

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MERCEDES-BENZ USA, LLC
Petitioner,

v.

YECHEZKAL EVAN SPERO
Patent Owner.

U.S. Patent No. 11,208,029

IPR Case No.: IPR2023-01034

PATENT OWNER'S SUR REPLY

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Exhibit No.	Description
2001	Declaration of Matthew A. Turk, PhD
2002	Curriculum Vitae of Matthew A. Turk, PhD
2003	Intentionally left blank
2004	Intentionally left blank
2005	Intentionally left blank
2006	U.S. Published Patent Application US2003/0137849A1 to Alden, Prosecution History in the U.S. Patent and Trademark Office
2007-2039	Intentionally left blank
2040	Second Declaration of Matthew A. Turk, PhD
2041	Transcript of Deposition of Nikolaos Papanikolopoulos, Ph.D. <i>Mercedes Benz-USA, LLC v. Yechezkal Evan Spero</i> , taken on February 23, 2024 IPR2023-01039, IPR2023-01040
2042-2049	Intentionally left blank
2050	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)
2051	Michael Bass, <i>Handbook of Optics</i> 3 RD Edition Volume II, (McGraw-Hill, 2010) (Available at https://www.worldcat.org/title/555545456)
2052	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/)
2053	Ben Wang and Jianzhong Jiao “Optical Transform

Exhibit No.	Description
	Limitations in Headlamp Photometric Performance,” SAE Technical Paper Series 2005-01-0861, (April 2005) (Available at https://www.sae.org/publications/technical-papers/content/2005-01-0861/)
2054	Intentionally left blank.
2055	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)
2056	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.)
2057	Intentionally left blank
2058	Intentionally left blank
2059	Intentionally left blank
2060	Michael Bass, <i>Handbook of Optics</i> 3 RD Edition Volume V, (McGraw-Hill, 2010) (Available at https://www.worldcat.org/title/557121959.)
2061	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.)
2062	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-

Exhibit No.	Description
	wwe&DCM=yes&distId=10) (Accessed September 12, 2023.)
2063	Surendra Gupte, Osama Masoud, Robert F. K. Martin, and Nikolaos P. Papanikolopoulos “Detection and Classification of Vehicles” IEEE Transactions on Intelligent Transportation Systems, Vol. 3, No. 1 (March 2002) (Available at https://ieeexplore.ieee.org/document/994794) (Accessed February 20, 2024)
2064	Intentionally left blank.
2065	Webster’s New Universal Unabridged Dictionary Deluxe 2 nd Edition excerpts, Simon and Schuster (1983)
2066	Transcript of Deposition of Nikolaos Papanikolopoulos, Ph.D. <i>Mercedes Benz-USA, LLC v. Yechezkal Evan Spero</i> , taken on March 26, 2024, IPR2023-01026, IPR2023-01027
2067	Transcript of Deposition of Nikolaos Papanikolopoulos, Ph.D. <i>Mercedes Benz-USA, LLC v. Yechezkal Evan Spero</i> , taken on March 27, 2024, IPR2023-01034

I. Ground 1: Alden and Kobayashi

Petitioner must show where each claim limitation is found in the applied references. *See, e.g., Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1361, 1366 (Fed. Cir. 2012).

A. Independent Claims 1, 12, and 23

1. The Alden-Kobayashi combination does not teach the Predictive Curve Limitation of “*increas[ing] light in a direction of the road curvature*”

Independent claim 1 is representative of claims 12 and 23 and requires: “*one or more processors to: ... determine a light change, the change adapting a light pattern of the headlamps ... to increase light in a direction of the road curvature ahead of the motor vehicle.*” Petitioner relies on Alden’s disclosure with reference to Figures 5 and 11 for satisfying this limitation. (Pet., 25-27.)¹ The Alden-Kobayashi combination does not teach “*increas[ing]*” illumination prior to the curve. (POR, 25-28; Ex.2040, ¶¶86-104.)

Alden describes that the default emitting state of the LEDs in headlight 123 is high intensity illumination to maximally illuminate the distribution area. (POR, 27; Ex.1005, ¶¶[0025-0029]; Ex.2040, ¶89.) In Reply, Petitioner argues that “Alden’s system does not simply default all LEDs to maximum high beam

¹ Emphasis added by Patent Owner unless otherwise noted.

intensity at all times unless otherwise dimmed ...” and cites Alden’s disclosure about element 109 of Figure 4 as an example. (Reply, 4-5.)

However, Alden discloses, with reference to element 109 of Figure 4, that “Signals are sent to each of the headlight control circuit zones that need to be dimmed to restrict the amount of current to the corresponding headlight zones such that they are dimmed in a dimming process 109. Zones which are not dimmed remain on high beam.” (Ex.1005, ¶¶[0028], [0046].) Further, when describing all three embodiments in the abstract, Alden discloses that “[a]ll embodiments maximize the areas receiving high beams” (Ex.1005, Abstract.)

Petitioner quotes Alden’s last paragraph that “[m]any other variations [of its system] are possible[.]” (Reply, 4.) Such boilerplate does not negate Alden’s express disclosure: “[z]ones which are not dimmed remain on high beam.” (Ex.1005, ¶¶[0028], [0046].)

As admitted by Dr. Papanikolopoulos: “in normal driving conditions when there’s no oncoming traffic and no curves, the [headlight illustrated in the] Figure 5 embodiment would illuminate the full pattern shown in Figure 5[.]” (Ex.2067, 17:21-25; POR, 28, Ex.2040, ¶¶165-166.) Petitioner’s proof is based on the Figure 5 embodiment. (Pet., 25-28.) Accordingly, since Alden illuminates the full pattern of Figure 5 during normal driving conditions, it cannot “increase light in a direction of the road curvature ahead of the motor vehicle” as claimed—i.e.,

before reaching a curve, it is simply operating in an “all high beam” state, per Dr. Papanikolopoulos’s admission. (Ex.2067, 17:21-25.)

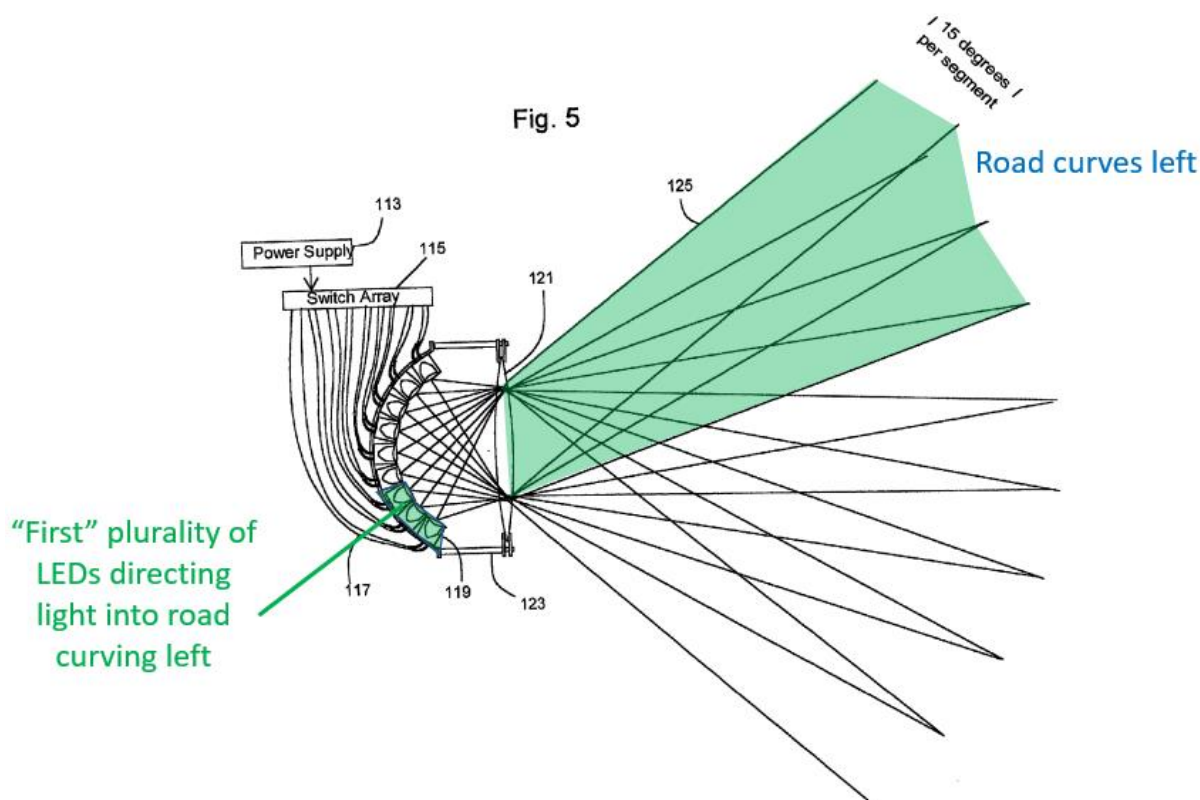
Petitioner attempts to walk back this admission stating: “As Dr. Papanikolopoulos explained, Alden may illuminate the full pattern at high beam intensity ‘under the first application of Alden’ (when no LEDs are dimmed if there is no detected oncoming vehicle), but it ‘depends.’” (Reply, 6.) Alden makes no such equivocation about it “depending” whether high beams would be present. Again, when describing all three embodiments in the abstract, Alden discloses that “[a]ll embodiments **maximize the areas receiving high beams ...**” and does not circumstantially limit this teaching. (Ex.1005, Abstract.)

Per Alden, the point of the invention is maximal high beam use to maximize safety—“[t]he invention ... represents a significant improvement for the safety of motor vehicles ... the present headlight can stay on high beam in all sectors which do not contain a motor vehicle ... [t]his maximizes the ability of the drivers to see **at all times.**” (Ex.1005, ¶¶[0005]-[0006].) “Thus, the present invention offers a significant advancement”. (*Id.*, ¶[0007]).

Providing less than maximal illumination, simply so Alden has something to “increase” in order to meet the claims, is never taught by Alden and defeats Alden’s primary purpose.

Petitioner also cites a thirteen-page range to clarify Dr. Papanikolopoulos’s

admission. (Reply, 6, citing Ex.2067, 14:9-27:2.) In this clarification, Dr. Papanikolopoulos does not dispute that Alden discloses the full lighting pattern in Figure 5. Instead, Dr. Papanikolopoulos explains that his annotations of Alden's Figure 5 in ¶75 of Ex.1003, reproduced below, correspond to Figure 11. (Ex.2067, 15:25-16:11.)



Ex.1005, Fig. 5, Annotated by Petitioner, (Pet., 29; Ex.1003, ¶75)

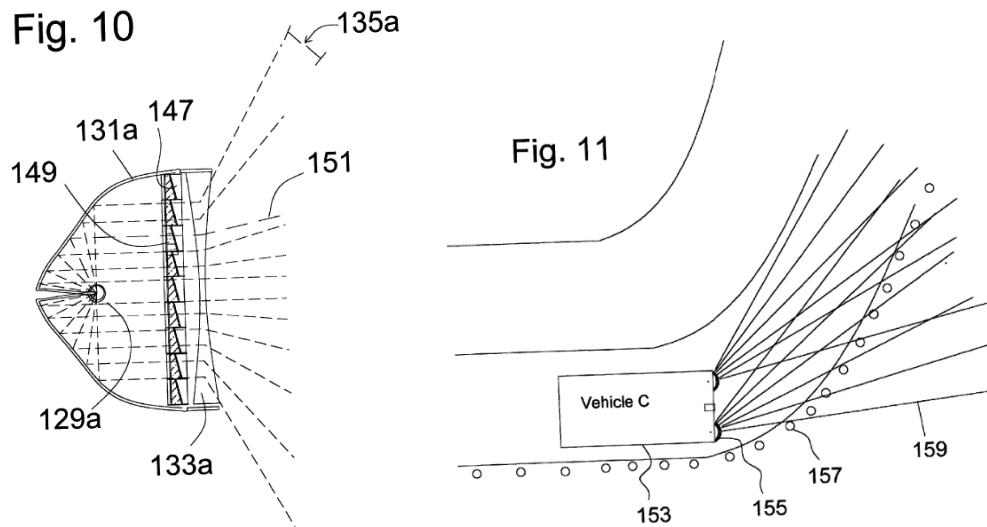
The above pattern would simply be a subset of the pattern that already existed when the vehicle encountered the turn, because the vehicle would be operating at full high beam illumination in all sectors. Terminating some number of LEDs (which is effectively what is shown) is not an “increase” as claimed.

(Ex.2067, 16:19-24.) Petitioner’s stance that Alden “can selectively switch to high beam those LEDs positioned on the curve” presupposes that those LEDs are not already operating at high beam—which is incorrect and contradicted by Alden’s own teachings. (Reply, 5.)

Petitioner is effectively searching for a reason to manipulate Figure 5 so that it can “concentrate light,” based primarily on disclosure in Alden with respect to Figure 11 that “[t]he directing of light can be achieved with the segmented sensing elements and segmented light distribution elements described herein.” (Ex.1005, ¶[0036].) Figure 5’s LEDs operate to control intensity—not redirect light. Figure 11 is presented in the context of “directing light” and “concentrating light,” and that is the purview of the Figure 10 embodiment.

Alden discloses that its third embodiment illustrated in FIG. 10 “depicts a segmented headlight with individually controlled sectors of distribution of the third embodiment.” (Ex.1005, ¶[0019].) Further, the headlight architecture of Figure 10 “enables light from an individual headlight distribution sector to be **redirected** in response to sensed environmental conditions when used in conjunction with the elements and processes previously discussed herein.” (Ex.1005, ¶[0035].) Alden also describes the Figure 11 application in the context of **directing** light: “An equipped vehicle 153 senses that the road turns by receiving light from reflectors such as a reflector 157. The responding headlights 155 direct light into the corner

to maximize the driver's ability to see there.” (Ex.1005, ¶[0036].)



Ex.1005, Figures 10, 11

Alden does not disclose that its Figure 5 embodiment includes light directing elements that can redirect light beams to provide the cornering functionality described with reference to Figure 11. (Ex. 2040, ¶¶73, 99, 103.) This is confirmed by Alden’s descriptions of the three distinct embodiments in the Abstract, specification and claims, in which all embodiments provide anti-glare functionality, but only the third embodiment of Figure 10 includes “light directing elements” that “redirect” light:

In a first embodiment [Fig. 5], individual light elements in array are individually controlled with regard to intensity to provide dim beam areas and high beam areas concurrently.

In a second embodiment [Fig. 6], individual electro-chromatic elements in array are individually controlled so as to provide a means to create dim beam areas and high beam areas concurrently.

In a third embodiment [Fig. 10], variable refractive segments in array are individually controlled to **redirect** beam portions such that high beam and dim beam areas are created concurrently.

(Ex.1005, Abstract, *see also* ¶¶[0014], [0015], [0019].)

3. The headlight system of claim 1 [Fig. 5] wherein said vehicular headlight system comprises at least one head light which contains at least two lighting elements each of said elements being individually controllable with regard to light intensity emitted there from.

4. The headlight system of claim 1 [Fig. 6] wherein said vehicular headlight system comprises at least one head light which contains at least two light filter elements, each of said elements being individually controllable with regard to controlling the intensity of light permitted to pass there through.

5. The headlight system of claim 1 [Fig. 10] wherein said vehicular headlight system comprises at least one head light which contains at least two light **directing** elements, each of said elements being individually controllable with regard to the output direction of light permitted to pass there through.

(Ex.1005, claims 3-5.)

Alden's Figure 11 statement that "[t]he directing of light can be achieved with the segmented sensing elements and segmented light distribution elements

described herein” expressly ties Figure 11 to “direct[ing] light”, i.e., a “light directing embodiment,” and is not defeated by an understanding that **only** the embodiment(s) that can **actually** direct light are appropriate for use in the context of Figure 11. (Ex.1005, ¶[0036].)

Understanding that the statement only applies to the third embodiment of Figure 10, because that is the only “light directing” embodiment, does not render the statement untrue or inaccurate. (See e.g., *Id.*, Abstract, Claims 3-5.) Figure 10 still includes segmented sensing elements and segmented light distribution elements “described herein,” and it also has the notable characteristic of actually being able to meet the other part of the statement, about “directing of light [being] achieved.” (Ex.1005, ¶¶[0035]–[0036].)

Petitioner further argues that “[t]he Alden-Kobayashi system would simply determine upcoming road curves or changes in road shape based on Kobayashi’s map data rather than data from Alden’s sensors detecting light from roadside reflectors” and “[t]hus, an equipped vehicle at point A of Kobayashi’s Figure 10 would have an illumination pattern particularized to the shape of that road.” (Reply, 7.) Since Alden’s Figure 5 embodiment cannot provide the illumination pattern of Figure 10, Petitioner’s “equipped vehicle” implies modifications to Alden’s Figure 5 embodiment.

Even if Alden's LED headlight of the Figure 5 embodiment was used in a cornering application, such as that described with reference to Figure 11, it would not be able to shift or direct light into the curve before the vehicle starts turning without significant modification. (Ex.2040, ¶¶94.) Petitioner described combining Alden's first and third embodiments for dependent claims 10-11, 21-22, 32-33. (Pet., 66-68.) However, a POSA would not have been motivated to make such a combination. (See POR, 69; Ex.2040, ¶¶96-103.)

Accordingly, the Alden/Kobayashi combination does not teach “*one or more processors to: ... **determine a light change**, the change adapting a light pattern of the headlamps in at least one of color, intensity or spatial distribution to increase light in a direction of the road curvature ahead of the motor vehicle*” as claimed, and claims 1, 12, and 23 are non-obvious over the combination. See, e.g., *Kinetic Concepts*, 688 F.3d at 1366.

2. The Alden-Kobayashi combination does not teach the Control Limitation of “*provid[ing] light ... prior to ... the road curvature.*”

Independent claim 1 is representative of independent claims 12 and 23 and further requires “*control at least a first plurality of the LED light sources to provide light based at least in part on the determined light change and prior to the motor vehicle reaching the road curvature.*” Petitioner relies on Kobayashi for satisfying the “*map data*” limitations and Alden for satisfying the remaining

limitations. (Pet., 29-30.) The Alden-Kobayashi combination does not teach “*provid[ing] light ... prior to ... the road curvature.*” (POR, 37-43; Ex.2040, ¶¶105-111, 171, 174-176.)

Alden does not disclose the timing of the re-direction of the light emitted by headlights 155 in connection with headlight control of Figure 11. (POR, 38-39; Ex.1005, ¶[0036]; Ex.2040, ¶108.) The only disclosure in Alden regarding the timing of the re-direction of light occurs in connection with Figures 14 and 15, where Alden states “[a]s the steering wheel 191 rotates ‘x’ degrees, rotation sensor 193 detects the rotation” and “[t]he system calculates the new direction of the vehicle and changes the direction of the headlight output 197 a corresponding ‘f(x)’ degrees.” (Ex.1005, ¶[0040].) Thus, the only express teaching of timing is related to express calculation of “the new direction of the vehicle,” which would mean it is already turning.

Petitioner argues that “Alden’s steering wheel rotation sensor data and Kobayashi’s map data are both ways to determine a vehicle is approaching a road curve.” “And, from this, it would have been obvious to use Kobayashi’s map data to determine when the road curves and adjust the lights accordingly in certain situations.” (Reply, 8 citing to Pet., 25.) To the extent Petitioner is now relying on Kobayashi’s control strategy for controlling the plurality of light sources, then this would be an impermissible new argument and contrary to the Petition where

Petitioner explained that “Alden would continue to perform the **same control** of LEDs to shape the light pattern to direct light into the curve, only now it would do so based on received map data indicating the road curve.” (Pet., 30.) Similarly, regarding the Predictive Curve Limitations, Petitioner stated: “Alden would continue to perform the **same determination** of changed light patterns to accommodate upcoming curves or changes in road shape, only now it would make the determination based on received map data indicating the road curve.” (Petition, 27, see also Ex.2067, 39:19-20, 40:3-5, 41:18-22.)

Petitioner argues that “Alden’s steering wheel sensor further provides for redirection of the light prior to a curve” and that “PO’s argument is premised on a misunderstanding of when a driver begins turning the steering wheel relative to when the vehicle enters the road curve.” (Reply, 10.) Petitioner is wrong, a POSA would have understood that a steering wheel is directly connected to the wheels such that when a driver turns the steering wheel, a moving vehicle immediately starts turning, there is no delay.

Petitioner further states that “[a]s a driver approaches a road curve, or is going to turn or enter a curve from a stopped position, the driver begins to turn the steering wheel before the vehicle enters the curve.” (Reply, 10-11.) Dr. Papanikolopoulos provides an example, “when a driver is at a stoplight or a stop sign. As a POSITA would have known, often times the driver would turn their

wheel before giving the vehicle gas, so as to be ready to turn after oncoming traffic has passed.” (Ex.1003, ¶67.) This is wrong, first a POSA would understand that turning the steering wheel while the vehicle is stopped would cause unnecessary wear and damage to the steering mechanism and the tires and therefore the driver would only start turning the wheel when the vehicle is in motion. Second, a POSA with basic defensive driving skills would have known to not turn a vehicle’s wheels when stopped at an intersection and to wait for oncoming traffic to pass before making a left turn to avoid being rear-ended and pushed into oncoming traffic. (Ex.2066, 112:15-117:7.)

Regardless, like Alden, Kobayashi discloses, with reference to Figure 10, irradiating the shoulder “when the vehicle turns” not prior to when the vehicle turns, i.e., “**as shown at point A in Fig. 10, when the vehicle turns** to the left, the left shoulder is irradiated. **When the vehicle turns** to right, the right shoulder is irradiated.” (Ex.1006, 15:20-26; Ex.2040, ¶¶81, 109.)

The Alden/Kobayashi combination does not teach “*control[ling] at least a first plurality of the LED light sources to provide light based at least in part on the determined light change and prior to the motor vehicle reaching the road curvature*” as claimed, and claims 1, 12, and 23 are non-obvious over the combination. See, e.g., *Kinetic Concepts*, 688 F.3d at 1366.

B. Dependent Claims 5, 16, and 27

Claim 5 is representative of claims 16 and 27 and requires “*an increase of light emitted at a level below high-beam light and directed in the direction of the road curvature.*” Petitioner’s proposal to modify Alden to meet the claim is contrary to Alden’s disclosure. (POR, 47; Pet., 42-43.) On Reply Petitioner argues that “a POSITA would have understood [Alden’s disclosure of an] increase of light in the direction of the curve would be a level less than high beam.” (Reply, 14.) As noted above, Alden expressly requires that “[a]ll **embodiments maximize the areas receiving high beams ...**” (Ex.1005, Abstract.) Accordingly, any modification of the maximized high beam pattern of Figure 5 to recreate the pattern shown in Figure 11, assuming this can even be done, can only be achieved by termination of LEDs not directed towards the curve—all other LEDs would remain in high beam state as they were prior to the curve. (See Ex.1005, Abstract, ¶¶[0028], [0046]; see also Ex.2040, ¶¶120-123.) The proposed modification cannot result in an “increase of light” in any manner—as claimed or otherwise.

C. Dependent Claims 8, 19, and 30

1. The Petition relies on an inoperable combination that can’t be remedied post-institution

Petitioner’s argument relies on Alden’s two-dimensional switch array (from Figure 3) to control and power the Figure 5 one-dimensional LED array—creating

an inoperable combination. (POR, 58.)

The Petition proofs confirm that Petitioner used the Figure 5 array as a single line of LEDs having one-dimension of emission: 1) the LEDs are “on a curve along the focal point of a headlight lens 121[,]” (Pet., 15, 34, 62, 64); 2) “the three LEDs at the bottom of the array direct light into sectors at the left-hand side of the headlight distribution area ... ” (Pet., 29); and 3) regarding claims 9, 20, and 31, the Petition states “[i]f, however, the equipped vehicle then encounters an oncoming vehicle, the system of Alden will switch those same LEDs that overlap with the area of the oncoming vehicle along the curve (“common LED light sources”) to dimmed, low beam light.” (Pet., 69.) The Petition is devoid of any suggestion that Figure 5 includes vertical stacks of LEDs that provide emission control in a second dimension, with multiple foci. (*See e.g.*, Pet., 15, 29, 40-41, 65-66.) Likewise, the Petition unequivocally relies on the Figure 3 two-dimensional switch array to power the one-dimensional LED array from Figure 5. (Pet., 55-59.)

Petitioner must live with the shortcomings of the inoperable combination it proffered. As the Supreme Court explained in *SAS Institute*, the Petition contentions “define the scope of the litigation all the way from institution through to conclusion.” *SAS Institute, Inc. v. Iancu*, 138 S. Ct. 1348, 1351, 1356, 1357 (2018).

2. To Address the Lack of Operability, the Reply Impermissibly Injects a New Argument

On Reply, after the defect was identified by Patent Owner (“PO”) in a related proceeding, Petitioner belatedly argues that “Figure 5 is simply a sectional view of one row of LEDs in this array.” (Reply, 18.) Per the Trial Practice Guide, “Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g., to make out a prima facie case of unpatentability.” (Consolidated Trial Practice Guide, November 2019 (“CTPG”), 73.) On this point the law is settled—“an IPR petitioner may not raise in reply ‘an entirely new rationale’” *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1330–31 (Fed. Cir. 2019) (quoting *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1370 (Fed. Cir. 2016)).

3. Petitioner’s New Argument Is Not Supported by Alden

To rectify its inoperable combination, Petitioner presents new reply arguments that incorrectly interpret the Figure 5 (LED) embodiment based on teachings related to a different (single light source) embodiment depicted in Figures 6-7, modifying Figure 5 so it depicts “a sectional view of a row of LEDs” (Reply, 18.) As stated in the POR, because Alden presents three distinct embodiments with different structural configurations and operations, a POSA would not look to the other embodiments to interpret/modify the LED

embodiment. (POR, 9-13.) Moreover, the depictions in Figures 6-7 actually establish that when Alden **intended** to show two-dimensional segmentation it did so. (Ex.1005, Figs 6-7.)

Petitioner also attempts to modify Figure 5 based on the two-dimensional switch array of Figure 3, citing [0029] of Alden. (Reply, 18-19, emphasis in original.) However, per the example identified in ¶[0029], Alden only borrows the Figure 3 *previously described CPU and logic for controlling a switch to provide power*, not the configuration of the switch array, 55a and 55b. (Ex.1005, ¶[0029]). The “previously described” connection between Figure 5 and Figure 3 does not extend to the illustrated “architecture of the elements[,]” which are called out as a separate component of Figure 3. (*See Id.*, ¶[0012]). Thus, Figure 5 discloses an array of 9 LEDs, where each of the 9 LEDs is controlled by a corresponding switch, and the CPU controls the power via switches. (POR, 17.)

Given that Alden: 1) describes the illustration of Figure 5 as “[t]he segmented headlight ... and controlling switch array” and not a cross-section and depicts a complete segmented headlight system, including nine separate segment wires from the array, one to each LED shown, powered by the CPU/logic of Figures 3-4, in contrast to Figures 6-7; 2) discloses arranging the LEDs of Figure 5 “on a curve along **the focal point** of a headlight lens[,]” (Ex.1005, ¶[0029]); and 3) lacks any disclosure or suggestion that Figure 5 should be interpreted as a section

of a two-dimensional array, if Petitioner is relying on inherency, it has failed to meet the requisite high standard—“to establish ... the limitation at issue ... [is] the natural result of the combination of elements explicitly disclosed” *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014).

Were Figure 5 interpreted, or modified, to include additional rows of LEDs, Petitioner had an obligation to explain this interpretation in the Petition if it wanted to rely on it. Alden lacks details regarding how the hypothetical structure would be put together, specifically the shape of the LED structure, which informs the control strategy and resultant beam spread. (Ex.2040, ¶¶80-87.) In his deposition, Petitioner’s expert was unable to provide the above, needed details-avoiding the issue altogether in his second declaration. (See Ex.2041, 56:25-57:11, 108:11-109:5, 112:19-113:18; Ex.2066, 35:14-36:22, 38:16-41:3, 44:14-45:12, 47:1-48:5; Ex.1010, ¶¶23-29.) Accordingly, at best Petitioner identifies ambiguities as to how Figure 5 should be interpreted—which establish that Petitioner has failed to meet its burden of proof. *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1284 (Fed. Cir. 2017). Prior art must be viewed as it is written, not as it might have been written. See *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 851 F.3d 1270, 1274-75 (Fed. Cir. 2017) (This court’s precedent “does not permit the Board to fill in missing limitations” even if “a skilled artisan would immediately envision them.”) (citation omitted).

Petitioner's remaining arguments are equally flawed: 1) an "array" can have a single row (Reply, 18); 2) the logic flow of Figure 4 can still apply without requiring that the Figure 5 LED array have X/Y coordinates (*Id.*, 19); 3) while Alden does not say "row," it does say "on a curve along **the** focal point"—i.e., a row (Ex.1005, ¶¶[0029], [0047]); and 4) Figure 5 is distinct from the Figure 10 embodiment, as it lacks the requisite "steering" or "redirecting" capability—a function never ascribed to Figure 5 by Alden nor proven by Petitioner. (Reply, 9-11.)

Petitioner's obviousness analysis for claims 8, 19, and 30 is thus deficient.

D. Dependent Claims 21 and 32: The Alden/Kobayashi Combination Does Not Teach Active Optics

Claims 21 and 32 are directed to active optics, i.e., optics that are controlled by a processor executing instructions or following a computer-implemented method. For example, claim 21 depends from independent claim 12 and requires "A non-transitory computer-readable storage medium, storing instructions ... instructions that, when executed by the one or more processors, enable the one or more processors to utilize one or more optical control elements included in the motor vehicle to control light from at least the first plurality or second plurality of the LED light sources." Similarly, claim 32 depends from independent claim 23 and requires "A computer-implemented method for adapting light from headlamps

of a motor vehicle to accommodate road shape changes, ... comprising[] ... utilizing one or more optical control elements included in the motor vehicle to control light from at least the first plurality or second plurality of the LED light sources.”

Petitioner relies on Alden’s passive lens element 121 for satisfying this limitation. (Pet., 64-65; Reply 27.) Petitioner’s analysis focuses on the term “utilize” while ignoring the active optic claim language, i.e., “instructions that, when executed by the one or more processors” (claim 21) and a “computer-implemented method for adapting light” (claim 32 via base claim 23).

The ‘029 Specification discloses controlling light using both passive optics and active optics, e.g., “[t]he direction of light exiting from the DLF as a whole or from each SLS individually is controllable by optical elements 6, such as reflective surfaces and or refractors, and may be electronically variable optical elements.” (Ex. 1001, 25:17-21; Ex.2040, ¶52.) However, a POSA would have understood that claims that require a processor executing instructions to control light or following a computer-implemented method are directed to active optics. Petitioner’s analysis fails the claim construction procedure outlined in *Phillips*, i.e., step one—look at the claim language itself. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) (internal citations omitted) (“Quite apart from the written description and the prosecution history, the claims themselves provide

substantial guidance as to the meaning of particular claim terms.”).

Alternatively, Petitioner relies on a combination of Alden’s first embodiment (Fig. 5) with its third embodiment (Fig. 10) for satisfying this limitation. (Pet., 66.) Petitioner states “Alden discloses that its use of refractive elements to ‘bend’ light can be included in its headlight system, such as that of Figure 5, and a POSITA would have readily understood how to implement the variable refractive elements in such system.” (Pet., 67 citing Ex.1003, ¶¶131-132.)

However, as explained by Dr. Turk, Dr. Papanikolopoulos did not explain how a POSA would have combined these distinct embodiments, e.g., he did not address how: use of multiple light sources vs. single light source; use of forward facing light sources vs. rearward facing light sources; use of extended, curved light source vs. point light source; use of collimated light and collimating reflector vs. non-collimated light; use of converging double convex lens vs. diverging double concave lens; controlling power supplied to light source(s) vs. controlling power supplied to electro-optic elements; controlling intensity by controlling power to the light source(s) vs. controlling intensity by filtering or redirecting light from the light sources, etc., would limit the modifications or substitutions of components, particularly those of the first embodiment with either the second or third embodiments disclosed by Alden. (Ex.2040, ¶¶100-103; POR, 69.)

On Reply, Petitioner further cites to Alden’s boilerplate ¶[0061] that states

“[o]ne or more methods employed herein may be used in combination to vary illumination in a segmented system.” (Reply, 28.) However, this statement does not cure Dr. Papanikolopoulos’s conclusory rationale to combine Alden’s distinct embodiments, and therefore Petitioner’s obviousness analysis fails. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citation omitted) (requiring “articulated reasoning with some rational underpinning” as to how or why a person of ordinary skill in the art would have combined or modified the teachings of the prior art); *see also Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017) (holding obviousness determination to be improper where the record lacked a “clear, evidence-supported account” of “how the combination” would work).

II. Ground 2: Alden, Kobayashi, and Beam

A. Dependent Claims 9, 20, and 31: The Alden/Kobayashi/Beam Combination does not teach controlling light sources to “*diminish glare ... by a decrease to intensity*” “*based ... on third data received from a non-camera sensor*”

Claims 9/20/31 depend from claims 8/19/30 and require “*control[] of the second plurality of LED light source[s] is based at least in part on third data received from a non-camera sensor of the motor vehicle.*” Claims 8/19/30 specify that **the** “control” is directed to diminishing glare, e.g., “*control ... a second plurality of LED light sources providing light directed toward an area including at*

least a portion of the other vehicle to diminish glare to a driver of the other vehicle by a decrease to intensity of light directed towards and illumining the area.”

Petitioner relies on either Alden’s steering wheel sensor or Kobayashi’s GPS sensor for satisfying the “*non-camera sensor*” limitations. (Pet., 70-71.)

As explained in the POR, neither Alden nor Kobayashi control LEDs to diminish glare using data from the non-camera sensors. (POR, 63-65; Ex.2040, ¶152.) Petitioner only considered data from these sensors for addressing curves in the Petition: “Similar to the steering wheel sensor, data from this [GPS] sensor could be used to cause CPU 71 to further control the ‘second plurality’ of LEDs, adjusting their direction in view of the map data indicating an upcoming road curve.” (Pet., 71.)

On Reply, Petitioner attempts to backfill the Petition and find a link between direction adjustment and diminishing glare:

In other words, data from the steering wheel rotation sensor is used to further control the second plurality of LEDs such that dimming to reduce glare is maintained in the direction of an oncoming vehicle as the equipped vehicle turns, by shifting the dimmed light by an amount equal to the turning of the steering wheel. (*Id.*; Petition 70-71.) If it were not, then there would be the possibility that as the vehicle is turned, high beam light instead of the diminished low beam light would be directed at an oncoming vehicle. (EX1010, ¶¶30-33)

(Reply, 25.)

First, Petitioner’s new argument on Reply is impermissible. *Intelligent Bio-Sys., Inc.*, 821 F.3d at 1369 (Fed. Cir. 2016). Second, in the context of the Figure 5 embodiment, which cannot “adjust the direction” of LEDs, the best Alden could do in response to steering is terminate some LEDs. So, Petitioner’s newly identified “shifting beam” problem is a red herring. (Reply, 25.) That is, the beam of Alden would merely be reduced, and any vehicle that was within a portion of the illumination that remained after the beam-reduction would be accommodated in exactly the same manner it was prior to the beam-reduction—it would never have been changed.

Even assuming *arguendo* there was a beam-shift, that beam-shift would be achieved, per Petitioner, by turning on some new LEDs. If there happened to be a vehicle within this new portion of illumination, glare to that vehicle would be addressed based on the vehicle being detected by the camera as being within a sector where illumination now exists.

Petitioner’s original argument was that the LEDs being controlled to reduce glare (e.g., those emitting low beam for glare reduction based on camera data) would also be controlled based on steering wheel data (or other data)—but such control was in the context of control for illuminating a turn. (Pet., 70-71.) Those LEDs, though, would remain in the exact same emission state regardless of how

the rest of the beam was controlled, because of the control driven to those LEDs based on the presence of light sources on the sensor array. Accordingly, “the control” (the control to reduce glare from claim 8) is still only going to be based on the “camera” data (as Petitioner would call it.) The proof was thus flawed, as Petitioner improperly considered “control” based on steering/GPS in a general sense, and not control to reduce glare as required by base claims 8/19/30. Petitioner clearly assumed that “adjusting direction” of these LEDs for purposes of addressing curves constituted the requisite “control,” as indicated at the conclusion of the section. (Pet., 71.)

What Petitioner is effectively now, for the first time, proposing is some sort of offset calculation to account for a shifting beam, as though the whole beam of Alden’s Figure 5 headlight were going to be moving left or right. This is not remotely taught by Alden, and since the oncoming light sources would still show up on the sensors in whatever sector in which they appeared, “the control” (to reduce glare) is still only being achieved based on the camera data.

The notion that data from the steering wheel sensor is “used to further control the second plurality of LEDs such that dimming to reduce glare **is maintained in the direction of an oncoming vehicle**” has no basis in Alden and is absent from the Petition. (Reply, 25.)

Ultimately, the Alden/Kobayashi/Beam combination simply does not teach

controlling LEDs to reduce glare based on any reliance on steering wheel data or map data. Once again, any maintenance of the dimmer light is going to be done exclusively based on the incidence of detected light on the sensor array, which is more than adequate to address the situation Petitioner is newly describing.

Therefore, the Alden/Kobayashi/Beam Combination does not teach “*the control [the control to diminish glare from claim 8] is based at least in part on third data [the contended steering wheel or GPS data]*” as claimed and, and claims 9, 20, and 31 are non-obvious over the combination.

III. Conclusion

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

Dated: August 15, 2024

Respectfully submitted,

/ Andrew B. Turner /
Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No. 38,383)
Andrew B. Turner (Reg. No. 63,121)
BROOKS KUSHMAN P.C.
150 W. Second St., Suite 400N
Royal Oak, MI 48067-3846
(248) 358-4400

Attorneys for Patent Owner

Certificate of Service

The undersigned hereby certifies that on August 15, 2024, a complete and entire copy of **PATENT OWNER SUR REPLY**, was served via electronic mail to the attorneys listed below:

LEAD COUNSEL	BACK-UP COUNSEL
Celine Jimenez Crowson (Reg. No. 40,357) HOGAN LOVELLS US LLP 555 13 th Street, N.W. Washington, D.C. 20004 Telephone: (202) 637-5600 Facsimile: (202) 637-5910 Celine.crowson@hoganlovells.com	Joseph Raffeto (Reg. No. 66,218) Scott Hughes (Reg. No. 68,385) Ryan Stephenson (Reg. No. 76,608) 555 13 th Street, N.W. Washington, D.C. 20004 Telephone: (202) 637-5600 Facsimile: (202) 637-5910 joseph.raffeto@hoganlovells.com scott.hughes@hoganlovells.com ryan.stephenson@hoganlovells.com

Respectfully submitted,

/ Andrew B. Turner /
Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No. 38,383)
Andrew B. Turner (Reg. No. 63,121)
BROOKS KUSHMAN P.C.
150 W. Second St., Suite 400N
Royal Oak, MI 48067-3846
(248) 358-4400

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Respectfully submitted,

Dated: August 15, 2024

/ Andrew B. Turner /
Sangeeta G. Shah (Reg. No. 38,614)
David S. Bir (Reg. No 38,383)
Andrew B. Turner (Reg. No. 63,121)
BROOKS KUSHMAN P.C.
150 W. Second St., Suite 400N
Royal Oak, MI 48067-3846
(248) 358-4400

Attorneys for Patent Owner