LEDs for forward illumination would fail to provide sufficient forward illumination and most likely result in a non-functional system. (Ex.2015.) Given the state of the art at the time, without creating issues with packaging, heat degradation and cost, additional LEDs could not simply be added to preserve forward illumination and multi-functional LED clusters. (Ex.2006, ¶150-151.) Moreover, given the complex challenges and tradeoffs, suitable versions of the proposed combinations would be beyond the skill of a POSA. (See Ex.2006, ¶152, 26-44; Exs. 2011-2013, 2015-2016, 2020-2022.)

Finally, the Petition fails to identify the issue and/or explain if/how a POSA would reconcile Beam’s binary blanking/maximum intensity system with Thominet’s control strategy which, by design, provides partial predefined regions that are controllable as a unit to deliver multi-functional capability with an LED array. (Ex.2006, ¶153.)

The specification details the central tenet of the Beam reference — to darken the area of the beam that would dazzle the driver, “**while maintaining [full] intensity elsewhere.**” (Ex.2006, ¶153.) Beam specifically recognizes and disparages prior art attempts to control the direction of the headlight beams. (Ex.1005, 1:60-2:6; Ex.2006, ¶153.) According to Beam, prior art systems that had

to choose where to put light and that changed the direction of the headlamp beam, were prone to errors and/or subject to misalignment. (Ex.1005, 2:15-26; Ex.2006, ¶153)

In response to these prior art problems, Beam's solution is to provide "the equivalent of high beam headlights or brighter on at all times, greatly enhancing the ability to see at night" (*Id.*, 6:53-56) except for areas where incoming light is detected. (Ex.2006, ¶155.) Since Beam is already putting maximum intensity light everywhere it can, there is no light left to place or move or add; thus there would be no reason to provide the ability to change the direction of microbeams in the AABH system or point or direct light in any particular direction. (Ex.2006, ¶155.)



(Ex. 1005, FIG 1, Annotated)

Indeed, in the annotated Figure above, everything, the curve, shoulders, etc. are already illuminated, except where Beam is blanking for glare. (Ex.2006, ¶156.) If Thominet segmented the beam above, then the full illumination would be lost. If the blanking strategy above were applied to such a segmented beam, the problem would be exacerbated, as now the already-diminished subset of light is being further blanked. (Ex.2006, ¶156.) Further, because the vehicles in the scene move, the blanking would be unpredictable. (Ex.2006, ¶156.)

All of these control incompatibilities need to be resolved, if they even can be, before a functioning system can be derived; giving a POSA pause as to whether the combination would be functional as proposed. (Ex.2006, ¶157.)

Petitioner's motivation to combine arguments are in line with presentations routinely rejected by the Federal Circuit as insufficient. *See e.g., InTouch Techs., Inc. v. VGO Comm's, Inc.*, 751 F.3d 1327, 1349 (Fed. Cir. 2014) (criticizing expert who simply "opined that all of the elements of the claims disparately existed in the prior art, but failed to provide the glue to combine these references."). Petitioner's "jigsaw puzzle" approach does not "explain what reason or motivation one of ordinary skill in the art at the time of the invention would have had to place these pieces together." *Id.*

B. Grounds 1A-1E: Neither Beam Nor Beam-Thominet

Teach the Detected Vehicle Limitations of Claim 20

1. Grounds 1A-1E Lack the Ability to Detect a Vehicle

In Grounds 1A-1E, Petitioner relies exclusively on Beam to meet the [20.9] limitation—which requires *the processor, in communication with at least the sensors and the control circuitry, configured to process the sensor data to determine, within a field-of-view, at least a first sub-section including a detected vehicle* (Pet. at 43; Ex.2006, ¶159.) Specifically, to satisfy [20.9], Petitioner points to Beam’s ability to provide a “shaded area based on blanking signals” and Beam’s statement that the “blanked area tracks the location of the oncoming vehicle.” (*Id.*) Beam however lacks the ability to **detect a vehicle** and then segment the field of view based on the location of the detected/identified vehicle. (Ex.2006, ¶¶159-160.)

The plain meaning of “detect” is to “determine the existence, presence or fact of.” (<https://www.merriam-webster.com/dictionary/detect>.) As such, for the processor to “determine a subsection **including a detected vehicle**”, it must be able to determine the existence/presence/fact that a vehicle exists. To satisfy [20.10], the processor must similarly be able to determine the absence of/fact that a detected vehicle does not exist, to demarcate a second subsection. For both limitations, a mere association will not suffice. (Ex.2006, ¶161.)

In Beam, incoming light — which may be associated with any light source,

e.g., house lights, streetlights, motorcycles, interior vehicle lights, headlights of an oncoming vehicle and/or taillights of a preceding vehicle-- is transmitted through optical system 106 and detected by a sensor (camera) 107. (*Id.*) Data from sensor 107 is used by controller 108 to map the angular position of incoming light to a corresponding position/size of microbeams that must be significantly reduced in intensity. (Ex.1005, 4:9-24, 53-59, 62-64; Ex.2006, ¶162.)

Beam's AABH system is agnostic to whether the incoming light is from a vehicle, a streetlight or another light source; it simply blanks all LEDs correlated with the position of incoming light, regardless of the classification of the light source. (Ex.2006, ¶163.) Thus, Beam lacks any specific way to differentiate between different sources of incoming light. (*Id.*) Beam's generalized, more simplistic solution is devoid of a machine vision system or pattern recognition system for detecting a vehicle. (*Id.*, ¶91.) As such, it is incapable of detecting and segmenting the field of view based on the location of the detected vehicle, as required by the [20.9] limitations.

2. Because a Vehicle is Not a Species of the Light Genus, Genus/Species Law Does Not Apply

In the Institution Decision, the Board disagreed with Patent Owner's position:

We find these arguments unpersuasive because the claims do not require that the system detect **only vehicles**. We find it sufficient to meet the claim language that Beam and Karlsson would identify oncoming **headlights** and dim the light being projected in that area, even if they would also reduce **light being projected towards other types of light sources**.

(DI, 20.)

Buttressing the Board's conclusion is the premise that the prior art genus disclosure of light anticipates the narrower species of **headlights**. However, the claims are directed to detecting a **vehicle**, not a headlight. Because a vehicle is not a species of the light genus, genus/species law does not apply. It is also worth noting that the systems do not technically "identify" headlights, they detect lights that **may** include headlights or any other kind of light – so light detection does not equate to headlight detection, let alone headlight "identification." (Ex.2006, ¶166.)

Moreover, per the claim language, the detection of light is *per se* insufficient, the processor must be able to **detect a vehicle**, which inherently requires the processor to use the sensor data to determine whether the sensor inputs confirm **vehicle detection**. On this point, the '503 Patent describes the use of **image sensing data** and machine vision/pattern recognition technology to detect a vehicle by filtering out nuisance light sources such as road signs and reflectors. (Ex.2006, ¶167.)

Though the claims do not require the use of machine vision or pattern recognition technology, they do require the processor to *process the sensor data to determine . . . at least a first subsection including a detected vehicle and at least a second subsection not including the detected vehicle*, so the processor can *maximize vehicle operator visibility in at least the second subsection while a disturbing effect resulting from the illumination output on the vision of other traffic in at least the first subsection*.

The ability to distinguish a vehicle based on detected light, that may include light from nuisance sources, is thus part of the Detected Vehicle Limitation. As such, the mere detection of light in Beam and Karlsson is insufficient to satisfy the Detected Vehicle Limitation. (Ex.2006, ¶166.)

Even if genus/species law is applied, the “Federal Circuit and its predecessor court [the CCPA] have found anticipation of a species by a genus in this context only when the genus itself is narrowly defined,” i.e. the genus is “so small that a person of skill would immediately recognize the ‘defined and limited class’” of species as falling within the genus. *See generally Pernix Ireland Pain DAC v. Alvogen Malta Operations Ltd.*, 323 F. Supp. 3d 566 (D. Del. 2018)(*aff’d on other grounds*); *Persion Pharm. LLC. v. Alvogen Malta Operations Ltd.*, 945 F.3d 1184 (Fed. Cir. 2019); *VirnetX Inc. v. Apple Inc.*, 665 F. App’x 880 (Fed. Cir. 2016). Here, as the genus is light, which includes for example, landscape lights,

residential lights, house lights, interior lights, motorcycle lights, streetlights, bicycle lights and vehicle lights, a POSA would not immediately recognize vehicle headlights as falling within the light genus. Accordingly, even if genus/species law applied, the disclosure of light detection in the primary Beam and Karlsson references fails to anticipate the species claim to vehicle detection. (Ex.2006, ¶171.)

C. Grounds 1A-1E: The Proffered Combinations Also Fail to Teach the Output Limitations in [20.11-20.13]

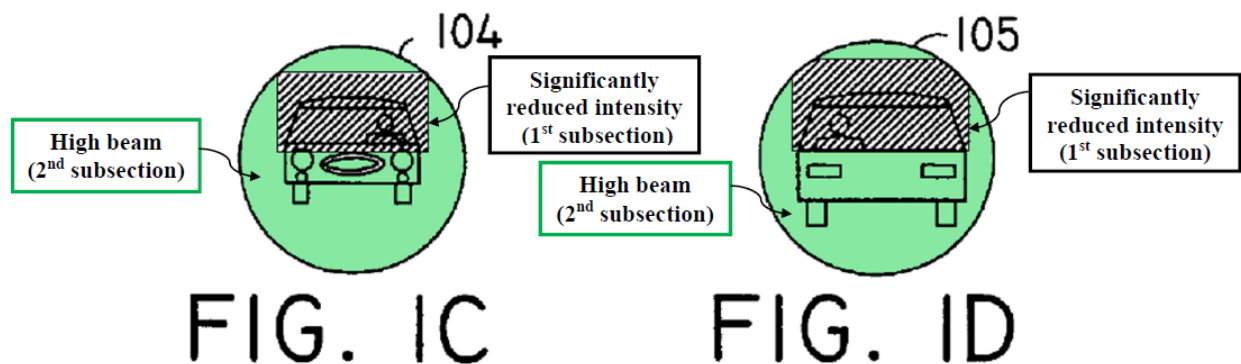
Because Beam is incapable of **detecting** a vehicle, it is also incapable of differently illuminating at least two distinct subsections to minimize light output at **a subsection including the detected vehicle** in [20.11-20.13]. (Ex. 2006, ¶177.)

D. Grounds 1A-1E : Beam Does Not Determine Illumination of the First and Second Subsections in [20.9]/[59.7]

Finally, Petitioner’s argument that each pixel is determined to be blanked or not blanked during pixel evaluation does not satisfy the Detecting Vehicle Limitation, which also requires “**determining illumination**” for a first and second subsection. (Pet., at 43; Ex.2006, ¶161.) Beam’s pixel evaluation **determines whether to blank** the light source, which is distinct from **determining illumination**. (Ex.2006, ¶172.) By definition, the absence of light, is not illumination. The plain meaning of illumination is “the action of illuminating or state of being illuminated.” (<https://www.merriam->

[webster.com/dictionary/illumination](https://www.merriam-webster.com/dictionary/illumination).) (Ex.2006, ¶172.) Because at least the first subsection includes the detected light, Beam would blank the first subsection and thus never *determine illumination for the first subsection*, as required by [20.9] and [59.7]. (Ex.2006, ¶172.)

Petitioner's [20.9] proofs for the second subsection also fail. With Annotated Figures 1C and 1D from Beam, Petitioner identifies what it considers to be the claimed second subsection. (Pet., 26; Ex.2006, ¶173.)



(Ex.1005, FIG. 1C, FIG. 1D)

Significantly, the “2nd subsection” identified in **both** annotated pictures, **plainly includes the second vehicle**, thus failing to meet the *at least a second subsection of the field-of-view not including the other vehicle* limitation in [20.9]. (Ex.2006, ¶174.) This failure cuts across **all** sub-grounds, 1A-1E, rendering Petitioner's proof of Claim 20 deficient for every sub-ground.

E. Ground 1- Dependent claim 25

Claim 25, which depends from independent claim 20, includes *at least one*

of reflectors, refractors or lenses usable to alter emitted light from at least one of the light sources. The Petition addresses claim 25 with one sentence: “Beam discloses ‘a spatial light modulator. . . digital mirror devices’ and ‘an optical system 106 (e.g., a bi-convex lens)’. [citations omitted] (‘a reflector or lens’), 4:10-59 (‘reflected by a beamsplitter 201’), 5:17-21; EX 1003, ¶¶199-201.” (Pet. at 50-51; Ex.2006, ¶178.) Petitioner’s arguments regarding claim 25 fails for at least two reasons: 1) as explained in Grounds 1A-1E of Section VI.A and contrary to Petitioner’s assertions, none of the LED combinations include an SLM; and 2) beamsplitter 201 does not output reflected light, but rather prevents certain microbeams from exiting the headlamp to facilitate blanking. (Ex. 2006, ¶179.)

F. Ground 2: Even combined, Beam, Thominet, and Stam Fail to Teach the “Predefined Illuminance” Limitation in Claims 59 and 63-64, And Beam’s Failings Further Render the Proofs Deficient

1. Sub-grounds 2A and 2D Inherit Deficiencies of Sub-ground 1C

Sub-grounds 2A and 2D include the logic of sub-ground 1C and thus inherit its deficiencies. (See §VI.B, §VIII.A.2.a-c, §VIII.A.2.e(3), *supra*.)

2. Sub-grounds 2B and 2E Inherit Deficiencies of Sub-ground 1D

Sub-grounds 2B and 2E include the logic of sub-ground 1D and thus inherit its deficiencies. (See §VI.B, §VIII.A.2.d-e, *supra*.) No POSA would have made

either combination. (Ex.2006, ¶181.)

3. Sub-grounds 2C and 2F Inherit Deficiencies of Sub-ground 1E

Sub-grounds 2C and 2F include the logic of sub-ground 1E and thus inherit its deficiencies. (*See* §VI.B, §VII.2.A.2.e, *supra*.) No POSA would have made either combination. (Ex.2006, ¶182.)

4. Sub-grounds 2A-2F All Inherit Beam’s Failures

All sub-grounds include Beam and Petitioner relies on proofs related to Beam as evidence of features of claim 59 it equates to being comparable to features of claim 20. For example, Petitioner argues that 59.7 is patentably indistinct from 20.9. (Petition, 58.) Accordingly, Petitioner’s proof for 59.7 fails on all grounds for reasons comparable to its failure with respect to claim 20.9. (§VIII.D.)

Claim 59.8 recites “determine output that aims illumination at the first subsection.” (Ex.2006, ¶184.) Petitioner’s proof is that figures show illumination in the shaded areas that is less than low beam. (*Id.*) This is not evidence of aimed illumination, this is evidence of spillover illumination. (Ex.1005, 6:45-50; Ex.2006, ¶184.)) Moreover, the mere presence of illumination certainly fails to **prove** that Beam “aims” illumination at this section, and that burden was

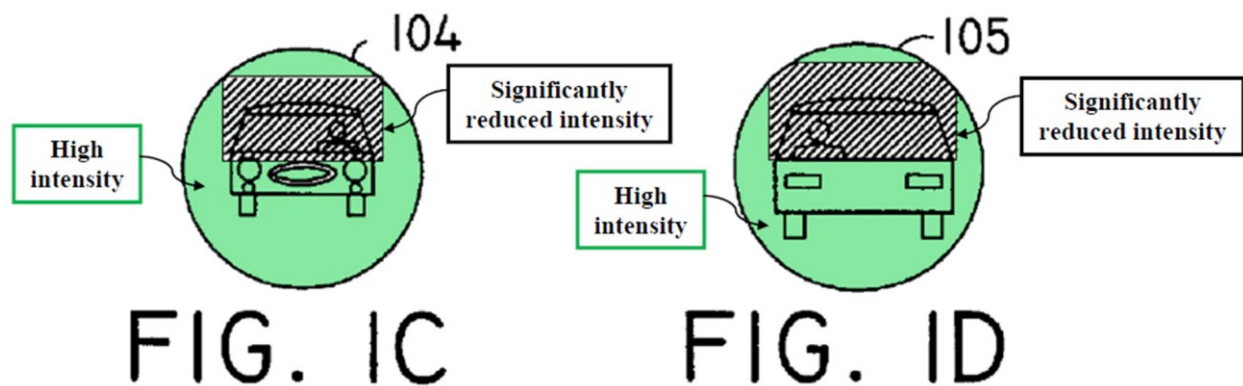
Petitioner's. (Ex.2006, ¶184.) With no additional explanation, this proof fails. (*See also*, §VIII.F.6, *infra*.)

5. Grounds 2D-2F: There Is No Motivation to Combine Blanked Subsections With A Predefined Illuminance Level

The Petition fails to specify **which** Beam-Thominet ground is being combined with Stam, giving rise to Grounds 2D-2F. (Pet. at 53-64; Ex.2006, ¶184.) In Grounds 2D-2F, Petitioner attempts to prove that the inclusion of Stam somehow “substantially illuminates the first subsection below a predefined illuminance.” (Ex.2006, ¶185.) By Petitioner's own admission, Beam alters the illumination pattern to blank or **prevent** illumination — mooted the purported need for Stam, as blanking is necessarily below a predefined illuminance. (Ex. 2006, ¶185.) Under the same rationale, because the first subsection is blanked, there is no output that aims illumination at the first subsection, contrary to Petitioner's argument that the combination in Grounds 2D-2F results in significantly less illumination in shaded areas. (Ex.2006, ¶186.) Moreover, the teaching imported from Stam is merely about when one should modify lamp emission, so in conjunction, the two teachings, at best, merely teach when to institute Beam's expressly determined emission-prevention. (Ex.2006, ¶186.)

6. Petitioner Fails to Prove at Least Limitations 58.8-58.9

Further, Claim 59 requires *determine light output ...that illuminates the first subsection below a predefined illuminance*. [59.8-59.9] This requires positive illumination, as “no” illumination does not “illuminate” anything (nor is it “aimed” anywhere as required in 59.8). (§VIII.F.4, *supra*; Ex.2006, ¶187.) Moreover, there is a **determination** of this illumination, it is not the result of spillover illumination from a high-beam region, because the illumination that “illuminates the first subsection” is actually determined. Beam, which utilizes a blanking strategy, provides no illumination directed at the “blanked area” because it either blocks lamp 202 emission towards that area via the SLM or changes LEDs responsible for that area to a non-emitting state. (Ex.1005, 4:36-40, 5:65-66; Ex.2006, ¶188.)



(Ex. 1005, Figs. 1C-1D, Annotated by Petitioner)

The fact that spillover illumination results in non-zero illumination of the shaded areas in Petitioner’s annotated figures 1C and 1D above is not dispositive, because it is not actually proof that Beam determines any illumination that illuminates those areas at all, and is merely proof of off-axis (i.e., other-area)

emission bleeding over. (Ex.1005, 6:44-48; Ex.2006, ¶189.)

Significantly, in IPR2023-00328, Petitioner undercuts its own position, quoting Beam, “Beam discloses ‘reformatting the pattern... **to prevent it from illuminating certain areas.**” (Pet., 44; Ex.2006, ¶190.) The fact that Beam prevents illumination in the areas where a light source is detected, proves that the limitation *determine light output ...that illuminates the first subsection below a predefined illuminance*” does not occur in Grounds 2D-2F. (Ex.2006, ¶190.)

G. Ground 3: Dependent Claims 21-23 The Beam-Thominet-Kobayashi Combination Does Not Teach All Claim Limitations

1. Grounds 3A-3I Inherit Deficiencies of Sub-grounds 1C-1E

Grounds 3A-3I include Grounds 1C-1E and inherit the deficiencies of those sub-grounds. (See §VI.C, §VIII.A.2, *supra*.)

2. Sub-grounds 3A-3I All Inherit Beam’s Failures

All sub-grounds include Beam and elements of claim 20 by dependency. Thus the failures of proof using Beam for elements of claim 20 extend to all claims 21-23. (§VIII.A, *supra*)

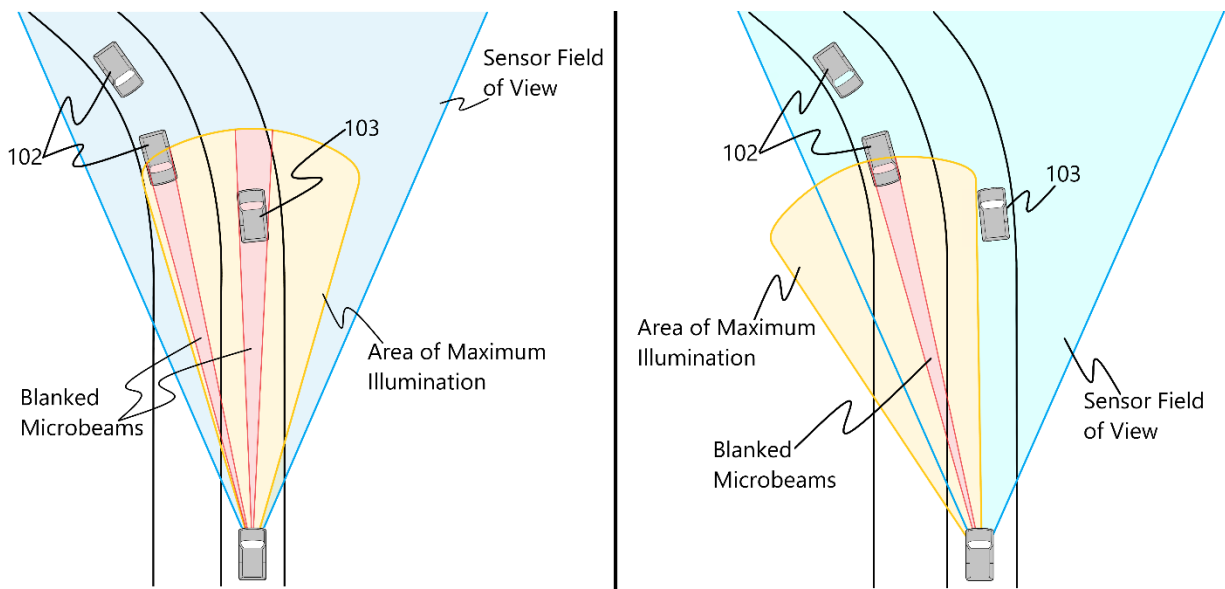
3. Beam-Thominet-Kobayashi Is Never Shown to “Increase” Illumination as Required in Claims 21-23

Claims 21-23, which depend from claim 20, require that the processor is *configured to determine at least a planned upcoming turn or road curvature and*

direct the control circuitry to increase illumination illuminating the **turn or road curvature**. (Ex.2006, ¶194.) For claims 21-23, Petitioner argues that a POSA would have been motivated to modify Beam-Thominet “to adjust light based on map data including road curvature, as in Kobayashi, to further control Beam’s directional microbeams to illuminate roadway curves.” (Pet. at 64; Ex.2006, ¶194.)

The combination of Beam-Thominet and Kobayashi however fails to teach the limitations in claims 21-23 for at least two reasons: 1) because, as both parties agree, Beam provides maximum intensity light to the greatest extent possible in all areas outside of the anti-glare region, there would be no remaining unlit LEDs with which to achieve the increase and further no reason *to increase illumination illuminating the turn or road curvature*; and 2) a POSA would have had no motivation to combine Beam-Thominet with Kobayashi. (Ex.2006, ¶195.)

For example, as illustrated below, changing direction of microbeams in the direction of an upcoming left-hand curve in response to map data would reduce illumination below the maximum possible in regions to the right of oncoming vehicles 102 and would defeat anti-blinding operability for any vehicles outside of the intersection of the illumination and sensor fields of view. (Ex.2006, ¶196.)



(Ex.2006, Fig 1 modified)

Beam, as Petitioner admits, “illuminat[es] non-shaded areas ‘at maximum intensity [at all times].’” (Pet., 46, quoting Ex. 1005, 6:30-33.) Accordingly, regardless of whether there is Kobayashi data indicating a curve or knowledge of a road profile or advancing direction, Beam is already maximally illuminating everything it can illuminate. (Ex.1005, 4:57-59; Ex.2006, ¶197.) If there is “maximum intensity” at all times, as Petitioner contends, then any curve that Beam **could** illuminate is already **maximally** illuminated. (Ex.2006, ¶197.) This leaves the combined system with no use for Kobayashi’s map data. (*Id.*)

In light of the fact that the presented combination can do nothing with Kobayashi’s map data, there is no reason to make such a combination that merely adds unusable, extraneous information. (Ex.2006,198.)

For at least this reason, Petitioner’s combination is not a combination any

POSA would be motivated to make, and thus Petitioner fails to prove the unpatentability of claims 21-23.

H. Ground 4: Even Combined, Beam, Thominet, Stam and Kobayashi Fail to Teach Claims 60-62

1. Sub-grounds 4A-4I Inherit Deficiencies of Sub-grounds 1C-1E

Sub-grounds 4A-4I include sub-grounds 1C-1E through inclusion of “Beam-Thominet” and are deficient for the reasons noted with respect to the sub-ground 1C-1E combinations for Ground 1. (*See* §VI.D, §VIII.A.2.a-c, §VIII.A.2.e(3), *supra*.)

2. 4A-4I Are Duplicative of Ground 2, Sections 1-3

Further, all sub-grounds also include Beam-Thominet-Stam, and the claims depend from claim 59, so the failings of Beam-Thominet-Stam grounds 3A-3I are inherited through inclusion and dependency of claims. (§VI.D, §VIII.C, §VIII.F.5-6, *supra*.)

3. The Ground 4 Argument Omits Material Limitations in Claims 60-62

As detailed in Section VII, the Petition omits material elements of claims 60-62, resulting in incomplete proofs. (*See*, §VII, *supra*).

I. Ground 5- Karlsson or Karlsson-Harbers Applied to Claims 20-25 and 59-64

Ground 5 includes the following Sub-grounds (§VI.E, *supra*):

- 5A - Karlsson_LEDs
- 5B - Karlsson_LEDs+Modulator
- 5C - Karlsson_LEDs+Modulator + Harbers Control
- 5D - Karlsson_Control + Harbers Control + Harbers_Array
- 5E - Karlsson_Control+Harbers_Array
- 5F - Karlsson_LEDs+Modulator + Harbers Control + Harbers_Curve
- 5G - Karlsson_LEDs+Modulator + Harbers_Curve

1. Grounds 5F-5G There is no Motivation to Merely Use the Curve of Harbers

As detailed with respect to sub-ground 1E, *supra*, for Beam-Thominet, a POSA would understand that the addition of Harbers' curved substrate alone, is of no more use than Thominet's substrate. (§VIII.A.2.e(2), *supra*.)

2. Absent Harbers' Software, Ground 5E Lacks the Ability to Segment and Presents Color-Shifting Issues

Because Petitioner's Ground 5E combination lacks Harbers' software, per Dr. Jiao's testimony, the control features of Harbers' would be missing. (Ex. 2025, 65:13-19.) Without light segmentation the motivation to use Harbers' hardware alone--curved substrate and LEDs-- is lacking. ((Ex.2006, ¶206.) Further, the use of Harbers' colored array combined with Karlsson's controls creates a color-shifting problem because Karlsson will not know how or when to use colored

LEDs, and will instead use them unpredictably in its own strategies, which are not designed to even generally accommodate color — all of which Petitioner fails to address. (*Id.*)

**3. Grounds 5C-5D/5F Are Unmotivated Combinations
Due to the Unaddressed Issues Arising From
Conflicting Control Strategies**

Petitioner never explains how Karlsson’s selective dimming and Harbers particular automatic controls would contemporaneously function in situations where the two strategies required conflicting control. For example, Harbers’ control under “different driving situations” may try to widen a beam (due to a slowing vehicle) that Karlsson is controlling as in Petitioner’s annotated Fig. 14. (Pet., 81, 101.) (Ex.2006, ¶207.) At that moment, Harbers would be trying to place light where Karlsson is intentionally removing it, as well as possibly trying to dim forward illumination in the central segment of Fig. 14 that Karlsson is attempting to utilize at full output. (Pet. at 101.) Petitioner never recognizes these conflicts nor resolves them, and these indicate the unsuitability of combining Harbers and Karlsson’s conflicting control strategies into a single combination as in 5C-5D or 5F. (Ex.2006, ¶207.)

4. Ground 5F Lacks Necessary Particularity

In Ground 5F, there are two controllable systems, an LED array 2 and a modulator 3 from Karlsson. There are also two control strategies, Karlsson’s

selective control and Harbers' alleged automatic beam segmentation. (Ex.2006, ¶208.)

Petitioner never explains which controllable structure would be controlled by which control function, rendering the argument fatally flawed for a lack of particularity. For example, it is unclear which of Karlsson or Harbers would control source 2 or modulator 3. (Ex.2006, ¶209.) As such, the combination lacks requisite particularity of explanation.

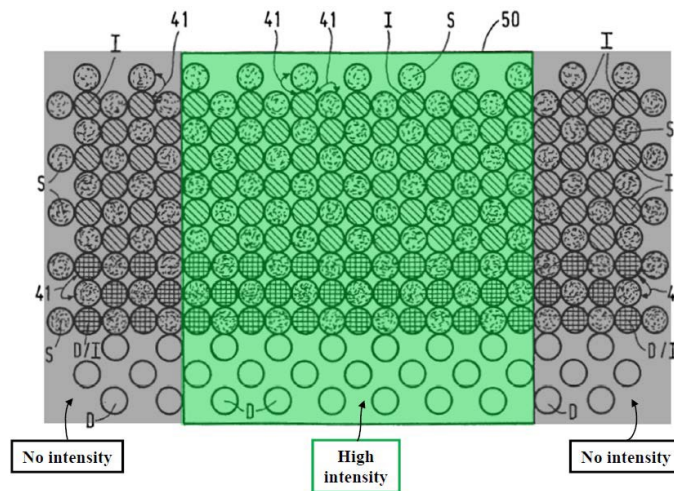
J. Karlsson's Failings Alone Are Sufficient To Defeat All Proposed Grounds Utilized Against Claims 20-25 and 59-64

Karlsson's teachings, as applied, include substantive failings that extend across all sub-grounds.

Petitioner contends that Fig. 14 is a functional representation of the actual operation of Karlsson in the presence of detected light, stating that "the shaded subsections below are "no intensity" sections **that correspond to detected light**. (Pet., 101.) That is, these are not merely electively unused areas, they are, by Petitioner's contention, areas that are intentionally shaded responsive to detection, i.e., they were under use prior to shading (*Id.*) Karlsson, however, lacks these teachings with respect to Fig. 14. (Ex.2006, ¶211.)

Petitioner's statement, that those "shaded areas" are sections that correspond to "directions from which light is detected," is useful to understand Petitioner's

position on how Karlsson generally functions— namely, these annotations present an array that would be fully utilized were light not being detected. (Ex.2006, ¶212.)



(Ex.1010, FIG.14, Annotated by Petitioner)

Petitioner’s “full usage of the array except when accommodating glare” interpretation generally supports Patent Owner’s similar understanding of how Karlsson functions (*See*, §III.B.1, *supra*; Ex.2006, ¶213.)

K. Grounds 5A-5B, 5F-5G: Karlsson Does Not Teach Directional Light Sources Having Different Aimings

To satisfy the Aiming Limitation [20.2]/[59.2], Petitioner asserts that Karlsson “explicitly or implicitly” discloses every feature of claims 20 and 59, but if not, then Harbers discloses [20.2]/[59.2] and a POSITA would have been motivated to extract them from Harbers and insert them into Karlsson. (Pet. at 76-77.)

As with Ground 1A, in Ground 5A Petitioner undermines its construction of

light source to improperly conflate the emitted beam and the light source — arguing that each of Karlsson’s spotlight beams is a directional light source. (Pet. at 81-82; Ex.2006, ¶214-215.) Here, however, the failing is worse because now Petitioner uses deceptive ellipses to twist the meanings of teachings to maintain its argument. (*Id.*)

First, Petitioner deletes words to equate “beams 34” to “being” light sources: “Karlsson discloses ‘spotlight beams 34 can be...a *grid of separate light sources*, such as *LEDs*...controlled either *individually* or in *groups*.’” (Pet. at 77; Ex. 2006, ¶216.) What the section actually says is “beams 34 **can be obtained**, for example, **by using a light source 2, which is a grid of separate light sources**.” Karlsson clearly contemplates the plain meaning of the word “source”— i.e., the emitter that produces the light. (Ex. 2006, ¶216.)

Petitioner immediately omits essential context again, now to create new capabilities for the modulator: “*light modulator means 3* advantageously can be switched to . . . *given directions*.” (Pet. at 77.) As the Board concluded, “Petitioner’s argument mischaracterizes the quoted language, using ellipses to flip the meaning.” (DI at 14.) Read in context, the quoted language is referring to the light modulator means ***detecting*** light ***from*** different directions to control **intensity**, not projecting light in different directions. (Ex.2006, ¶217.) Absent these disingenuous quotations, Petitioner fails to establish that Karlsson discloses

[at least three] *different light sources aimed at different angles*” or *having different aimings* per claim 59. (*Id.*)

Petitioner’s proof is ultimately “each spotlight beam is a directional ‘source’ having its own independent direction (angle/aiming).” (Petition, 77.) Since spotlight beams are not LEDs, this proof fails (sub-ground 5A). (Ex.2006, ¶218.) And, absent the directionality language improperly ascribed to the modulator through ellipses, Petitioner lacks proofs for their premise that the modulator (in 5B-5C/5F-5G) projects light in different directions. (*Id.*) Petitioner is limited to the flawed evidence upon which it relied, and for these reasons grounds 5A and 5B relying exclusively on Karlsson fail, as well as grounds 5C and 5F-5G.

L. Grounds 5C-5G: Even Combined, Karlsson and Harbers Fail to Teach the Aiming Limitation in All Claims

Petitioner can’t decide whether or how various limitations of the Challenged Claims are found in Karlsson or Harbers or some combination thereof left to the imagination of the reader. Petitioner asserts that Karlsson explicitly or implicitly discloses every feature of claims 20 and 59, but if not, then Harbers discloses [20.2]/[59.2] and a POSITA would have been motivated to extract them from Harbers and insert them into Karlsson. (Pet. at 76.)

However, neither Petitioner nor Dr. Jiao describe how Harbers’ “array of opto-electronic elements” a.k.a. “directional light sources” of Fig. 2 that may

alternatively be provided on a curved substrate are combined or substituted into the planar LED array of Karlsson's Fig. 14 that includes interspersed light-sensitive sensors. (Ex.2006, ¶220.) Expert declarations that merely repeat, "verbatim, the conclusory assertion for which it is offered to support" are entitled to little weight. *See, Xerox Corp v. Bytemark, Inc.*, IPR2022-00624, Paper 9, at 15 (PTAB August 24, 2022).

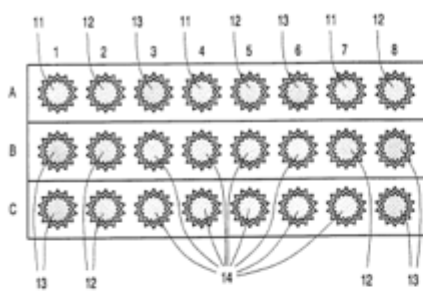


FIG. 2

Harbers Array/Light Pattern

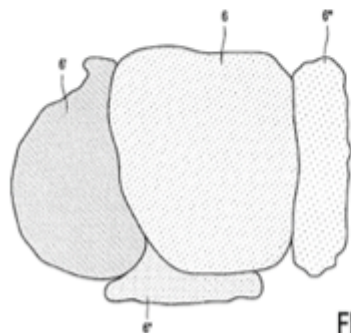


FIG. 3B

(Ex. 1011, Figs 2, 3B, Annotated)

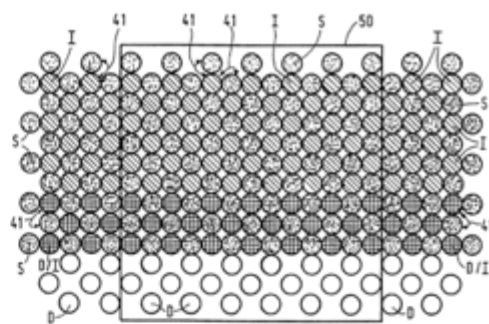


FIG. 14

Karlsson Array/Light Pattern

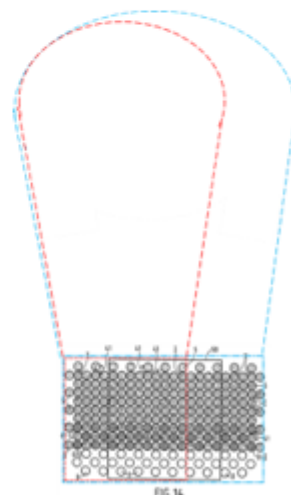


FIG. 14

(Ex. 1010, Fig. 14, Annotated)

Furthermore, Petitioner does not explain how the combined Karlsson/Harbers system having a curved substrate to satisfy [20.2]/[59.2] controls intensity of the individual spotlight beams in response to light detected by the interspersed light-sensitive sensors of Karlsson, or how parameters such as vehicle velocity, steering wheel position, or weather as disclosed by Harbers are provided by the dipped/main beam groupings of LEDs disclosed by Karlsson. (Ex. 2006, ¶222.)

Significantly, the Petition fails to explain how a POSA would reconcile the incompatible control systems of Karlsson—which strives for optimum illumination—with Harbers’ preassigned, selective controls. (Ex.2006, ¶223.) The combination leads to conflicts with forward illumination instructions (*Id.*: §VIII.I.3). The problem is compounded by Harbers’ use of colored LEDs in the array, which would need to be addressed to avoid color-shifting issues. ((Ex.2006, ¶223; §VIII.I.2).

Petitioner further fails to describe how the four beam segments and resulting light pattern of Harbers is provided by the groupings of D, I, and D/I LEDs in Karlsson that correspond to the dipped beam and main beam functions. (Ex. 2006, ¶223.)

M. Ground 5A-5G: Karlsson Fails to Teach the Detected Vehicle Limitation

Similar to Grounds 1A-1E that rely on Beam to meet the [20.9] limitations, Petitioner relies on Karlsson in all sub-grounds 5A-5G in Ground 5.

Unlike Beam's sensor (camera) 107 used to detect incoming light within the entire field-of-view, Karlsson relies on multiple spatially distributed "spotlight sensors" interspersed with the LEDs that generate "spotlight beams" to detect incoming light "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, 3:29-31, 19:6-20:5, Figs. 13, 14; Ex.2006, ¶225.) One or more spotlight sensors are associated with each LED "for adjusting the light intensity of the spotlight beams . . . so as to provide a compound light beam having a desired pattern." (Ex1010, 4:25-31.)

But, more importantly, Karlsson, like Beam, detects light as a general predicate for control. (Ex.2006, ¶226.) So even if a camera were presented for Karlsson, it would, at best, use the camera as Beam does – merely to detect light. (Ex.2006, ¶226; §VIII.B, *supra*.)

As such, Karlsson, like Beam, is agnostic to the source of the incoming light and does not disclose any processing of the spotlight sensor signals to determine whether the source is a vehicle, house light, interior light, streetlight, or another light source. (Ex.2006, ¶227.) Rather, Karlsson simply adjusts intensity of one or more spotlight beams associated with the spotlight sensors that detect incoming

light. (*Id.*) Accordingly, for the same reasons detailed in Ground 1B, Ground 5B fails to satisfy the [20.9] Detected Vehicle limitations in the Challenged Claims and by extension, the Output Limitations in [20.10].

N. Ground 6 – Even Combined, Karlsson, Harbers, and Gotou Fail to Teach Claims 21-23 and 60-62

Petitioner relies on Gotou’s disclosure of adjusting light based on GPS data including road curvature for satisfying the sensor data limitations and relies on Karlsson-Harbers for satisfying the hardware and software limitations. (Petition, 116.) This introduces a third control function, the alleged attempts to modify light into a curve as Gotou does it. (Ex.2006, ¶229.)

1. Grounds 6A-6E inherit issues from 5C-5G

All combinations involving Karlsson-Harbers have the deficiencies of sub-grounds 5C-5G, included respectively in grounds 6A-6E through combination. (*See*, §VI.F, *supra*.)

2. Grounds 6A-6E inherit issues from Proofs of Claims 20 and 59 Reliant On Karlsson

Claims 21-23 depend from claim 20 and claims 60-62 depend from claim 59, and all the noted deficiencies of proof with respect to Ground 5 arguments against claims 20 and 59 thus extend to claims 21-23 and 60-62. (§VIII.I-M, *supra*.)

3. Combining Gotou with 6A, 6B, 6D Results in Multiple, Incompatible Control Functions

Grounds 6A, 6B, 6D include all controls of Karlsson, Harbers software and Gotou. This now presents three control functions that can desire conflicting results - e.g., the combination may instruct full illumination of the scene (Ex. 1010, 1:21-23), while conflictingly trying narrow the main beam based on speed (Ex. 1011, 3:18-22; Ex.2006, ¶232). Those functions already conflict. (Ex.2006, ¶232.) Then if the system further tried to steer the beam per Gotou, this would either confound the goals of the narrowed beam or be obviated by the already existent full illumination (depending on which system “won” the additional prior conflict). (*Id.*) All of this is never noted or addressed in the proposed combination.

Further, in 6A and 6D, there are two controllable systems, the array 2 and modulator 3, and Petitioner fails to explain, let alone with particularity, which controls would be achieved with which systems or how any sort of curving of a beam could be even achieved with a modulator (for example) that merely controls intensity. (Ex. 1010, 14:12-15; Ex.2006, ¶233.)

Given the multitude of possible situations arising from systems that purportedly individually accommodate varied instances of weather, curves, turns and traffic, all features that are highly prevalent on roads and which occur in almost limitless combinations, any POSA seeking to make a combination of

Karlsson-Harbers, let alone Karlsson-Harbers-Gotou, would have needed to understand and adapt the system to deal with all likely scenarios — an absurdly complex undertaking when working with three systems not designed to work together. (Ex.2006, ¶232.)

Further, when Petitioner argues that Karlsson would “direct light of the spotlight beams appropriately,” that is an explanation devoid of substantive evidence or reasoning. (Petition, 119.) Petitioner never explains how Karlsson-Harbers is doing this or which combination of which sub-ground is doing this, or, for that matter, which controllable system is doing this, in combinations 6A, 6B and 6D, which have multiple controllable systems – LED array 2 and modulator 3. This is a fatal failing in particularity for all sub-grounds 6A-6E. (Ex.2006, ¶¶233-235.)

Accordingly, the highly unpredictable combination is not a combination a POSA would have made, regardless of which embodiment of Karlsson-Harbers were combined with Gotou. (Ex.2006, ¶236.)

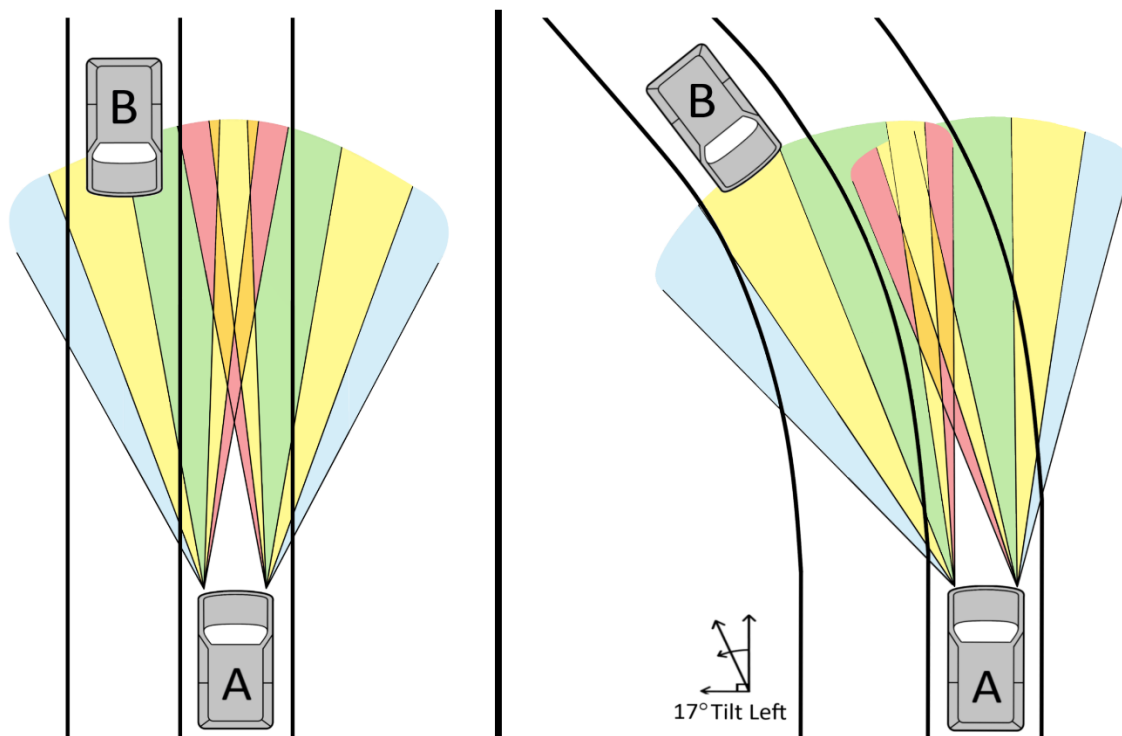
4. Ground 6E Has No Directional Control

It is unclear that Karlsson’s hardware could achieve Gotou’s desired change, lacking directional control because the modulator merely controls intensity. (Ex. 1010, 14:12-15; Ex.2006, ¶237.) Moreover, the control is explained as nothing more than “adjust and direct light of the spotlight beams appropriately in view of

Gotou's map..." but what control system is doing this is never stated, and different combinations of Karlsson-Harbers have different control systems. (Pet., 119; §VI.F, §VIII.I.3; Ex.2006, ¶237.) This generic function and lack of detail lacks the requisite particularity to demonstrate a functional solution that a POSA would have been motivated to make, a failing extending to all sub-grounds 6A-6E.

5. Grounds 6B-6C Suffer From Color Shifting Issues

Steering a beam including color as in 6B or 6C would create color overlaps that create undesirable color shifts, as indicated below in the Annotated Fig. (Ex.2006, ¶238.)



(Ex. 2006, ¶238)

Petitioner does not explain how systems resulting from sub-grounds 6B or

6C would actually achieve Gotou's output, but both sub-grounds do have colored LEDs from Harbers' array. (Ex.2006, ¶239.) Accordingly, if the overlap changed due to whatever alleged beam steering was utilized, color changes would result. (*Id.*) These grounds thus suffer from a fatal lack of particularity on this point and raises issues that would render the lamps unsuitable for predictable road illumination. (*Id.*)

IX. Conclusion

In light of the remarks herein, Patent Owner respectfully requests that the Board finds all challenged claims not unpatentable.

Dated: October 12, 2023

Respectfully submitted,

/ Sangeeta G. Shah /
Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No. 38,383)
Bernard Tomsa (Reg. No. 60,121)
Andrew B. Turner (Reg. No. 63,121)
Brooks Kushman P.C.
1000 Town Center, 22nd Floor
Southfield, MI 48075
(248) 358-4400

Attorneys for Patent Owner

Certificate of Service

The undersigned hereby certifies that on October 12, 2023, a complete and entire copy of **PATENT OWNER'S RESPONSE and all exhibits**, was served via electronic mail to the attorneys listed below:

LEAD COUNSEL	BACK-UP COUNSEL
Michael D. Specht (Reg. No. 54,463) Sterne, Kessler, Goldstein & Fox P.L.L.C. 1101 K Street, N.W., 10 th Floor Washington D.C., 20005 Telephone: (202) 371-2600 Facsimile: (202) 371-2540 mspecht-PTAB@sternekessler.com	Jason A. Fitzsimmons (Reg. No. 65,367) Daniel E. Yonan (Reg. No. 53,812) Ian Soule (Reg. No. 74,290) Jason D. Higgins (Reg. No. 74,992) Sterne, Kessler, Goldstein & Fox P.L.L.C. 1101 K Street, N.W., 10 th Floor Washington D.C., 20005 Telephone: (202) 371-2600 Facsimile: (202) 371-2540 jfitzsimmons-PTAB@sternekessler.com dyonan-PTAB@sternekessler.com isoule-PTAB@sternekessler.com jhiggins-PTAB@sternekessler.com PTAB@sternekessler.com

Respectfully submitted,

/ Sangeeta G. Shah /

Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No. 38,383)
Bernard Tomsa (Reg. No. 60,121)
Andrew B. Turner (Reg. No. 63,121)
Brooks Kushman P.C.
1000 Town Center, 22nd Floor
Southfield, MI 48075
(248) 358-4400

Attorneys for Patent Owner

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 13,965 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,

Dated: October 12, 2023

/ Sangeeta G. Shah /
Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No. 38,383)
Bernard Tomsa (Reg. No. 60,121)
Andrew B. Turner (Reg. No. 63,121)
Brooks Kushman P.C.
1000 Town Center, 22nd Floor
Southfield, MI 48075
(248) 358-4400

Attorneys for Patent Owner

Appendix A
A. Listing of All Challenged Claims

Element
20. A vehicle headlight system, comprising:
one or more headlamps affixed to a vehicle, each headlamp including at least three directional light sources aimed at different angles relative to the vehicle, the light sources configured to have one or more controllable light characteristics, wherein a first light source of the more than one light sources at a first angle is less visually disturbing to traffic than a second light source of the more than one light sources aimed at a second angle, different from the first angle;
control circuitry configured to adjust the at least one light characteristic of at least one of the directional light sources;
one or more sensors configured to sense information defined as pertinent to determining illumination output from the one or more headlamps and communicating the sensed information to a processor as sensor data;
the processor, in communication with at least the sensors and the control circuitry, configured to:
process the sensor data to determine, within a field-of-view, at least a first subsection including a detected vehicle and at least a second subsection not including the detected vehicle,
determine optimal use of the differently aimed directional light sources to maximize vehicle operator visibility in at least the second subsection, while minimizing a disturbing effect, resulting from the illumination output, on the vision of other traffic in at least the first subsection, and
direct the control circuitry to adjust the directional light sources to achieve the determined optimal use.
21. The system of claim 20, wherein the processor is further configured to determine at least a road curvature, indicated by the sensor data, ahead of the vehicle and to direct the control circuitry to adjust the directional light sources to increase illumination in a direction of the road curvature.
22. The system of claim 21, wherein the processor is further configured to determine at least a planned upcoming turn, indicated by the sensor data, and to direct the control circuitry to increase illumination illuminating the turn.

Element
23. The system of claim 20, wherein the processor is further configured to determine at least a planned upcoming turn, indicated by the sensor data, and to direct the control circuitry to increase illumination illuminating the turn.
24. The system of claim 20, wherein at least one light source provided to at least one of the one or more headlamps further includes a laser diode.
25. The system of claim 20, wherein at least one of the one or more headlamps further includes at least one of reflectors, refractors, or lenses usable to alter emitted light from at least one of the light sources.
59. A vehicle headlight system, comprising:
one or more headlamps affixed to a first vehicle, each headlamp including at least three directional light sources having different aimings relative to the first vehicle, the light sources having one or more controllable illumination characteristics;
one or more sensors configured to sense information, at least a portion of the sensed information indicating a second vehicle, and communicate sensor data reflecting the sensed information to at least one processor, wherein the at least one processor is configured to:
process the sensor data to identify a first subsection, of a field of view, that includes at least a portion of the second vehicle;
determine light output for the headlight system that aims illumination at the first subsection, the illumination aimed at the first subsection substantially resulting in light below a first predefined illuminance in the first subsection, and that aims illumination at one or more second subsections of the field of view to either side of the first subsection, the illumination aimed at the one or more second subsections substantially resulting in light above the first predefined illuminance in the one or more second subsections; and
instruct adjustment of one or more of the light sources to achieve the determined output.
60. The system of claim 59, wherein at least one of the at least one processors is further configured to determine at least a road curvature, indicated by the sensor data, ahead of the first vehicle and to determine light output that aims illumination in a direction of the road curvature.

Element
61. The system of claim 60, wherein at least one of the at least one processors is further configured to determine at least a planned upcoming turn, indicated by the sensor data, and to determine light output that illuminates the turn.
62. The system of claim 59, wherein at least one of the at least one processors is further configured to determine at least a planned upcoming turn, indicated by the sensor data, and to determine light output that illuminates the turn.
63. The system of claim 59, wherein at least one light source provided to at least one of the one or more headlamps further includes a laser diode.
64. The system of claim 59, wherein at least one of the one or more headlamps further includes at least one of reflectors, refractors, or lenses usable to alter the light emitted from at least one of the light sources as part of the instructed adjustment.