Trials@uspto.gov
571-272-7822

Paper 39
Date: June 20, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

YECHEZKAL EVAN SPERO,
Patent Owner.

IPR2023-00197[†]
U.S. Patent 10,894,503 B2

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

MOORE, *Administrative Patent Judge*.

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

[†] Porsche Cars North America, Inc., which filed a petition in IPR2023-01231, has been joined as a party to this proceeding.

TABLE OF CONTENTS

I. BACKGROUND 3
A. Related Matters 3
B. The '503 Patent 4
II. ANALYSIS 7
A. Level of Ordinary Skill in The Art 7
B. Claim Construction 8
C. Particularity 9
D. Obviousness Based on Karlsson and Harbers 10
1. Karlsson 10
2. Harbers 11
3. Independent Claims 20 and 59 12
a. The Combination 13
b. Patent Owner Arguments 14
i. Motivation to Combine 14
ii. Segmentation/Color Shifting 18
iii. Conflicting Control Strategies 20
iv. Particularity 21
v. Full Illumination 22
vi. Different Aimings in Karlsson 23
vii. Issues with Different Aimings in the Combination 23
viii. Detecting a Vehicle 25
c. Independent Claims Conclusion 27
4. Dependent Claims 21–25 and 60–64 27
a. Turns/Curves in Karlsson 28
b. Combination with Gotou 29
i. Multiple Control Functions 29
ii. Directional Control 30

iii. Color Shifting 30
c. "Failure of Proof" for Claims 60–62 and 64 32
d. Dependent Claims Conclusion 35
E. Obviousness Based on Beam and Thominet 35
F. Petitioner's Motion to Exclude 35
III. CONCLUSION 36

I. BACKGROUND

Volkswagen Group of America, Inc. ("Petitioner") filed a Petition (Paper 1, "Pet.") requesting *inter partes* review of claims 20–25 and 59–64 of U.S. Patent No. 10,894,503 B2 (Ex. 1001, "the '503 patent"). Yechezkal Evan Spero ("Patent Owner") filed a Preliminary Response (Paper 6, "Prelim. Resp.").

We instituted *inter parties* review on June 21, 2023 (Paper 13, "Inst. Dec."), Patent Owner filed a Response (Paper 18, "PO Resp."), Petitioner filed a Reply (Paper 22, "Pet. Reply"), and Patent Owner filed a Sur-Reply (Paper 26, "PO Sur-reply").

We held a hearing on April 16, 2023, and a transcript of the hearing is included in the record, as are the demonstratives. *See* Paper 38 ("Tr."); Ex. 1072 (Petitioner Demonstratives); Ex. 2029 (Patent Owner Demonstratives).

We issue this Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 and, for the reasons that follow, determine that Petitioner has shown, by a preponderance of the evidence, that claims 20–25 and 59–64 are unpatentable.

A. Related Matters

Petitioner identifies one civil action, *Torchlight Techs. LLC v. Daimler AG et al.*, No. 1:22-cv-00751 (D. Del.), as a related matter. *See* Pet. 129. Petitioner also identifies U.S. Patent Nos. 9,955,551 and 8,100,552 as having issued from a parent of the application that issued as the '503 patent, and U.S. Patent No. 11,208,029 as having issued from a child application. *See id.* at 130.

Patent Owner identifies two civil actions in which the '503 patent has been asserted, *Torchlight Techs. LLC v. Daimler AG et al.*, No. 1:22-cv-00751 (D. Del.), and *Torchlight Techs. LLC v. General Motors LLC et al.*, No. 1:22-cv-00751 (D. Del.), both of which are pending. *See* Paper 4, 1. Patent Owner also identifies two

related *inter partes* reviews, *Volkswagen Group of America, Inc. v. Yechezkal Evan Spero*, IPR2023-00328 and *Volkswagen Group of America, Inc. v. Yechezkal Evan Spero*, IPR2023-00335. *See id*. at 1–2. Patent Owner additionally identifies seven other Patent Office proceedings concerning related patents. *See id*. at 2.

B. The '503 Patent

The '503 patent is titled "Detector Controlled Headlight System" and is directed to "[a]n automated headlight system for vehicles [that] replaces the high and low beam with a continuum of beam patterns, with further variable spatial distribution of intensities and color spectrum." Ex. 1001, Abstract. The embodiment that corresponds to the challenged claims is depicted in Figure 15, which is reproduced in part below:

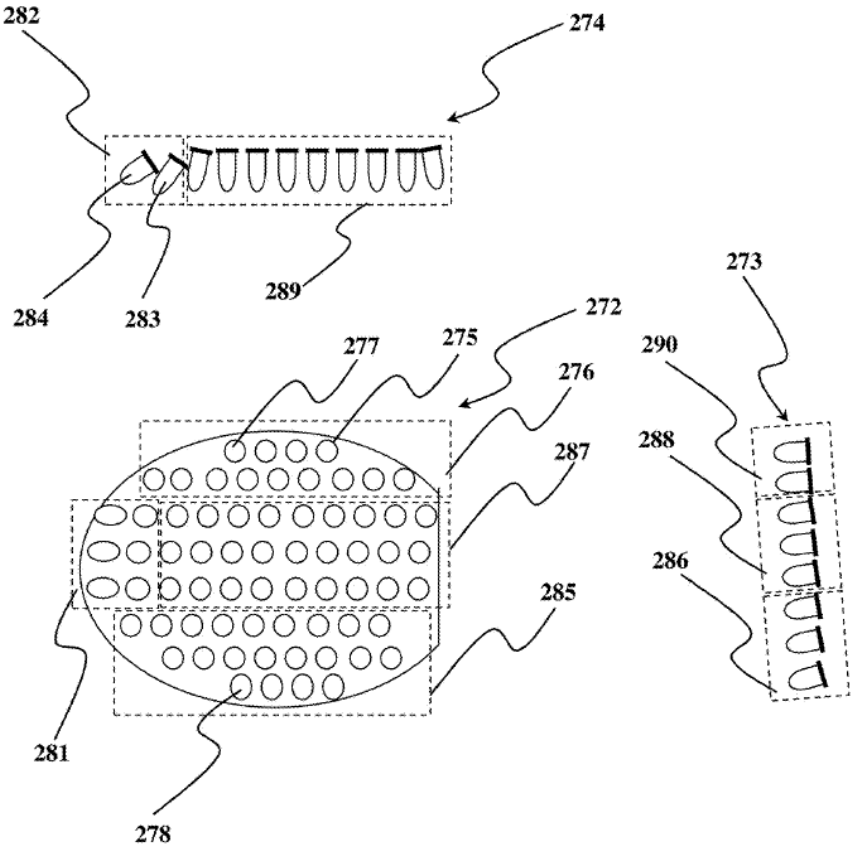

Figure 15 shows a "multiple light-source headlamp." Ex. 1001, 15:64.

The figure depicts "a headlamp 270 of a land, sea or air vehicle . . . in front view 272, side view of a section 273 and top view of a section 274." Ex. 1001, 53:17–19. A solid-state light source, "such as an LED 275 with [a] specific location within the cluster 276 has a specific spatial light distribution, color wavelength and aiming relative to the vehicle, such as straight ahead, and or downwards and or off towards the right or left." Ex. 1001, 53:19–23. Different LED 277, which is "at a second location within the same cluster[,] may have a similar or dissimilar aiming, wavelength and spatial light distribution." *Id*. at 53:29–31.

The patent explains that "headlamp control is automatic, from turning on automatically when ambient lighting levels fall to such a level where it is advantageous to have headlamps on, either to aid in illuminating the way ahead or facilitate being seen by others, to automatic dimming of high beam due to detection of oncoming vehicles and shut off when ambient lighting levels are sufficient." Ex. 1001, 52:25–32. The patent further identifies "[a] possible control system for such purposes [that] is described in U.S. Pat. No. 6,281,632 by Stam, et-al from Aug. 28, 2001," in which "[i]f there is no oncoming traffic, then [the headlamp] operates as [a] high beam," but "[i]f there is oncoming traffic, then it acts as [a] regular low beam." *Id*. at 52:31–33, 52:55–57.

Claims 20 and 59 are independent, directed to vehicle headlight systems, and reproduced in full below:

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.

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.

II. ANALYSIS

We discuss the appropriate level of skill in the art, claim construction, particularity of the Petition, the parties' arguments regarding the obviousness of the challenged claims, and Petitioner's motion to exclude.

A. Level of Ordinary Skill in The Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention "would have had a bachelor's degree (B.S.) in mechanical engineering, electrical engineering, optical engineering, applied physics, or an equivalent field, as well as at least 2 years of industry experience in the area of automotive lighting and lighting-control systems" and "may work as part of a team, for example, with computer engineers to integrate, program, etc., controllers and various control inputs to affect control of a given light source." Pet. 9 (citing Ex. 1003 ¶¶ 42–44).

In the Preliminary Response, Patent Owner asserted that a person of ordinary skill in the art "would have had a Master of Science Degree (or a similar technical Master Degree, or higher degree) in an academic area emphasizing electrical engineering, computer engineering, or computer science with experience or education in optics and imaging systems or, alternatively, a Bachelor's Degree (or higher degree) in an academic area emphasizing electrical, computer engineering or computer science and having two or more years of experience in the field of optical and imaging systems." Prelim. Resp. 9–10 (citing Ex. 2001 ¶¶ 28–30).

At institution, we adopted Petitioner's proposal, except that we omitted the qualifier "at least" and set the level of experience at two years. *See* Ins. Dec. 7. In its Response, Patent Owner stated that it "does not dispute the Board's reframing of Petitioner's proposed level of ordinary skill" and asserts that "the modification should have no effect on the analysis." *See* PO Resp. 14.

We accordingly maintain the level of ordinary skill in the art we adopted in the institution decision.

B. Claim Construction

We construe claims using the standard that would be applied in a civil action under 35 U.S.C. § 282(b), giving terms their ordinary and customary meaning to one of ordinary skill in the art in view of the specification and prosecution history. *See* 37 C.F.R. § 42.100(b).

The Petition discusses Patent Owner's assertion, made during prosecution of a different patent, that "light source" should mean "individual LED" but asserts that "the applied references cover Patent Owner's proposed construction." *See* Pet. 10–11. Petitioner further stated that it "does not believe any other claim terms require specific construction and should receive their plain and ordinary meaning, in the context of the '503 patent specification." *Id*. at 11.

At institution, we interpreted the term "light source" as the Specification defines it: "any system that is capable of receiving an electrical signal and producing light in response to the signal." Ex. 1001, 17:7–10 ("As used herein, the term 'light source', LED or 'solid state light source' means any system that is capable of receiving an electrical signal and producing light in response to the signal."). Patent Owner agrees with that construction. *See* PO Resp. 14.

However, the reason we interpreted "light source" in the institution decision was that there was a question about whether the individual "microbeams"

described in the Beam reference were "light sources." *See* Inst. Dec. 11. Because, as explained below, we do not reach the Beam grounds, we need not construe "light source" in this final decision. We further find that that no other express claim construction is necessary. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (explaining that construction is needed only for terms that are in dispute, and only as necessary to resolve the controversy).

C. Particularity

Patent Owner argues that "Petitioner's arguments should be rejected based on finding of lack of particularity." PO Resp. 26. We do not agree.

We addressed this issue at institution, explaining that "we understand the asserted combinations" and that "[a]ssertions that both references disclose a particular claim element do not undermine or overly cloud Petitioner's asserted combinations." Inst. Dec. 22. That remains the case. Patent Owner's attempt to spin some loose language in the Petition into "41 Sub-Grounds within the nominal framework of six Grounds" (PO Resp. 15) is not persuasive, particularly *after* the institution decision, in which we explained how we viewed the combinations presented by Petitioner, for example finding that the primary references did not disclose differently angled light sources, and explaining that the combination contemplated the lighting schemes of the secondary references augmented by the selective dimming of the primary references. *See* Inst. Dec. 9–20. The combinations are simply not as multiplicated and complicated as Patent Owner contends, and Patent Owner acknowledged at the hearing that the alleged multiplicity did not prevent it from addressing any issue. *See* Trans. 37:17–18 ("[Q]: Which of these [alleged sub-grounds] did you address in your papers? [A]: We address every single one for every single claim.").

Patent Owner also argues that "[the] 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." PO Resp. 25 (emphasis omitted). We again disagree with Patent Owner's assessment of the number of "sub-grounds" at issue, and conclude, as we did at institution, that three petitions were justified given the number of asserted claims and the differences in claim scope. *See* Inst. Dec. 22.

D. Obviousness Based on Karlsson and Harbers

Petitioner asserts that claims 20, 24, 25, 59, 63, and 64 are unpatentable as obvious in view of Karlsson and Harbers, and that claims 21–23 and 60–62 are unpatentable as obvious in view of Karlsson, Harbers, and Gotou. *See* Pet. 76–126.

1. Karlsson

Karlsson describes a lighting device with a controllable lighting pattern. The overall structure is shown in Figure 3, which is annotated below:

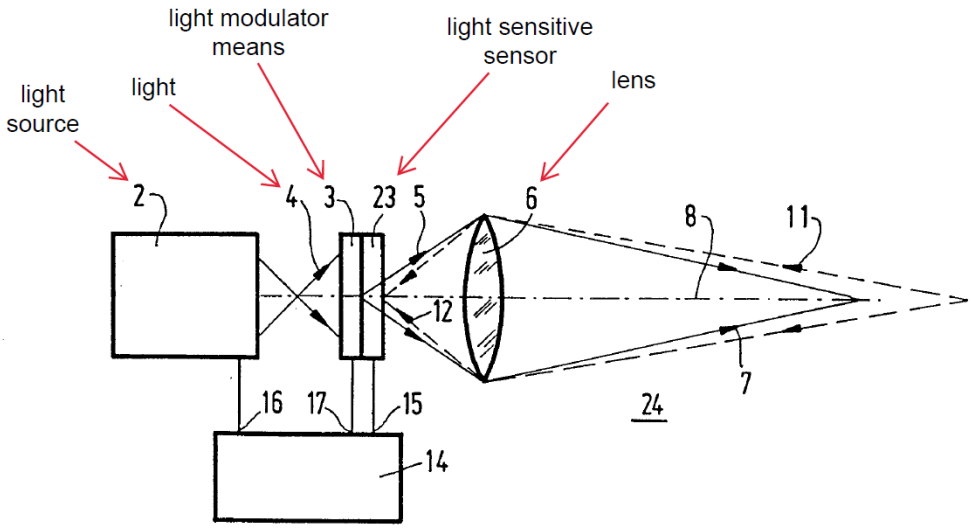

FIG. 3

Karlsson's Figure 3 shows an embodiment with a light sensitive sensor. See Ex. 1010, 7:10–11.

This drawing shows a light source 2 that projects light 4 through a light modulator means 3, a light sensitive sensor 23, and a lens 6 to form a light beam 7. This arrangement "enables the combined use of a single optical system both for forming the light beam 7 to be emitted and for detecting ambient light, due to the intermittently control of the lighting means 2, 3, and of the light-sensitive sensor 23, if desired, such that one or the other can be controlled to be light transmittive or light blocking." Ex. 1010, 11:19–23.

Karlsson further describes how "[t]he pattern of the light beam being emitted by the lighting device is automatically and dynamically adapted in dependence on the intensity and the direction of . . . light being detected" and that "[the] part of the light beam which might cause inconvenience to oncoming traffic is automatically suppressed, whilst retaining an optimum lighting effect for the driver of the vehicle himself." Ex. 1010, 2:4–9; *see also id.* at 9:19–23 ("When the lighting device 1 is used as a headlight in a car, the pattern and the intensity of the light beam 7 are, for example, controlled in such a manner that no light at all or light having a low intensity is emitted in those directions from which light is detected by the light-sensitive sensor 9.").

2. Harbers

Harbers discloses a vehicle headlamp system in which a "light beam generated by the light source has a continuously adjustable spatial distribution." Ex. 1011, 1:26–27. As shown in Figure 1B, below, Harbers' system is implemented with light beams directed at different angles, as denoted by the different numbers of prime symbols (e.g., 6' and 6"):

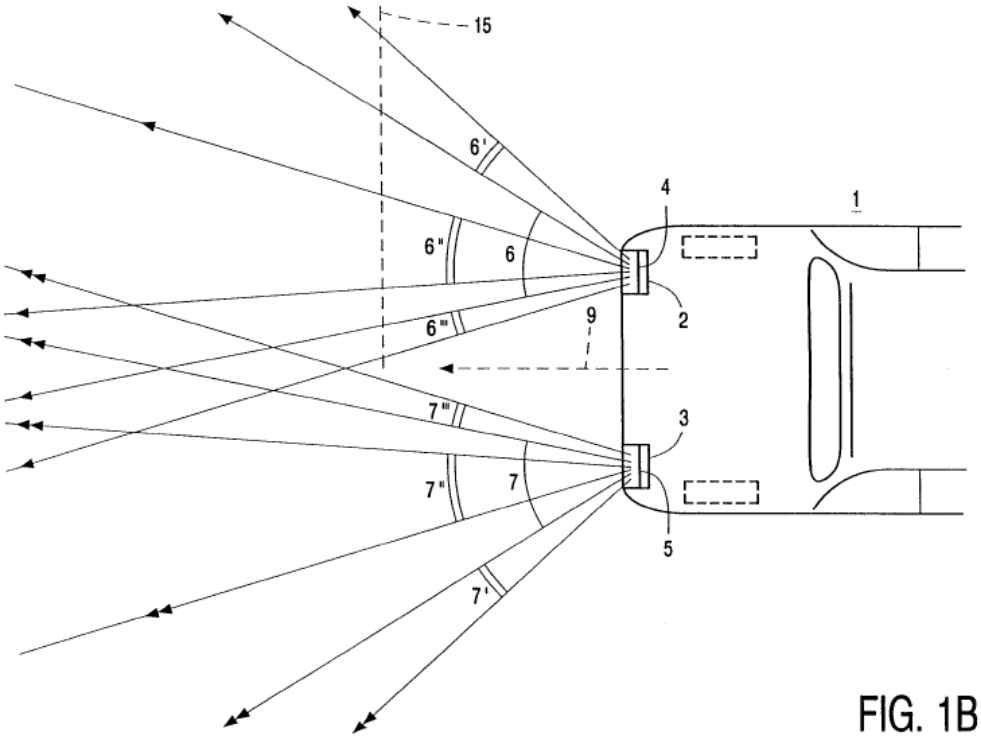

FIG. 1B

Harbers' Figure 1B shows "a plan view of a part of [a] vehicle." Ex. 1011, 6:13.

Harbers explains that its "array of optoelectronic elements . . . does not have to be provided on a flat substrate" and "may alternatively be provided on a curved substrate." Ex. 1011, 7:27–29. The reference explains that "[t]he shape of the substrate on which the array of opto-electronic elements . . . is provided is determined to a substantial degree by the desired direction of the light beams emitted by the various opto-electronic elements." *Id.* at 7:29–32.

3. Independent Claims 20 and 59

Independent claim 20 is generally directed to a vehicle headlight system with a headlamp that includes at least three directional light sources aimed at different angles relative to the vehicle. The light sources have one or more controllable light characteristics, and one light source aimed at a first angle is less

visually disturbing to traffic than a second light source aimed at a different second angle. There is control circuitry to adjust the light characteristics and a sensor configured to sense information for determining illumination output and communicating the sensed information to a processor, which uses the sensor data to determine a first subsection of a field-of-view that includes a detected vehicle and a second subsection not including the detected vehicle. The processor determines optimal use of the light sources to maximize vehicle operator visibility in the second subsection while minimizing a disturbing illumination effect on the vision of other traffic in the first subsection and directs the control circuitry to adjust the directional light sources to achieve the determined optimal use.

Independent claim 59 is directed to similar subject matter but also requires that the processor determines the light output such that the illumination for a first subsection of the field results in light below a first predefined illuminance, and illumination for a second subsection of the field of view on either side of the first subsection is above the first predefined illuminance.

a. The Combination

At institution, we rejected Petitioner's arguments that Karlsson discloses "at least three directional light sources," but found that Harbers does. *See* Inst. Dec. 13–14. We adopt and incorporate those findings and conclusions from the Institution Decision.

The Petition argued that "[h]aving multiple directional beam segments with different angles/aimings as in Harbers, implemented with Karlsson's control means 14/spotlight beams 34 (including light modulator means 3), would have provided Karlsson's system with different spatial distributions for different driving situations beyond reducing glare for drivers, thereby improving safety." Pet. 84 (citing Ex. 1003 ¶ 350). Essentially, the combination relies on Karlsson for most

of the subject matter of the independent claims, adding Harbers for the limitations concerning differently directed light sources. *See* Pet. 87–111.[2] The motivation to combine is that it would have been desirable to implement Harbers' lighting scheme, which uses "multiple directional beam segments with different angles/aimings" because it would "provide different spatial distributions for improved visibility in different driving situations (off-axis viewing, bends, narrow roads, motorways, etc." *Id.* at 80 (citing Ex. 1011, 5:14–26, 6:1–7, 6:27–7:32, 9:28–10:5, 13:5–7, Figs. 1B, 2; Ex. 1003 ¶¶ 343–344); *see also* Ex. 1011, 2:33–3:10 ("Since the spatial distribution is . . . adjustable, the driver's view of the road and the surroundings of the vehicle is improved. On the one hand, objects situated on or in the axis of the light beam, such as oncoming traffic, can be better observed. On the other hand, also the observation of objects outside the center of the light beam is improved.")

b. Patent Owner Arguments

Patent Owner raises a number of issues with the combination, which we address in the order presented.

i. Motivation to Combine

Patent Owner first argues that there is no motivation to combine because "a POSA would understand that the addition of Harbers' curved substrate alone, is of no more use than Thominet's substrate." PO Resp. 62. Patent Owner refers to its contentions regarding the Beam/Thominet combination, where it argued that "neither the Petition nor the accompanying Jiao Declaration offer any evidence as to why in the 'hardware combination'" one of ordinary skill "would have [had]

[2] It may have been more natural to use Harbers as the "base reference" and modify its teachings with Karlsson's teachings regarding selective dimming, but we limit our analysis to the combination as presented in the Petition.

even a general motivation to combine Thominet's curved hardware with the Beam system." PO Resp. 41. Patent Owner argues that Petitioner "fails to explain why the addition of . . . differently angled LEDs . . . improves driver safety" and that "[m]erely 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.'" *Id.* Patent Owner contends that "[t]he Petition offers no explanation for why a POSA would select an optional curved substrate over the similarly functioning flat substrate . . . , especially when the primary reference also includes a flat substrate." *Id.* at 42.

We find that the focus on the "curved substrate" is somewhat misplaced, because the limitation at issue concerns *the directions of the light sources*, not the shape of the substrate. In Figure 1B, Harbers shows a system in which differently angled light sources produce differently angled light beams:

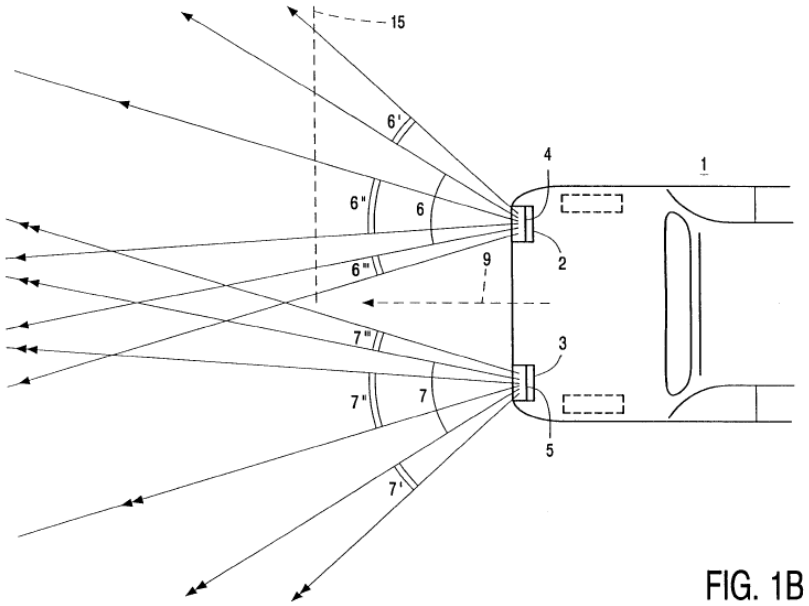

FIG. 1B

Harbers' Figure 1B shows "a plan view of a part of [a] vehicle." Ex. 1011, 6:13.

For example, beam segments 6 and 7 are "a relatively wide, central part of the light 5 beam . . . compris[ing] a kind of passing beam" and beam segments 6' and 7' are "directed in particular towards the edge of the road (the shoulder of the road)." Ex. 1011, 7:4–7. It is evident from the figure that these different beam segments are produced by light sources arranged at different angles, with the source(s) producing segment 7", for example, at a smaller angle relative to the longitudinal direction 9 than the source(s) producing segment 7'. Harbers does not describe how these differently angled beams might be achieved if all of the light sources were pointed in the same direction.

Harbers then explains in connection with Figure 2 that the light sources are "opto-electronic elements" and that they "[do] not have to be provided on a flat substrate" and "may alternatively be provided on a curved substrate." Ex. 1011, 7:20–29. In either case, however, we find that the light sources must be directed at different angles to produce the pattern shown in Figure 1B. In other words, we do not read Harbers' explanation that the *substrate* may be flat or curved to mean that the *light sources* in the non-curved substrate embodiment would all be pointed in the same direction because that is simply not consistent with Figure 1B. Instead, we understand Harbers to be describing how the differently directed light beams may be achieved either by light sources mounted on a flat substrate at different angles relative to the substrate, or by light sources mounted on a substrate that is curved.

The Petition asserted that "[h]aving *multiple directional beam segments with different angles/aimings* as in Harbers, implemented with Karlsson's control means 14/spotlight beams 34 (including light modulator means 3), would have provided Karlsson's system with different spatial distributions for different driving situations beyond reducing glare for drivers, thereby improving safety." Pet. 84

(emphasis added, citing Ex. 1003 ¶ 350). Petitioner thus relied on Harbers' "beam segments" with "different angles/aimings" that produce the pattern shown in Figure 1B. We agree that the advantages Harbers attributes to its spatial distribution scheme would have provided a sufficient motivation to use it in the combination, and that it would include the differently angled light sources present in *both* the flat and curved substrate embodiments of Harbers.

Because all embodiments of Harbers' illumination method require that the light sources be arranged at different angles, we need not conclude that it would have been obvious to use Harbers' curved substrate in place of Karlsson's flat substrate. However, were inclusion of Harbers' curved substrate necessary for a finding of obviousness, we conclude that Harbers' explanation of how the non-curved and curved embodiments are simply alternative means of producing differently angled beams would be sufficient to show that use of the curved substrate in place of a flat substrate would have been a simple substitution of a known element (a curved substrate) for another (a flat substrate), yielding the predictable results described in Harbers (differently angled light sources capable of producing the designed light pattern), and that this would be, therefore, an obvious modification. *See* Pet. 86 (asserting that use of the curved substrate would have been a simple and predictable substitution). We find that the skilled artisan would have known to use either a flat or curved substrate to achieve Harbers' multi-directional lighting scheme as appropriate for a given application.

Patent Owner suggests that *Virtek Vision Intl. ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882 (Fed. Cir. 2024), supports its position that it would not have been obvious to use the curved substrate in the combination. *See* Trans. 101, 127. In that case, the issue was whether it would have been obvious to modify the primary references, which used an angular direction system, to instead use a 3D

coordinate system that was also known in the art. *See id.* at 886. The Federal Circuit found a lack of motivation to combine because "[t]he mere fact that . . . possible arrangements existed in the prior art" was insufficient. *Id.* at 887. Here, however, there *is* a motivation—the advantages of Harbers' spatial lighting scheme—and Harbers teaches that those advantages may be achieved with differently directed light sources on either a flat substrate or a curved substrate. We find this to provide a sufficient motivation under the controlling law. *See KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) (explaining that to be non-obvious a change must be "more than the predictable use of prior art elements according to their established functions").

ii. Segmentation/Color Shifting

Patent Owner next argues that "[b]ecause Petitioner's Ground 5E[3] combination lacks Harbers' software, per Dr. Jiao's testimony, the control features of Harbers would be missing," and that "[w]ithout light segmentation the motivation to use Harbers' hardware alone--curved substrate and LEDs--is lacking." PO Resp. 62 (citing Ex. 2025, 65:13–19; Ex. 2006 ¶ 206).

We find this argument unpersuasive because we do not agree that the combination "lacks Harbers' software"; to the contrary, one of skill in the art would readily understand that some type of programming would be needed to control the light sources to achieve the benefits Harbers describes. And the cited portion of Dr. Jiao's testimony (which technically was about the Beam/Thominet combination) does not say that the combination lacks Harbers' software—in that

[3] "Ground 5E" is one of the "sub-grounds" identified by Patent Owner.

exchange the witness simply confirmed that software is required to control the light intensity and direction.[4]

Patent Owner additionally argues that "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." PO Resp. 62–63.

We also find this argument unpersuasive. The combination contemplates the use of Harbers' control scheme (which is used in the combination because it is the reason for the combination), along with Karlsson's teachings about dimming the portion of the projected light that may cause inconvenience to oncoming drivers. *See* Pet. 93. Patent Owner does not sufficiently explain how or why simply suppressing a portion of the light would cause "color-shifting problems," and we agree with Dr. Jiao that one of ordinary skill in this art, which is fairly predictable, would be able to avoid or sufficiently minimize any color shifting problems. *See* Ex. 1051 ¶¶ 162–165.

Moreover, the color-shifting argument appears to be based on the idea that Harbers' scheme must include different colors, but Harbers varies the *spectral* characteristics only in one alternative embodiment. *See* Ex. 1011, 4:33–5:9 ("An alternative embodiment of the vehicle headlamp is characterized in accordance with the invention in that the spectral characteristic of a light beam generated by the light source depends upon the position in the light beam."). We conclude that,

[4] *See* Ex. 2025, 65:13–19 ("[Q:] So again, just to make sure I'm clear, to achieve the control, specifically intensity and direction, in Thominet, that requires software controls? [A:] It is always software control the light direction and intensity change, both Beam and Thominet.").

even if color-shifting were a problem when combining the selective dimming with Harbers' colored embodiment, it nevertheless would have been obvious to one of ordinary skill in the art to use Harbers' single-color embodiment in combination with Karlsson's selective dimming, thereby obviating any color-shifting problems.

iii. Conflicting Control Strategies

Patent Owner next argues that "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." PO Resp. 63. "For example," argues Patent Owner, "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" and "[a]t 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." *Id.* (citing Ex. 2006 ¶ 207).

We do not agree that "conflicting control strategies" would be a problem that would preclude the combination. Instead, one of ordinary skill in the art would have known to take the aspects of the different strategies that would be desirable for a given application or situation. Patent Owner's argument seems to be based on the idea that all aspects of both control strategies would have to be implemented at the same time, but we see no reason why that would be the case.

A proper obviousness analysis considers whether the claimed subject matter would have been obvious in light of the teachings of the prior art, not whether the particular embodiments disclosed in the prior art could actually be combined. *See Allied Erecting and Dismantling Co., Inc. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) ("The test for obviousness is not whether the features

of a secondary reference may be bodily incorporated into the structure of the primary reference.") (quoting *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)).

Here, Harbers describes a useful general headlight illumination scheme, and Karlsson describes how, in the context of headlight illumination, it would be desirable to dim portions of the illumination corresponding to oncoming traffic. We see no problem with a combination of those teachings.

iv. Particularity

Patent Owner next argues that in "sub-ground" 5F, there are two controllable systems, an LED array 2 and a modulator 3 from Karlsson," that "[t]here are also two control strategies, Karlsson's selective control and Harbers' alleged automatic beam segmentation," and that "Petitioner never explains which controllable structure would be controlled by which control function, rendering the argument fatally flawed for a lack of particularity." PO Resp. 63–64.

We do not agree that the challenge lacks particularity. In Karlsson, LED array 2 and modulator 3 are used together to control the light output. *See* Ex. 1010, 9:3–8 ("The light modulator means 3 are controlled by the control means 14 in such a manner that the light 4 emitted by the light 5 source 2 is processed into a light beam 7 having a desired pattern and intensity.").

As explained in the Petition, the combination contemplates the use of Harbers' illumination scheme, along with Karlsson's teachings about dimming the portion of the projected light that may cause inconvenience to oncoming drivers. *See, e.g.*, Pet. 93. Thus, Karlsson's light source and modulator would be controlled to produce a lighting scheme as shown in Harbers, but to selectively dim the areas projecting in the direction of oncoming vehicles as taught in Karlsson.

v. Full Illumination

Patent Owner next argues that Petitioner contends Karlsson teaches "full usage of the array except when accommodating glare" and that this "interpretation generally supports Patent Owner's similar understanding of how Karlsson functions." *See* PO Resp. 64–65. We do not agree that Karlsson teaches full usage of its array except for accommodating glare, or that Petitioner so argues.

Petitioner offers the following annotated version of Karlsson's Figure 14 on page 101 of the Petition:

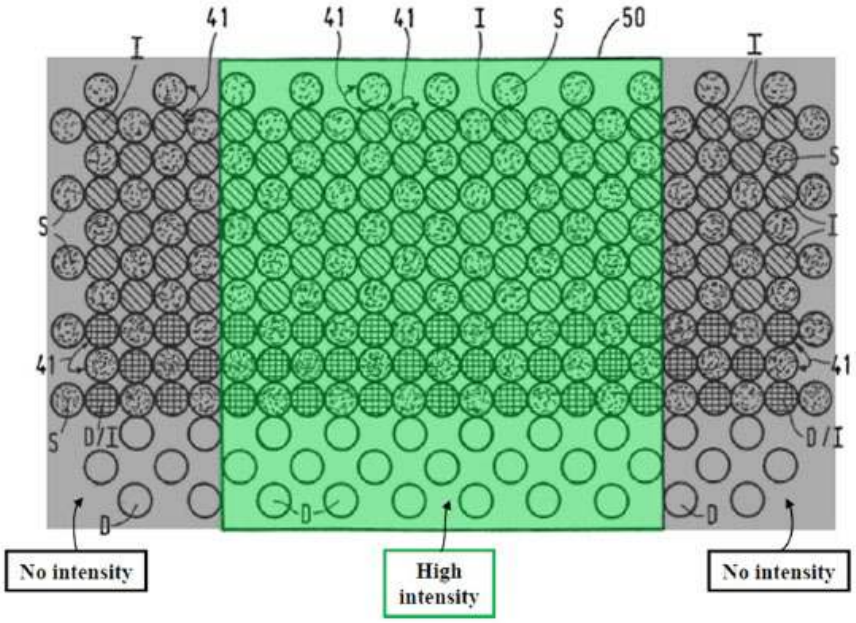

Figure 14 of Karlsson as Annotated by Petitioner

According to Petitioner, this shows a first subsection (in grey) corresponding to a detected vehicle and having no intensity and a second subsection (in green) in which light is not suppressed. *See* Pet. 101. In our view, this figure and description illustrates how Karlsson's system might work to dim the light output in the case of oncoming vehicles, but we fail to see how it supports Patent Owner's argument that in the absence of a detected vehicle the entire array *must* be at full

intensity. Instead, Karlsson explains that, "the emitted light beam 50 is represented as a window which can shift in the plane of the drawings from the left to the right and from the top to the bottom, if desired, and vice versa," and that the window "may vary as regards its shape and dimension in dependence on the desired pattern and direction of the beam." Ex. 1010, 19:29–33. Karlsson thus teaches the skilled artisan that its array of light sources may or may not be fully illuminated, depending on the situation.

vi. Different Aimings in Karlsson

Patent Owner next argues that Karlsson does not teach directional light sources having different aimings. *See* PO Resp. 65–67. As we did at institution, we agree with that argument. *See* Inst. Dec. 13–14. But that point is immaterial because, as explained above, Harbers provides this feature in the combination.

vii. Issues with Different Aimings in the Combination

Patent Owner also argues that "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." PO Resp. 67–68.

We find this argument unpersuasive for two reasons. First, as explained above, Harbers uses differently directed light sources in the embodiment that does not use the curved substrate, and Patent Owner does not address that embodiment. Second, we conclude that one of ordinary skill in the art would be able to arrange the sensors in appropriate positions on a curved substrate, for example, by positioning the sensors at angles corresponding to the angles of the light sources to which they correspond. Indeed, the light source and its corresponding sensor would need to be arranged at the same angle in order to selectively dim the

illumination as described in Karlsson. *See, e.g.*, Ex. 1010, 5:28–32 (explaining how the sensors "make[e] it possible to determine precisely the direction from which light is being detected, so that subsequently a precise adjustment of the pattern of the light beam can be carried out, for example so as not to emit light in the direction of the detected light"). Additionally, Petitioner does not rely solely or even primarily on the interspersed sensors Karlsson discloses in Figure 14; rather, Petitioner relies on Karlsson's "light-sensitive sensors 9 and 23." Pet. 95–96. Thus, Patent Owner's argument that focuses on Figure 14's sensors does not address the proposed combination.

Patent Owner also argues that "Petitioner does not explain how the combined Karlsson/Harbers system having a curved substrate . . . 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." PO Resp. 69. Patent Owner similarly argues that "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" and that "the problem is compounded by Harbers' use of colored LEDs in the array, which would need to be addressed to avoid color-shifting issues." PO Resp. 69.

These arguments are also unpersuasive. The combination employs Harbers' lighting scheme modified by Karlsson's teachings about suppressing the portion of the projected light that may cause inconvenience to oncoming drivers and, as explained above, need not include all aspects of both references such as control based on velocity or direction. We find that the skilled artisan would have been capable of selecting which features to use in a given application. And Patent

Owner has not shown how or why how simply suppressing a portion of the projected light would cause color-shifting issues that could not have been addressed by the skilled artisan, or that one would need to use Harbers' multi-color embodiment.

Patent Owner further argues that Petitioner "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." PO Resp. 69. This argument is unpersuasive because the combination need not include the D, I, and D/I groupings, which exist in just one embodiment of Karlsson. *See* Ex. 1010, 19:23–28 ("*In this embodiment* non-shaded spotlight sources indicated at D provide the dipped 25 light function in accordance with existing vehicle headlights, whilst the single-shaded spotlight sources indicated at I provide the main-beam light function of existing vehicle headlights."). The Figure 13 embodiment, for example, does not include the D, I, and D/I groupings. *See* Ex. 1010, 13:30–14:15. Petitioner is again making a bodily incorporation argument, where the focus must instead be on the teachings of the prior art as a whole.

viii. Detecting a Vehicle

The last argument Patent Owner makes regarding the independent claims is that "Karlsson . . . 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." PO Resp. 70 (citing Ex. 2006 ¶ 227). Patent Owner argues that this means Karlsson does not "detect" a vehicle and that it thus does not include a processor that determines a first subsection "including a detected vehicle" and a second subsection "not including the detected vehicle." *See id.* at 70–71.

Patent Owner asserts that "[t]he plain meaning of 'detect' is to 'determine the existence, presence or fact of'" and that "[a]s 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." PO Resp. 48. Patent Owner further argues that "the processor must similarly be able to determine the absence of/fact that a detected vehicle does not exist, to demarcate a second subsection," and that "[f]or both limitations, a mere association will not suffice." *Id.*

We find this argument unpersuasive because the claims do not require processing to determine what it is the source of the light. Instead, they simply recite "one or more sensors configured to sense information defined as pertinent to determining illumination output" and then "process[ing] 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." Nothing in the claims requires that the system identify the source of the light. So, an approaching vehicle with illuminated headlights would result in the claimed first and second subsections. While it may be that another source of light would also cause dimming, that is beside the point as long as a vehicle would as well. The claims require dimming in the case of headlights, but do not require not dimming the light being projected towards other light sources in the field of view.

Karlsson describes how its "sensor means" are "used for detecting ambient light and light from oncoming traffic as a parameter to which the pattern of the emitted light beam is to be adjusted." Ex. 1010, 5:16–18; *see also id.* at 9:18–22 ("the pattern and the intensity of the light beam 7 are, for example, controlled in such a manner that no light at all or light having a low intensity is emitted in those directions from which light is detected by the light-sensitive sensor 9 . . . [i]n this manner glaring or blinding of oncoming traffic is effectively prevented"); *id.*

15:17–22 ("Detected incident light . . . is transmitted to the light-sensitive sensor 43, for the purpose of precisely detecting the intensity and the direction of detected light, such as light from oncoming traffic or ambient light in the case of a lighting device 40 in the form of a headlight of a motor vehicle.").

Karlsson thus teaches a system that would include a first subsection that includes a detected vehicle (the "oncoming traffic," as indicated by the "light from oncoming traffic") and a second subsection not including the detected vehicle, namely a section without light from oncoming traffic. This is consistent with the description of the '503 patent, which explains that "[a]nalysis by a detector or an imaging system of the oncoming vehicle's position" may be done "*using its headlights for example*." Ex. 1001, 52:66–67 (emphasis added).

We conclude that Karlsson detects vehicles and does so in the same way as at least some embodiments of the '503 patent.

c. Independent Claims Conclusion

Patent Owner does not otherwise contest Petitioner's unpatentability assertions regarding the independent claims and any such challenge has been forfeited. *See* Paper 12, 9 ("Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.").

We have considered Petitioner's contentions in light of the full record and conclude that Petitioner has shown claims 20 and 59 unpatentable in view of Karlsson and Harbers for the reasons provided in the Petition, and as discussed above. *See* Pet. 76–111.

4. Dependent Claims 21–25 and 60–64

Petitioner argues that dependent claims 24, 25, 63, and 64 would have been obvious in view of Karlsson and Harbers, and that claims 21–23 and 60–62 would have been obvious in view of Karlsson, Harbers, and Gotou. *See* Pet. 112–126.

Claims 21–23 and 60–62 require that the processor be configured to determine a road curvature or turn that is "indicated by . . . sensor data" and direct the control circuitry to increase illumination in the direction of the curve or turn. Petitioner asserts that this is taught in Karlsson[5] or, in the alternative, that "this was well-known in the art and would have been obvious in view of Gotou" because it would "enhance driver safety." Pet. 116 (citing Ex. 1003 ¶ 453).

a. Turns/Curves in Karlsson

Regarding Karlsson/Harbers alone, Petitioner argues that "Karlsson 'selectively adjust[s] . . . spotlight beam[s] 34, in response to a control signal from sensor means 23 . . . [to] provide a desired lighting pattern' in 'given directions,'" "recognizes '[w]hen taking a bend . . . [that] the road ahead . . . is insufficiently lit,'" and "discloses using additional sensors, for example, 'direction sensor 54 . . . for determining when the car 56 is taking a bend, so that the light beam 7 can be adapted,' and acknowledges the safety benefits of those systems." Pet. 114–115 (citing Ex. 1010, 1:35–2:1, 6:26–33, 9:23–25, 11:25–28, 14:26–30, 20:22–32, Figs. 3, 6, 14; 16; Ex. 1003 ¶ 452) (emphasis omitted).

We have reviewed the portions of Karlsson cited by Petitioner and find them insufficient to teach or suggest the subject matter of claims 21–23 and 60–62. Although they disclose direction sensors and controlling the light in response to sensors, the direction sensors are used "for determining when the car . . . is taking a bend, so that the light beam . . . can be adapted to prevent the traffic on the other side of the road from being blinded as much as possible." Ex. 1010, 20:29–32. This suggests that the direction sensors are used to *decrease* illumination in the direction of the curve or turn, not to increase the illumination, as claimed.

[5] *See* Pet. 120 (citing Ex. 1003 ¶¶ 440–441, 460), 123 (citing Ex. 1003 ¶ 464).

b. Combination with Gotou

Regarding Gotou, Petitioner argues that "Gotou's navigation system 30 data is input to ECU 10, which alters the light direction from headlamp 2 in response to map data including road curvature input, directing light where it is needed at a given time, enhancing safety." Pet. 116 (citing Ex. 1012, 2:19–26, 4:30–49, 6:4–61, 8:28–35, Figs. 1–3). Petitioner argues that "[i]ncluding an additional data source for Karlsson-Harbers's controller/processor—Gotou's map data including road curvature—would have enhanced Karlsson-Harbers by increasing/adjusting illumination of road curvatures, thereby improving driver safety." *Id.* at 118.

Patent Owner makes a series of arguments concerning the addition of Gotou to the combination, which we address in the order raised.

i. Multiple Control Functions

Patent Owner argues that "[its sub-grounds] 6A, 6B, 6D include all controls of Karlsson, Harbers software and Gotou," that "[t]his now presents three control functions that can desire conflicting results - e.g., the combination may instruct full illumination of the scene . . . , while conflictingly trying narrow the main beam based on speed" and that "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." PO Resp. 72.

We again do not agree that "conflicting control strategies" would be a problem that would preclude the combination. Instead, as explained above (*see* Section II.D.3.b.iii), one of ordinary skill in the art would have known to take the features of the various strategies that would be desirable for a given application or situation. Patent Owner's argument again seems to be based on the idea that all aspects of the different control strategies would have to be implemented at the same time, but we see no reason why that would be the case.

Patent Owner also argues that "in [its sub-grounds] 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" and that "Petitioner never explains how Karlsson- Harbers is [directing light] or which combination of which sub-ground is [directing light], or, for that matter, which controllable system is [directing light]" PO Resp. 72–73. These arguments are unpersuasive for the reasons explained in connection the same arguments raised with respect to the independent claims. *See* Section II.D.3.b.iv.

ii. *Directional Control*

Patent Owner next argues that, for "sub-ground" 6E, "[i]t is unclear that Karlsson's hardware could achieve Gotou's desired change, lacking directional control because the modulator merely controls intensity." PO Resp. 73. This is unpersuasive because the directional control is provided by the differently angled light sources of Harbers, not by Gotou. *See* Pet. 88–91. The "direction" would be controlled by varying the intensity of the individual light sources. Further, even before modification with Gotou, Karlsson's system could illuminate different areas of the target field as desired for a particular situation. *See, e.g.*, Ex. 1010, 4:25–31, 9:18–22, 19:29–33. Thus, both Karlsson's base system and that system modified by Harbers' light sources would be able to implement the light distribution signaled by Gotou's control system.

iii. *Color Shifting*

Patent Owner also argues that "sub-grounds" 6B and 6C would include Harbers' array with different colors of LEDs and that steering a headlight with

regions of different colors "would create color overlaps that create undesirable color shifts." PO Resp. 74.

This is not persuasive, for several reasons. First, as noted above, Harbers does not *require* different colored light sources; instead, the varying of "spectral characteristics" is described as one alternative embodiment. *See* Ex. 1011, 4:33–6:7. We see no reason why one of ordinary skill in the art would need to use colored light sources if the use of colors would present problems when implementing the teachings of Karlsson (or Gotou) regarding curves/turns. Choosing to illuminate turns at the expense of optimal coloring of different areas would simply be a trade-off the skilled artisan could make depending on the application and conditions. *See Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 795 (Fed. Cir. 2021) (explaining that "simultaneous advantages and disadvantages . . . [do] not necessarily obviate motivation to combine") (*quoting Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006)); *see also Corephotonics, Ltd. v. Apple Inc.*, No. 2020-1961, 2021 WL 4944471, at *6 (Fed. Cir. Oct. 25, 2021) (explaining that "it is a commonplace fact that design decisions entail making tradeoffs among multiple objectives"). Second, we credit Dr. Jiao's testimony that any color-shifting would be minimal and that one of ordinary skill would have understood how to combine different colored LEDs in a headlight to emit a light beam having a white color, as demonstrated in the background of Thominet." Ex. 1051 ¶¶ 179–181. Finally, Dr. Turk's illustration of the color-shifting (see below) is not persuasive because both the straight and tuning diagrams show a similar amount of overlap. It is unexplained and unclear why the overlap on the left is acceptable but the similar amount of overlap on the right would be a problem.

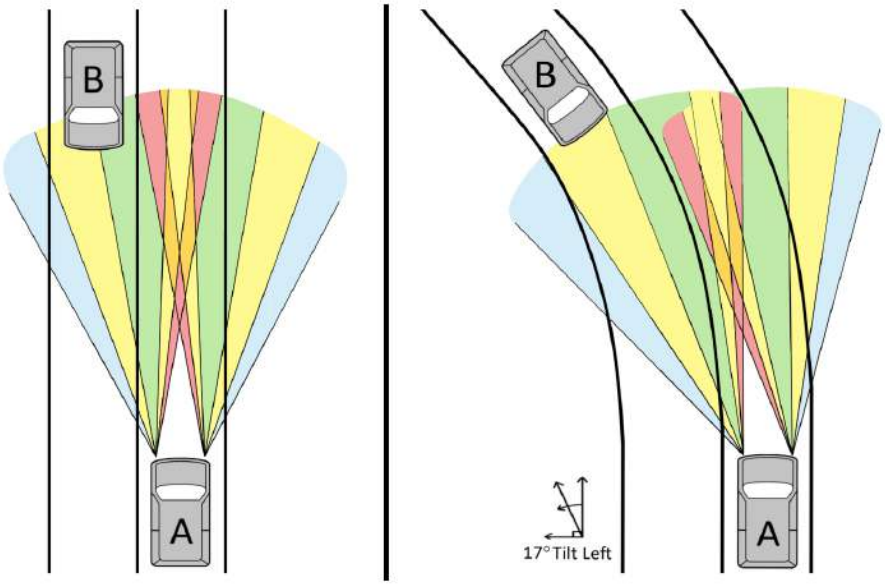

Diagram from Ex. 2006 ¶ 238.

c. "Failure of Proof" for Claims 60–62 and 64

Patent Owner also argues that because the Petition addressed corresponding claims together and incorrectly identified them as "patentably indistinct," it omitted elements recited in claims 60–62 and 64, resulting in a failure of proof. *See* PO Resp. 26–30. We do not agree.

Claim 25, which depends from claim 20, recites that one of the headlamps "further includes at least one of reflectors, refractors, or lenses usable to alter emitted light from at least one of the light sources"; claim 64, which depends from claim 59, includes the same language but also adds "as part of the instructed adjustment" at the end, referring to the "instruct adjustment of one or more of the light sources to achieve the determined output" element of claim 59.

The Petition states that "[c]laims 25 and 64 are patentably indistinct" and identifies as the claimed "reflectors, refractors, or lenses" the "light modulator means" and "lenses" in Karlsson. *See* Pet. 112.

Patent Owner argues that claim 64 differs from claim 25 because "[r]equiring 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." PO Resp. 27.

Patent Owner's argument is based on a construction of the additional claim 64 language—as requiring *active* control of a reflector, refractors, or lens—that we find insufficiently supported. The "instructed adjustment" of claim 59 is of the light sources (*e.g.*, the LEDs) *not* a reflector/refractor/lens, and the claim only requires that the reflector/refractor/lens be "usable to alter the light . . . as part of the instructed adjustment." In both the '503 patent and the prior art, the light that is being adjusted, for example by LEDs being dimmed according to an instruction, would also be altered by a lens through which it passed. The lens is thus "usable to alter the light" as it is adjusted. The claim does not require that the instructed adjustment be accomplished by the alteration.[6]

For these reasons, we are unpersuaded by Patent Owner's argument that there is a material distinction between claims 25 and 64 that would result in a failure of proof for claim 64.

Patent Owner next identifies an alleged difference between claims 21 and 60 and between claims 22 and 61, which Petitioner addresses together and asserts are patentably indistinct. *See* Pet. 64. Specifically, Patent Owner argues that claim 21 recites that the processor is configured to "*direct the control circuitry to adjust the directional light sources* to increase illumination in a direction of the road

[6] Patent Owner does not point us to a description in the '503 patent of active control of a reflector, refractor, or lens, and our review of the patent suggests that, at least for the headlight embodiment, there is no such disclosure. *See* Ex. 1001, 52:4–57:42.

curvature," but that claim 60 differently recites that the processor is configured to "*determine light output* that aims illumination in a direction of the road curvature." *See* PO Resp. 29. Patent Owner similarly argues that claims 22 and 23 recite that the processor is configured to "*direct the control circuitry to increase illumination* illuminating the turn," while claims 61 and 62 differently recite that the processor is configured to "*determine light output* that illuminates the turn." *See id.* Essentially, Patent Owner argues that the claims depending from claim 20 require "direct[ing] the control circuitry to adjust the . . . light sources," whereas the claims depending from claim 59 require "determin[ing] light output."

The Petition addressed claims 21 and 60 together, citing Karlsson to the effect that "direction sensor 54 . . . determin[es] when the car 56 is taking a bend, so that the light beam 7 can be adapted." Pet. 120 (quoting Ex. 1010, 20:29–32). The Petition additionally cites other parts of Karlsson that describe the use of the light sensor (2:2–4) and how the pattern and intensity of a light beam is controlled (9:11–17). *See id.* Viewed as a whole, we find this sufficient to disclose that Karlsson both directs the control circuitry to adjust the light sources to increase illumination towards a curve, as recited in claim 21, and determines the appropriate light output, as recited in claim 60.

We conclude that, regardless of whether or not Petitioner is correct that these claims are patentably indistinct, Petitioner has shown how the subject matter of both claims in found in Karlsson. We reach the same conclusions with respect to the claim 22/23 and 61/62 pairings. *See* Pet. 123–124. We note that, although Patent Owner faults Petitioner for arguing that the claims are indistinct, Patent Owner does not explain how any alleged differences might change the patentability analysis.

d. Dependent Claims Conclusion

Patent Owner does not otherwise contest Petitioner's unpatentability assertions regarding the dependent claims and any arguments not presented have been waived. We have considered Petitioner's contentions in light of the full record and conclude that, for the reasons provided in the Petition, and as discussed above, Petitioner has shown that claims 24, 25, 63, and 64 would have been obvious in view of Karlsson and Harbers, and that claims 21–23 and 60–62 would have been obvious in view of Karlsson, Harbers, and Gotou.

E. Obviousness Based on Beam and Thominet

Because we have already determined the claims are unpatentable in view of Karlsson and Harbers, we need not address Petitioner's challenges based on Beam and Thominet. Accordingly, we do not reach the Petition's grounds 1–4.

F. Petitioner's Motion to Exclude

Petitioner seeks to exclude the testimony of Patent Owner's declarant, Dr. Turk, asserting that he does not meet the agreed level of ordinary skill in the art. *See* Paper 30 ("Mtn. to Exclude") 1. Specifically, Petitioner argues that the agreed level of skill requires "at least 2 years of industry experience in the area of automotive lighting and lighting-control systems" and that Dr. Turk lacks such qualifications. *See* Mtn. to Exclude 4–6; Paper 33 ("Mtn. to Exclude Reply") 3–4 (arguing that Dr. Turk "has no experience with a vehicle headlamp company, an LED (or any other light source) company, or lighting design, or awards/patents for a vehicle forward lighting system" (citing Paper 31 ("Mtn. to Exclude Opp.") 4–5)).

Because Petitioner has prevailed on all claims, and our decision does not rely in any way on Dr. Turk's testimony, we conclude that the Motion to Exclude is moot. It is therefore dismissed.

III. CONCLUSION

Petitioner has met its burden of showing that claims 20–25 and 59–64 of U.S. Patent 10,894,503 B2 are unpatentable.[7]

Claim(s)	35 U.S.C. §	Reference(s)	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
20, 24, 25	103(a)	Beam, Thominet[††]		
59, 63, 64	103(a)	Beam, Thominet, Stam[††]		
21–23	103(a)	Beam, Thominet, Kobayashi[††]		
60–62	103(a)	Beam, Thominet, Stam, Kobayashi[††]		
20, 24, 25, 59, 63, 64	103(a)	Karlsson, Harbers	20, 24, 25, 59, 63, 64	
21–23, 60–62	103(a)	Karlsson, Harbers, Gotou	21–23, 60–62	
Overall Outcome			20–25, 59–64	

[7] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

[††] As noted above, we do not reach this ground because we determine those claims are unpatentable in view of Karlsson and Harbers. *See* Section II.E.

FOR PETITIONER:

Michael Specht
Jason Fitzsimmons
Daniel Yonan
Brian Burke
Ian Soule
STERNE, KESSLER, GOLDSTEIN & FOX PLLC
mspecht-ptab@sternekessler.com
jfitzsimmons-ptab@sternekessler.com
dyonan-ptab@sternekessler.com
bburke-ptab@sternekessler.com
isoule-ptab@sternekessler.com

FOR PATENT OWNER:

Sangeeta Shah
Andrew Turner
David Bir
BROOKS KUSHMAN P.C.
sshah@brookskushman.com
aturner@brookskushman.com
dbir@brookskushman.com