

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. 9,955,551

IPR Case No.: 2023-01039

DECLARATION OF MATTHEW A. TURK PhD

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List of Exhibits

Exhibit No.	Description	Identifier
2001	Declaration of Matthew A. Turk, PhD	Turk Decl.
2002	Curriculum Vitae of Matthew A. Turk, PhD	Turk CV
2003	Best Practices and FAQs for Filing Requests for Reexamination Compliant with 37 CFR 1.510 and 1.915, PTAB, May 2010	Best Practices
2004	Intentionally left blank	
2005	Petition challenging U.S. Patent No. 9,955,551, Mercedes-Benz USA LLC v. Yechezkal Evan Spero, IPR2023-01040, June 7, 2023	The '040 IPR Petition
2006	U.S. Published Patent Application US2003/0137849A1 to Alden, Prosecution History in the U.S. Patent and Trademark Office	Alden Prosecution History
2007	Wards Auto “Prospects Bright for Lighting Sensor Supplier Hella,” Roger Schreffler Wards Auto, June 6, 2017 (Available at https://www.wardsauto.com/technology/prospects-bright-lighting-sensor-supplier-hella)	Wards Auto
2008	Automotive World, “Hella: Matrix LED technology makes its debut”, February 13, 2014 (Available at https://www.automotiveworld.com/news-releases/hella-matrix-led-technology-makes-debut/)	Automotive World
2009	Intentionally left blank.	

Exhibit No.	Description	Identifier
2010	ATZ Worldwide “Multi-row Headlamp System in the Mercedes-Benz E-Class,” Franz-Josef Kalze, February 2016 (Available at https://link.springer.com/article/10.1007/s38311-015-0105-y)	ATZ Worldwide
2011	Intentionally left blank.	
2012	PR Newswire, “Mercedes Multibeam LED headlamps – in a class of their own,” June 22, 2016 (Available at https://www.prnewswire.com/news-releases/mercedes-multibeam-led-headlamps--in-a-class-of-their-own-300288628.html)	PR Newswire
2013	Complaint, <i>Torchlight v. Daimler et al.</i> , Case No. 1:21-CV-751 District of Delaware, filed June 7, 2022	Complaint
2014	Reexamination Application Certified File History of U.S. Patent No. 9,955,551	

1. I, Matthew A. Turk, hereby declare as follows:
2. I am making this declaration at the request of Yechezkal Evan Spero in the matter of *Inter Partes* Review of U.S. Patent No. 9,955,551 (“the ’551 Patent”) to Yechezkal Evan Spero.
3. I am being compensated for my work in this matter at a rate of \$490/hour for time spent reviewing materials and performing my analysis of the technical issues relevant to this matter. My compensation in no way depends on the outcome of this proceeding.
4. In preparation of this declaration, I have studied the exhibits as listed in the Exhibit List shown above in my report.
5. In forming the opinions expressed below, I have considered:
 - a. The documents listed above as well as additional patents and documents referenced herein;
 - b. The relevant legal standards, including the standard for obviousness provided in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007), and any additional documents cited in the body of this declaration; and
 - c. My knowledge and experience based upon my work and study in this area as described below.

I. Qualifications and Professional Experience

6. I am a Professor and President of the Toyota Technological Institute at Chicago (TTIC) and an Emeritus Professor of the Department of Computer Science at the University of California, Santa Barbara. I have worked and studied in the field of computer vision since 1984, as well as related areas of image processing, pattern recognition, machine learning, and human-computer interaction. The field of computer vision is concerned with determining how computers can extract, analyze and understand information from images and video.

7. I received my doctorate degree in Media Arts and Sciences from the Massachusetts Institute of Technology (MIT) in 1991. My doctoral work was in the area of computer vision, specifically concerning automatic face recognition. I received my Master of Science degree in Electrical and Computer Engineering from Carnegie Mellon University in 1984. My Master's work was in the area of robot fine motion planning. I received my Bachelor of Science degree in Electrical Engineering from Virginia Tech (VPI&SU) in Blacksburg, Virginia in 1982, where my senior honors thesis was on image processing.

8. In 1991, I published the paper "Eigenfaces for Recognition," which I co-authored with my Ph.D. advisor, Dr. Alex Pentland. The research reported in this paper helped lead to practical automated face recognition systems that are used in today's security and surveillance systems, as well as in consumer applications.

My work on Eigenfaces has received several awards, including an IEEE Computer Society Outstanding Paper award at the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) in 1991 and a “Most Influential Paper of the Decade” award from the International Association for Pattern Recognition (IAPR) Workshop on Machine Vision Applications (MVA 2000).

9. Along with my co-authors, I have received several other awards at professional conferences and workshops for my work in computer vision, image processing, and augmented reality, including several best paper awards and winning the ACM Multimedia Open Source Competition in 2015.

10. My industry experience includes working for Martin Marietta Denver Aerospace from 1984 to 1987, where I worked primarily on computer vision for autonomous vehicle navigation as part of the Defense Advanced Research Projects Agency’s Autonomous Land Vehicle program, the precursor to the later DARPA Grand Challenge events and subsequent advances in self-driving automobiles. In 1992, I was a visiting researcher at LIFIA/ENSIMAG in Grenoble, France and from 1993 to 1994, I worked for Teleos Research in Palo Alto, CA; in both of those positions, I worked on computer vision methods for recognizing human faces, gestures, and activity. From 1994 to 2000, I was a researcher for Microsoft Research, where I was a founding member of the Vision Technology Research Group and conducted research in vision-based human computer interaction and

other related areas.

11. In 2000, I joined the faculty of the University of California, Santa Barbara, as an Associate Professor. In 2005, I was promoted to Full Professor and served as the Chair of the Media Arts and Technology Graduate Program from 2005 to 2010. In 2017, I was appointed as Chair of the Department of Computer Science. At UCSB, I taught graduate and undergraduate courses related to computer vision, computer imaging, human computer interaction, probabilistic models and methods, artificial intelligence, computer graphics, machine learning, and other areas. My graduate Computer Imaging course covered the fundamentals of imaging systems, including the capture, storage, display, retrieval, and processing of images, as well as the nature of light, color, optics, human vision, non-visible (UV and IR) and multispectral imaging, sensors, cameras, and illumination.

12. I co-founded (in 2003) and co-directed the Four Eyes Lab at UCSB, where the research focus is on the “four I’s” of Imaging, Interaction, and Innovative Interfaces. The Four Eyes Lab researches a variety of topics, including computer vision, pattern recognition, virtual and augmented reality, and face processing technologies such as face recognition and facial expression analysis. I worked on and supervised many research projects in these areas, including (1) visual recognition of automobiles and (2) multi-flash imaging, which used multiple

image sources and special optics to infer 3D scene structure from images.

13. In 2014, I co-founded a startup company, Caugnate, to commercialize computer vision and augmented reality technology for remote collaboration. Caugnate was acquired by PTC Inc., in 2016, and now forms the core of the Vuforia Chalk augmented reality product.

14. In 2019, I became President of the Toyota Technological Institute at Chicago, an independent graduate research institute, where the research and education focus of the faculty and Ph.D. students is on computer science theory, machine learning, artificial intelligence, and related areas such as computer vision, speech and language processing, robotics, and computational biology.

15. As a result of my work and research, I am a named inventor of U.S. Patent Number 5,164,992 entitled “Face Recognition System,” U.S. Patent Number 6,674,877 entitled “System and Method for Visually Tracking Occluded Objects in Real-time,” and U.S. Patent Number 9,495,761 entitled “Environment mapping with automatic motion model selection.”

16. I was a founding member of the Advisory Board for the International Conference on Multimodal Interfaces (ICMI), which provides a venue for disseminating recent advances in multimodal interaction research, systems, and methods, which includes combining visual modalities with audio, haptic, or other modalities. I served as the Chair of the ICMI Advisory Board from 2006 to 2009. I

was also a founding member of the Advisory Board for the IEEE International Conference on Automatic Face and Gesture Recognition and served as the General Chair for the conference in 2011. I have been a primary organizer of several top research conferences, including serving as General Chair for the 2014 IEEE Conference on Computer Vision and Pattern Recognition, the primary annual conference in the field of computer vision, with over 2000 attendees, Program Chair for the 2017 IEEE Winter Conference on Applications of Computer Vision, and General Chair of the 2019 International Conference on Multimodal Interfaces (ICMI).

17. I am currently an Associate Editor of the *ACM Transactions on Intelligent and Interactive Systems* and the *International Journal of Computer Vision and Signal Processing*, and was formerly an Associate Editor of *Image and Vision Computing*. I have also served as a guest editor of several other journals related to computer vision, machine learning, and facial recognition.

18. In 2020, I was elected a Fellow of the Association for Computing Machinery (ACM), the main professional society in the field of computer science, for “contributions to face recognition, computer vision, and multimodal interaction.” In 2013, I was elected as a Fellow of the IEEE (the Institute of Electrical and Electronics Engineers), an award conferred by the Board of Directors of the IEEE upon a person with an extraordinary record of

accomplishments in any of the IEEE fields of interest. In 2014, I was elected as a Fellow of the International Association for Pattern Recognition (IAPR). In 2022, I was named as a Fellow of the Asia-Pacific Artificial Intelligence Association. I am also the recipient of the 2011-2012 Fulbright-Nokia Distinguished Chair in Information and Communications Technologies. I have given many keynote presentations at top conferences and workshops in my fields.

19. I have provided my full background in the curriculum vitae that is attached as Exhibit 2003.

II. Relevant Legal Standards

20. I have been asked to provide opinions on the claims of the '551 Patent in light of the prior art.

21. It is my understanding that a claimed invention is unpatentable under 35 USC § 102 if a prior art reference teaches every element of the claim. Further, it is my understanding that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the alleged invention was made to a person having ordinary skill in the art to which the subject matter pertains. I also understand that an obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed

subject matter.

22. It is my understanding that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of the claimed subject matter. Some of these rationales include the following: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to obtain predictable results; a predictable use of prior art elements according to their established functions; applying a known technique to a known device to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

III. Overview of the '551 Patent

23. The '551 Patent discloses “a novel multi-light source approach to the design and construction of solid-state lighting fixtures (vs. solid state lamps), which is termed a ‘Digital Lighting Fixture’, due to the control of individual lighting element ‘digits’ to provide the ‘correct’ lighting solution for the situation at hand.” (Ex. 1001, 11:8-13.) The '551 Patent further explains that “[t]he terminology ‘digital’ as used herein refers to the discrete nature of the multiple

[illegible]

24. The '551 Patent describes “a different approach which is to provide the end user with the most correct lighting solution not a new technology lamp to replace the old one.” (*Id.*, 11:5-8.) “In contrast to a prior art, single large, lamp replacement like light source, the present invention provides multiple, small sized sources of differing characteristics such that the effect of the whole is greater than the sum of the individual parts.” (*Id.*, 11:45-49.) “The added controllability offered by breaking the total light output up into discrete (‘digital’) specifically aimable

and dimmable elements which can be addressed by control electronics to effect intensity, spectrum and spatial distribution of intensity and spectrum, yields a lighting fixture (vs. lamp) of unparalleled performance.” (*Id.*, 11:56-62.) The ‘551 patent explains how to use its “digital lighting” in the context of headlamps to “provide the optimal lighting solution in real-time” – whether that be for predictive curve illumination (*Id.*, 57:31-37), to preserve forward illumination while preventing glare (*Id.*, 52:54-65), or both (*Id.*, 53:33-44).

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

26. The ‘551 Patent also recognizes that different “objects” may be in the

field of view in a variety of lighting situations, and that different light output may be appropriate to accommodate these different objects. (*Id.*, 44:36-45:44.) In the context of headlamps, it can, for example, determine types of objects, *e.g.*, without limitation, whether something is a vehicle or a sign, and respond differently to each object. With regards to a preceding vehicle it may reduce illumination of the vehicle and with regards to a preceding sign it may increase illumination of the sign. It can also make these accommodations at the same time, because of the discrete nature of the directional light sources — “use the controller and properly aimed SLS to follow and illuminate distant overhead and roadside signs for a longer time, yet not blind oncoming traffic due to the narrow beam.” (*Id.*, 53:1-4.) This is a headlamp embodiment employing, among other things, the described notion of “task lighting” — contemplation of varied illumination needs within an illuminated scene.

27. Thus, the '551 Patent provides a comprehensive solution for the control and use of light, and extends the application to headlamps that can accommodate other traffic without blinding it, predictively illuminate road curvatures, and differentially illuminate objects in a scene based on object recognition. All of this lends itself to the complete headlamp solution contemplated and described — a solution where “[a]t any instant in time the intensity, spectrum and beam pattern of the headlamp may be varied as a function of the drivers intent,

lay of the road and environmental factors.” (*Id.*, 51:49-52.) The marrying of the ’551 techniques with the headlamp embodiments results in a headlamp with highly controllable emission elements that, “[w]hen combined with devices capable of detection changes in the surrounding environment the flexible DLF is capable of changing the illumination so as to provide the optimal lighting solution in real-time.” (*Id.*, 57:33-37.)

IV. The Challenged Claims

28. The Challenged Claims are claims 8, 10-18 and 24-47. Of those, claims 8, 24, 32, and 40 are independent claims. Each of the remaining Challenged Claims depends from one of those independent claims. (Petition at 5.)

V. Qualifications of one of ordinary skill in the art

29. I have been asked to provide my opinion as to the level of skill of a person having ordinary skill in the art (“POSA”) of the ’551 Patent at the time of the claimed invention. In determining the characteristics of a hypothetical person of ordinary skill in the art of the ’551 Patent at the time of the claimed invention, I was told to consider several factors, including the type of problems encountered in the art, the solutions to those problems, the rapidity with which innovations are made in the field, the sophistication of the technology, and the education level of active workers in the field. I also placed myself back in the time frame of the claimed invention and considered the skill level of colleagues with whom I had

worked at that time.

30. In my opinion POSA for the invention claimed in the '551 Patent, would have had an undergraduate degree in mechanical engineering, electrical engineering, automotive engineering, optical engineering, applied physics, computer science, or similar disciplines, along with two years of experience working with intelligent vehicle systems, automotive control systems, or lighting control systems.

31. The more education one has, the less experience needed to attain an ordinary level of skill. Similarly, more experience in the field may serve as a substitute for formal education.

VI. Proposed Claim Constructions

32. To properly evaluate these claims, I understand that the terms of the claims must first be construed. In my opinion, the claims of the '551 Patent do not include any terms that require specific construction. Instead, each of the claims includes terms that an ordinary artisan would understand according to their plain and ordinary meaning.

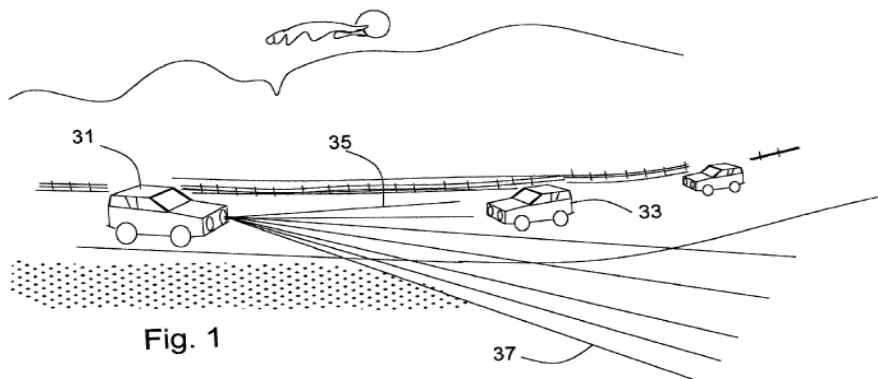
VII. Overview of the Prior Art

A. Alden

33. Alden is directed to controlling the distribution of light by a vehicle headlight. Alden's systems include headlights that produce multiple individually

controllable beam segments of light, each illuminating a sector of the area (“distribution area”) ahead of the vehicle equipped therewith (“equipped vehicle”).

(Ex. 1005, ¶¶[0002, 0004-0006, 0008].)



(Ex. 1005, FIGURE 1)

34. The systems also include sensors 51a, 51b for detecting incoming light received from the distribution area, which sensors 51a, 51b are divided into multiple sectors associated with sectors of the distribution area illuminated by the beam segments of the headlight of the equipped vehicle. The systems also includes a central processing unit (CPU) 71 that determines whether incoming light detected in each sector of the sensors 51a, 51b has an intensity that meets a threshold value.

(Ex. 1005, ¶¶[0027-0028].)

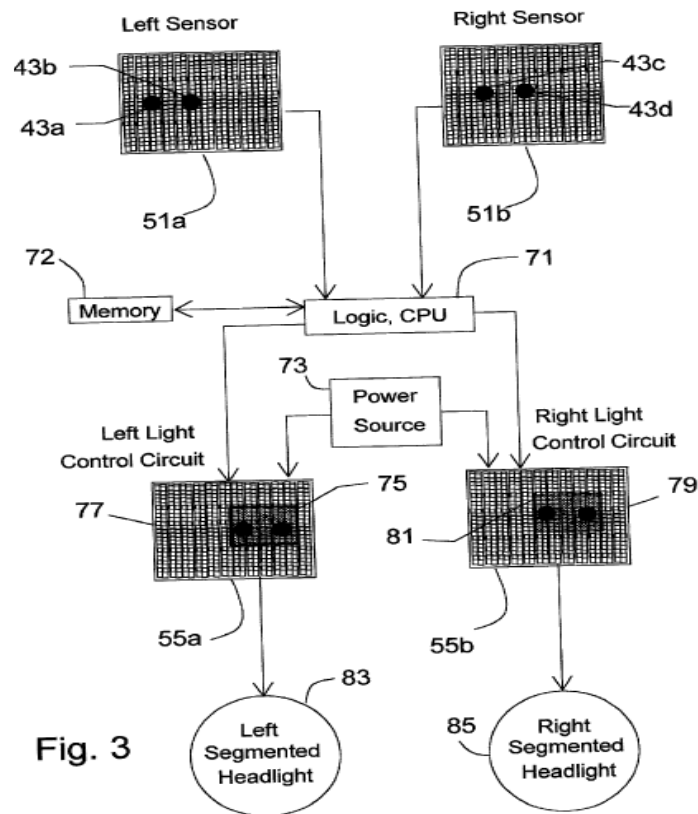
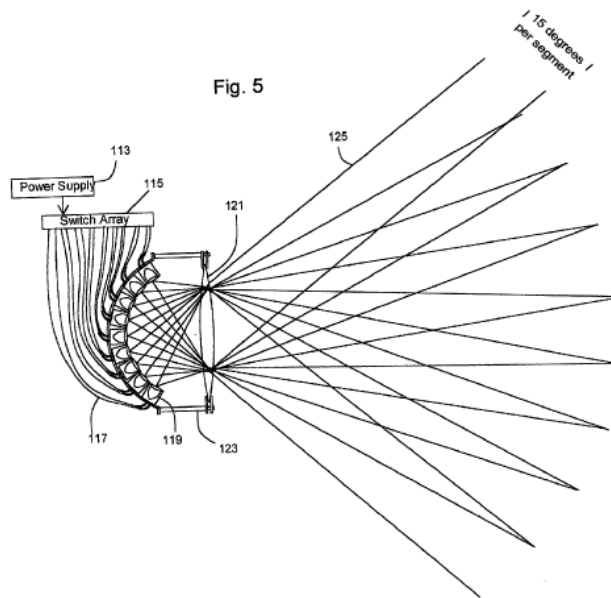


Fig. 3

(Ex. 1005, FIGURE 3)

35. In one of the two types of embodiments described, illustrated in Figures 1, 2, and 5, the headlight system dims the intensity of those beam segments produced by the headlight of an equipped vehicle that are incident on a sector or sectors in the distribution area. In this embodiment, a headlight 123 employs a one-dimensional array of light emitting diode (LED) elements 119 and a convex lens 121 for directing the beam segment produced by each LED element 119 that illuminate different sectors of the distribution area. (Ex. 1005, ¶¶[0025, 0026, 0029].)

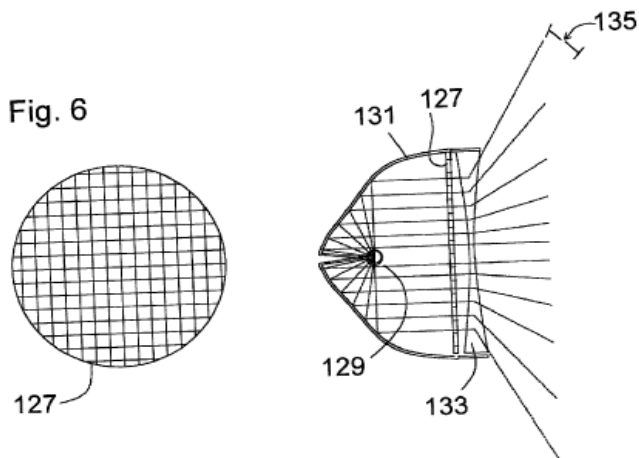


(Ex. 1005, FIGURE 5)

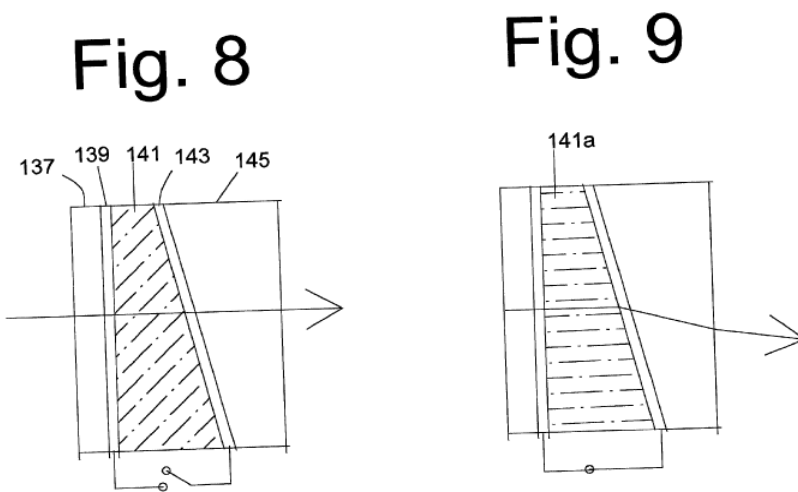
36. The CPU 71 determines the sector or sectors of the sensors 51a, 51b receiving incoming light from the distribution area that have a detected threshold intensity. In response, the CPU 71 controls the headlight 123 to dim those beam segments or segments produced by the individual LED elements 119 that illuminate the distribution area sector or sectors associated with any such sensor sectors. (Ex. 1005, ¶¶[0026-0029].)

37. In the other of the two types of embodiments described, illustrated in Figures 6-14, the headlight system changes the direction of light produced by the headlights of an equipped vehicle. For example, light produced by the equipped vehicle headlights may be re-directed from a forward direction to a leftward or rightward direction to illuminate a turn in the road, or from a forward direction to an upward or downward direction to illuminate an incline or decline in the road. In

these embodiments, the headlight system employs a single point light source 129, a collimating reflector 131, electro-chromatic refractive elements 127, and a concave lens 133 to produce multiple light beam segments. (Ex. 1005, ¶¶[0030-0040].)



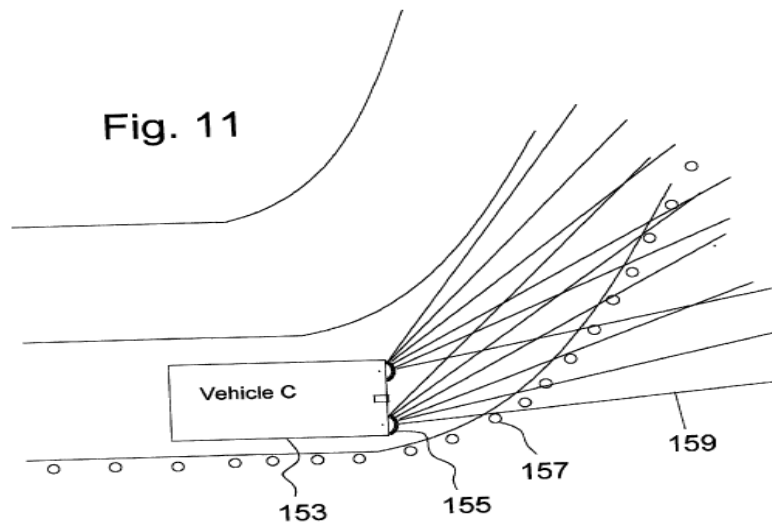
(Ex. 1005, FIGURE 6)



(Ex. 1005, FIGURES 8, 9)

38. In one example of this second type of embodiment, the CPU 71 determines the sector or sectors of the sensors 51a, 51b receiving incoming light from the distribution area that have a detected threshold intensity. In response, the

CPU 71 controls the electro-chromatic refractive elements 127 of the headlight to change the direction of the beam segments produced thereby to illuminate a turn in the road. (Ex. 1005, ¶[0036], Figure 11.)



(Ex. 1005, FIGURE 11)

39. Notably, each of the two types of embodiments disclosed by Alden is discrete and includes features that are incompatible with the other type of embodiment. For example, the headlight system embodiment described in connection with Figures 6-14 having electro-chromatic refractive elements 127 for changing the direction of headlight beam segments is designed to work with collimated light produced by single point light source 129, collimating reflector 131, and concave lens 133. However, the LED elements 119 of the headlight system embodiment described in connection with Figures 1, 2 and 5 produce non-collimated light. Non-collimated light cannot be directed in any meaningful

fashion by the electro-chromatic refractive elements 127 of the headlight system embodiment described in connection with Figures 6-14. Indeed, non-collimated light would blend and have different incident angles on those electro-chromatic refractive elements 127 thereby preventing any meaningful control of individual sectors as well as redirecting much of the non-collimated light they receive away from the desired segments of the distribution area. Any combination of these different types of Alden's headlight system embodiments would therefore be incapable of meeting the basic requirements of a headlight, i.e., effectively illuminating the area ahead of the equipped vehicle, let alone directing its emitted light in any meaningful fashion. Rather than suggesting combinations of various features of its different headlight system embodiments, Alden only states generally that each of its two types of headlight system embodiments may employ the sensing elements 51a, 51b discussed in connection with Figures 3 and 4. (Ex. 1005, ¶¶[0036-0038].)

40. Alden is a theoretical reference that fails to enable much of its disclosure and is ambiguous in critical respects. The disclosure in Alden is directed to certain features of headlamp systems and general benefits such features and systems could provide but lacks detailed explanations as to how those features and systems are practically implemented or how those benefits are realized thereby. For example, while Alden depicts control circuit switch array switches in

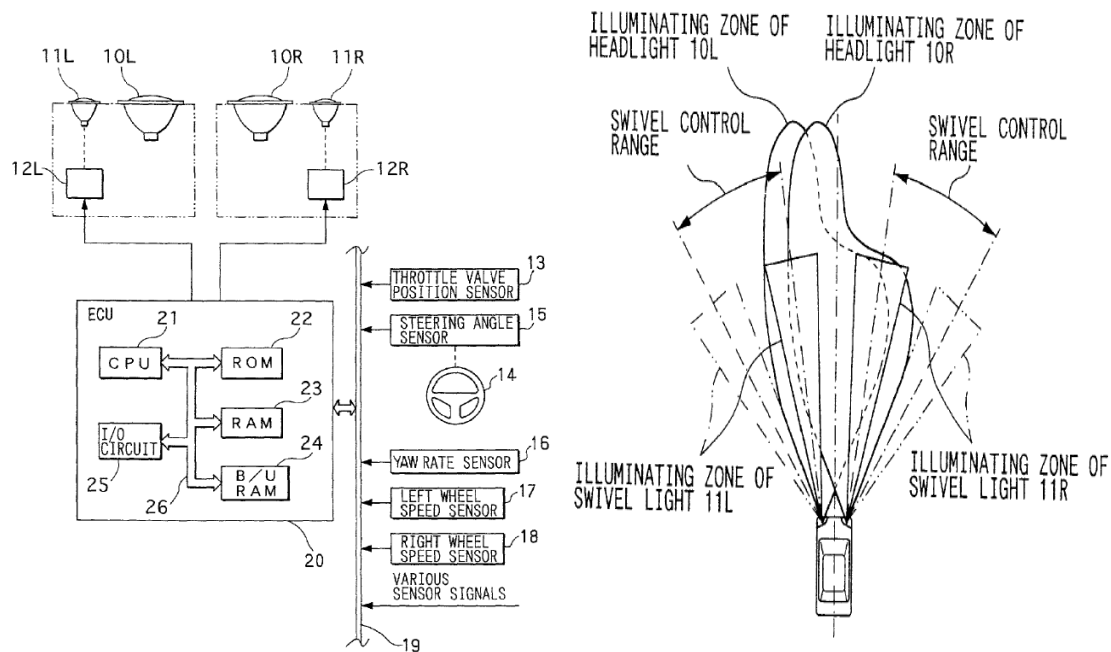
Figure 3 for dimming certain headlight beam segments while leaving other beam segments on high intensity, it does not clearly describe or specifically demonstrate how such operations are accomplished using the one-dimensional array of LED elements 119 of headlight 123 illustrated in Figure 5. In connection with Figure 4 Alden describes progressing through the sectors of sensors 51a, 51b of Figure 3 to detect incoming light, but it does not explain how those sensor sectors are mapped to either the one-dimensional array of LED elements 119 shown in Figure 5, the switches 115 for that array, or the distribution area sectors depicted therein. In fact, Alden specifically states that the switch arrays of the light control circuits 55a, 55b shown in Figure 3 are merely for illustrative purposes. (Ex. 1005, ¶[0027].)

41. Relatedly, Alden contacted Gentex Corporation, an automotive industry supplier, regarding his segmented headlight system and was informed that Gentex's technical staff had determined the system to be "futuristic" and likely "years away from any practical use." (Ex. 2006 at 39.)

B. Kondo

42. Kondo discloses a system for automatically adjusting the direction of optical axes of vehicle lights. The system includes left and right vehicle headlights 10L, 10R and left and right swivel lights 11L, 11R. The swivel lights 11L, 11R are attached to left and right actuators 12L, 12R which are controlled by an ECU 20 based on information obtained from sensors, such as a steering angle sensor 15,

yaw rate sensor 16, and wheel speed sensors 17, 18. (Ex. 1007, ¶¶[0016-0019].)



(Ex. 1007, FIGURES 1, 2)

43. The ECU 20 evaluates the output signals from the sensors 15, 16, 17, 18 as either normal or abnormal and uses normal sensor signals to calculate optical axes for the swivel lights 11L, 11R. The ECU 20 then drives the left and right actuators 12L, 12R of the left and right swivel lights 11L, 11R to control the direction of the light produced by the those swivel lights 11L, 11R within a swivel control range. (Ex. 1007, ¶¶[0018, 0028-0029].)

VIII. Grounds for Challenge

A. Grounds 3 and 4: Petitioner's Combination of Alden and Kondo Fails to Teach All of the Features of Independent Claim 8

44. It is my understanding that Petitioner must show where each claim

limitation is found in the applied references and that failure to do so defeats a claim of obviousness. It is also my understanding that to establish an obviousness rejection, all of the claimed features must be taught or suggested by the prior art.

1. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine Alden and Kondo Because Such a Combination Renders Alden Inoperable or Unsatisfactory for Its Intended Purpose and Changes Its Principle of Operation

45. It is my understanding that Petitioner must explain how and why a POSA would have modified or combined the prior art and that there must be an articulated reasoning with a rational underpinning to support a legal conclusion of obviousness. It is also my understanding that, if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. It is still further my understanding that, if a proposed modification or combination of prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are insufficient to render a claim obvious. Petitioner fails to address these issues.

46. Independent claim 8 requires “a light fixture . . . having movable structure for aiming the directional light sources mounted thereon in a defined direction.” Petitioner relies on Kondo for satisfying these claim features. Petitioner’s sole contention in this regard consists of conclusory statements that a

portion of the LED elements 119 of Alden's headlight 123 could be made moveable using Kondo's actuator 12L (12R) for moving a vehicle front light 11L (11R). (Petition at 72-73.)

47. Headlight 123 is one of two types of headlight system embodiments disclosed in Alden. The intended purpose of this type of embodiment is to dim the intensity of those beam segments produced by the LED elements 119 of headlight 123 that may be incident on an oncoming vehicle present in the distribution area of that headlight 123. (Ex. 1005, ¶[0027].)

48. According to the Petition, this purpose is accomplished using a sensor 51a (51b), which receives incoming light from the distribution area. In response to the detection of any such light having a threshold intensity in any sector of the sensor 51a (51b), the CPU 71 controls the headlight 123 to dim the beam segment or segments produced by the individual LED element or elements 119 that illuminate the distribution area sector or sectors associated with any such sensor sector. (Ex. 1005, ¶¶[0025-0029].)

49. As a result, both the LED elements 119 and sensor 51a (51b) of the headlight 123 must be oriented toward the distribution area. It is only this common orientation of, and association between, the LED elements 119 and the sensor 51a (51b) that would enable the headlight 123 to accomplish the intended purpose of Alden.

50. However, Petitioner's combination of Alden and Kondo, whereby a portion of the LED elements 119 of Alden's headlamp 123 are made movable using Kondo's actuator 12L (12R), would render Alden inoperable or unsatisfactory for its intended purpose and thus an unsuitable option. More specifically, once moved, that portion of LED elements 119 would be disassociated from the distribution area and the sensor 51a (51b), which Alden shows and describes in connection with Figure 2 thereof as part of a sensor unit 45 (including lens 49) mounted to the equipped vehicle. (Ex. 1005, ¶[0026], Figure 2.) As a result, the fixed sensor 51a (51b) would receive no incoming light from the new and different area illuminated by the now-moved LED elements 119. The CPU 71, having no information from the sensor 51a (51b) regarding that new and different illuminated area, would be unable to control the now-moved LED elements 119 to dim the beam segment or segments produced thereby that are incident on any oncoming vehicle present in that new and different area illuminated.

51. Kondo does not disclose a "swivel structure." (Petition at 72.) Figure 1 of Kondo illustrates black-box actuators 12L, 12R schematically connected by dotted lines to lights 11L, 11R, which are referred to as swivel lights because they can be rotated by the actuators 12L, 12R. (Ex. 1007, ¶¶[0016-0019, 0028-0029], Figures 1, 2.) Petitioner's obviousness contention also fails to include any details of a structure for mounting a portion of the LED elements 119 of Alden's headlight

123, or any explanation of how one of ordinary skill would mount a portion of those LED elements 119 on a moveable structure and integrate such a structure or coordinate it with operation of Alden's headlight 123 — in particular given Alden's description of the positioning of the LED elements 119 on a curve along the focal point of the lens 121 in order to illuminate specific portions of the distribution area. (Ex. 1005, ¶[0029].) Such engineering details are critical to Petitioner's proposed combination of Alden and Kondo..

52. Petitioner's combination of Alden and Kondo would therefore render Alden inoperable or unsatisfactory for its intended purpose and change its principle of operation. As a result, one of ordinary skill would not be motivated to combine Alden and Kondo as Petitioner contends and, indeed, the teachings of Alden and Kondo are insufficient to render the claimed invention obvious.

2. Petitioner's Combination of Alden and Kondo Does Not Teach the Independent Claim 8 Features of “determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables”

53. Independent claim 8 requires “determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables.” Petitioner relies on Alden for satisfying these claim features. Petitioner states that Alden's CPU 71 receives information from sensors 51a, 51b regarding patterns of sensed light and assesses whether such

patterns appear to be a vehicle. (Petition at 78.) Petitioner does not contend that Alden teaches determining illumination within an area using artificial intelligence, video analytics, or look-up tables.

54. Alden's sensors 51a, 51b are divided into sectors that detect light received from the distribution area. In Alden's headlight system embodiment illustrated in Figures 1, 2, and 5, the CPU 71 determines those sectors of the sensors 51a, 51b in which any such received light has a threshold intensity. The sensor sectors are associated with sectors of the distribution area illuminated by beam segments produced by the LED elements 119 of headlight 123. Alden's CPU 71 then designates one or more distribution area sectors associated with sensor sectors that encompass those sensor sectors in which the threshold intensity light was detected. The CPU 71 then controls the LED elements 119 of headlight 123 as required to dim the beam segments produced thereby that illuminate the designated sector or sectors of the distribution area. (Ex. 1005, ¶¶[0025-0029].)

55. Rather than pattern recognition, Alden's system uses thresholding of detected incoming light to control the beam segments produced by the LED elements 119 of headlight 123. Notably, the word "pattern" appears in Alden only twice, both times in the context of the distribution pattern of light produced by Alden's headlight systems. (Ex. 1005, ¶[0002].) Alden also does not teach identifying a vehicle. Instead, Alden's CPU 71 simply determines whether

detected incoming light has a threshold intensity and controls the beam segments produced by the LED elements 119 of headlight 123 accordingly. (Ex. 1005, ¶¶[0025-0029].) While Alden describes an example in which two spots of incoming light having a threshold intensity are detected, Alden's sensors 51a, 51b and CPU 71 would similarly detect a single spot of incoming light having a threshold intensity and control the beam segments produced by the LED elements 119 of headlight 123 accordingly, whether that single detected spot resulted from an oncoming motorcycle with a single headlight, an oncoming vehicle having only one functioning headlight, a flashlight held by a pedestrian, a streetlight, or a house light.

56. Alden's system that includes headlight 123 with LED elements 119 therefore does not recognize or use any pattern of light or any pattern of a vehicle to control the LED elements 119 illuminating the distribution area. Rather, Alden's system detects incoming light having a threshold intensity and simply designates a sector or sectors of the distribution area for use in then selectively controlling beam segments produced by LED elements 119. (Ex. 1005, ¶¶[0025-0029].)

57. In connection with the second of the two types of headlight system embodiments disclosed, Alden describes an example in which the headlight system changes the direction of light produced by the headlights of an equipped vehicle to illuminate a turn in the roadway. To do so, the CPU 71 controls electro-chromatic

refractive elements 127 to change the direction of collimated light produced by a headlight having a single point light source 129 and a collimating reflector 131. (Ex. 1005, ¶¶[0030-0040].) Here again, rather than pattern recognition, Alden's system uses thresholding of detected incoming light to control the direction of beam segments produced by the headlight system. Alden's CPU 71 controls the direction of the beam segments produced by the headlight in response to detecting any incoming light having a threshold intensity. This embodiment of Alden's headlight systems therefore also does not recognize any pattern of light and thus again fails to anticipate the claim features of "determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables." Moreover, as previously demonstrated, Alden's different headlight system embodiments have different functions and thus include features that are incompatible and cannot be combined with each other.

58. It is also my understanding that Petitioner cannot assume the various aspects of Alden's embodiments are interchangeable, rather Alden's disclosure must support any such interchangeability. It is further my understanding that extrinsic evidence, such as an expert declaration, on what Alden's different embodiments could include or would accommodate are not the same as what Alden specifically discloses, and that Petitioner must provide a sufficient rationale to combine Alden's different embodiments. It is my understanding if a Petitioner

fails to explain sufficiently why a POSA would have found it obvious to combine those embodiments, any contentions by Petitioner of obviousness based thereon would fail.

59. For the reasons set forth above, Alden fails to teach the independent claim 8 features of “determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables.” Thus, any combination of Alden and Kondo fails to render the claimed invention obvious.

B. Grounds 1 and 2: Alden Fails to Teach All of the Features of Independent Claims 24, 32, and 40

60. To demonstrate anticipation, it is my understanding that Petitioner must show that the prior art reference discloses each and every limitation of the claim, either expressly or inherently, and that a prior art reference does not anticipate if it must be modified to meet a disputed claim limitation. It is also my understanding that an inoperative prior art device cannot be relied on for anticipation. It is still further my understanding that inherency requires a basis in fact and/or technical reasoning to reasonably support a determination that an allegedly inherent characteristic necessarily flows from the teaching of the applied reference, and that a certain result or characteristic may occur or be present in an applied reference is insufficient to establish inherency of that result or

characteristic.

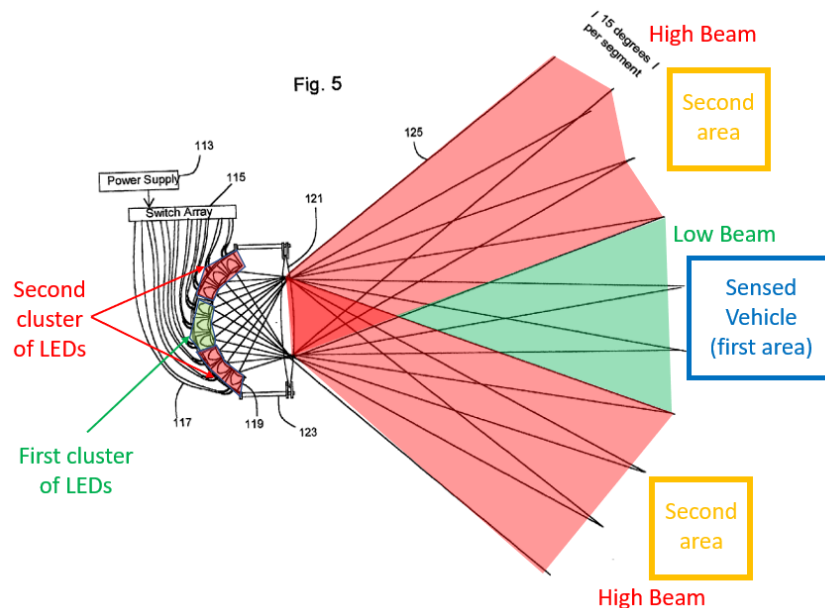
61. To anticipate, it is also my understanding that a prior art reference must enable a POSA to make the claimed invention without undue experimentation and that a claimed invention is not anticipated if the allegedly experimentation and that a claimed invention is not anticipated if the allegedly anticipatory prior art disclosures are not enabled. It is further my understanding that a prior art reference must clearly and unequivocally disclose the claimed invention or direct a POSA to the invention without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the reference. It is also my understanding that anticipation requires that a single prior art reference describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in the prior art and that ambiguous references therefore do not anticipate a claimed invention.

1. **Alden Fails to Teach the Independent Claim 24**
Features of “*change emission of the selected cluster of LEDs relative to emission of other LEDs not included in the cluster to create headlamp illumination that preserves a first level of illumination illuminating past the other vehicle while preventing glare to a driver of the other vehicle*”

62. Though, Petitioner asserts that Alden teaches the above-noted independent claim 24 features relating to creating headlamp illumination that preserves a first level of illumination illuminating past the other vehicle while

preventing glare to a driver of another vehicle, Alden fails to provide an enabling disclosure of these claim features.

63. Petitioner relies on its annotations of Figure 5 of Alden to support its contention. Petitioner's annotated version of Figure 5 is reproduced immediately below:



(Petition at 36, Annotated)

64. Unlike the rest of its Petition, Petitioner has not here annotated Figure 5 to simply highlight elements of Alden's headlight system. (Petition at 10, 12, 13, 15-18, 21, 24-26.) With these annotations of Figure 5, Petitioner purports to show how headlight 123 operates in a specific scenario. However, none of the operations purportedly shown by these annotations of Figure 5 are expressly disclosed in Alden, but instead speculation.

65. In its annotations, Petitioner has rendered the sensed oncoming vehicle shown using an inaccurate scale, with the width of that vehicle being less than that of the headlight 123. Properly scaled given the size of headlight 123, the sensed vehicle located at the distance shown in Petitioner's annotated version of Figure 5 would have a width that spans all the beam segments illuminating the distribution area. According to this embodiment of Alden's headlight systems, this means that all the light LED elements 119 would be dimmed to produce low beam illumination. As a result, Alden's system would fail to preserve a first level of illumination illuminating past the other vehicle, as claimed. Independent claim 24 requires not just creating illumination illuminating past the other vehicle, but changing emission of a selected cluster of LEDs relative to emission of other LEDs not included in the cluster to create illumination to preserve a first level of illumination illuminating past the other vehicle while preventing glare to a driver of the other vehicle.

66. It is only by rendering the annotated vehicle with an inaccurate scale relative to headlight 123 that Petitioner can assert that Alden teaches these claim features.

67. Alden is also ambiguous because it fails to disclose these independent claim 24 features clearly and unequivocally. While Alden depicts control circuit switch array switches in Figure 3 for dimming certain headlight beam segments

while leaving other beam segments on high intensity (Ex. 1005, ¶[0027]), it does not clearly describe or specifically demonstrate how such operations are accomplished using the one-dimensional array of LED elements 119 of headlight 123 illustrated in Figure 5, which is the only headlight system embodiment of Alden that involves LED elements and the only embodiment relied upon by Petitioner in connection with these claim features. In that regard, Alden does not describe the array of LED elements 119 as multi-dimensional. Alden indicates that LED elements 119 are positioned along the focal point of the lens 121 in order to illuminate specific portions of the distribution area (Ex. 1005, ¶[0029]), with no explanation of how that could be accomplished with a multi-dimensional array of LEDs. Moreover, while in connection with Figure 4 Alden describes progressing through the sectors of sensors 51a, 51b of Figure 3 to detect incoming light (Ex. 1005, ¶¶[0027-0028]), it does not explain how those sensor sectors are mapped to either the one-dimensional array of LED elements 119 shown in Figure 5, the switches 115 for that array, or the distribution area sectors depicted therein. Rather, Alden specifically states that the switch arrays of the light control circuits 55a, 55b shown in Figure 3 are merely for illustrative purposes. (Ex. 1005, ¶[0027].)

68. Alden is also ambiguous regarding the propagation of beam segments produced by headlight 123 beyond the endpoints illustrated in Figure 5. In that regard, the beam segments of each LED element 119 exiting the lens 121 are

illustrated in Figure 5 as collimated and propagating with a columnar shape, which would be unchanged with distance. However, Alden's contradictory description and illustration in Figure 5 indicate that each such beam segment illuminates a 15° arc of the distribution area, which would continue to expand with distance. (Ex. 1005, ¶[0029], Figure 5.) Thus, even if the oncoming vehicle(s) in Petitioner's annotated versions of Figure 5 were to be depicted at a properly scaled distance from the headlight 123, it is unclear how that oncoming vehicle would be illuminated by the equipped vehicle headlight, particularly in view of the statement in Alden that the intensity of light (high-beam/low-beam) produced by the equipped vehicle headlight is determined by the distance between the equipped vehicle and the oncoming vehicle. (*Id.*, ¶¶[0027-0028].)

69. If the disclosure of Alden relating to these claim features was clear, Petitioner's annotations of Figure 5 would be unnecessary. Petitioner's annotations are therefore themselves a demonstration of Alden's ambiguity. Because it does not disclose these independent claim 24 features with sufficient precision and detail to establish their existence as prior art, Alden is ambiguous and per my understanding, fails to anticipate.

70. Moreover, it is my understanding that Alden can only anticipate the claimed invention if it discloses every claim feature, either expressly or inherently. Once again, none of the operations purportedly shown by Petitioner's annotations

of Figure 5 are expressly disclosed in Alden. To anticipate these claim features, it is my understanding that Petitioner's annotations therefore must therefore be inherently disclosed by Alden. It is my understanding that inherency requires a basis in fact and/or technical reasoning to reasonably support a determination that an allegedly inherent characteristic necessarily flows from the teaching of the applied reference, and that a certain result or characteristic may occur or be present in an applied reference is insufficient to establish inherency of that result or characteristic.

71. As previously demonstrated, however, Petitioner's annotations of Figure 5 are inaccurate and thus do not and cannot flow necessarily from the express disclosure in Alden. Petitioner's annotations are therefore insufficient to demonstrate that Alden teaches these independent claim 24 features and per my understanding, Alden fails to anticipate.

72. Petitioner also contends that Alden not only anticipates these independent claim 24 features but also renders the claimed invention obvious. The Petition however fails to explain this contention at any level of detail. Instead, Petitioner's obviousness contention is based on statements consisting of no more than a single sentence. (Petition at 11, 37, 39, 44, 46, 47, 49, 51-53, 57-59.) Petitioner has failed to establish or demonstrate multiple elements that are required to support an obviousness conclusion, including explaining *how* Alden must be

modified, and explaining *why* a POSA would be motivated to so modify Alden by providing some articulated reasoning with some rational underpinning to support an obviousness conclusion.

73. It is also my understanding that Petitioner cannot simply treat the various features of Alden's embodiments as interchangeable, but that Alden's disclosure must support any contention of interchangeability. It is still further my understanding that extrinsic evidence, such as an expert declaration, on what Alden's different embodiments could include or would accommodate are not the same as what Alden specifically discloses and that Petitioner must provide a sufficient rationale to combine Alden's different embodiments. Having failed to explain sufficiently *why* a POSA would have found it obvious to combine those embodiments, it is my understanding that any contentions by Petitioner of obviousness based thereon would fail.

2. Alden Fails to Teach the Independent Claim 32
Features of “*create a beam of diminished illumination illuminating at least a portion of the at least one target with non-glaring illumination, created in a broader field of illumination having different intensity than the beam . . . the beam diminished in intensity relative to the broader field of illumination illuminating at least above and on both sides of the beam*”

74. Petitioner states that Alden teaches the above-noted independent claim 32 features relating to creating a beam of diminished illumination illuminating a

target with non-glaring illumination, in a broader field of illumination having different intensity than the beam, the beam diminished in intensity relative to the broader field of illumination illuminating at least above and on both sides of the beam.

75. The headlight system embodiment illustrated in Figures 1, 2, and 5 of Alden is directed to dimming selected beam segments. Figure 5 discloses a one-dimensional array of LED elements 119. (Ex. 1005, ¶[0029].) Thus, as shown therein, the beam segments produced by the LED elements 119 of that one-dimensional array propagate in the same plane within horizontally divided sectors of the distribution area. In each of those distribution area sectors, any portion of a beam segment propagating vertically would therefore have the same intensity (*e.g.*, high-beam or low-beam) as that portion of the beam segment propagating horizontally in that sector. In that regard, Figure 1 of Alden depicts the elements of a segmented distribution headlight according to the first type of headlight system embodiment disclosed therein. (Ex. 1005, ¶[0026].) The distribution area sectors 63, 65 illustrated in Figure 1 are the same as the distribution area sectors of Figure 2 (*e.g.*, 35, 37) and Figure 5 directed to that same embodiment, which are illustrated in each of Figures 2 and 5 in a horizontal plane. The headlight system embodiment illustrated in Figures 1, 2, and 5 of Alden is thus incapable of “creating a beam of diminished illumination illuminating at least a portion of the at

least one target with non-glaring illumination, created in a broader field of illumination having different intensity than the beam, the beam diminished in intensity relative to the broader field of illumination illuminating at least **above** and on both sides of the beam”, as claimed. As a result, it is my understanding that because, Alden fails to provide an enabling disclosure of these claim features, it fails to anticipate the claimed invention.

76. For these same reasons, and for the reasons identified above for independent claim 24, Alden is also ambiguous because it fails to disclose these independent claim 32 features clearly and unequivocally, lacking sufficient precision to establish their existence as prior art. For that reason, it is my understanding that Alden fails to anticipate.

77. As previously demonstrated, Alden’s disclosure fails to enable these claim features and is ambiguous because it does not disclose them with sufficient precision and detail. It is thus my understanding that Alden therefore not only fails to expressly disclose these claim features, but also fails to do so inherently; these claim features do not and, cannot flow necessarily from the express disclosure in Alden. As a result, it is my understanding that Alden again fails to anticipate.

78. If Petitioner’s anticipation arguments are based on picking, choosing, and/or combining various features of Alden’s different headlight system embodiments not directly related to each other (*see, e.g.*, Petition at 43, n. 7), any

resulting headlight would be inoperative.

79. Each of the embodiments disclosed by Alden is discrete and includes features that are incompatible with other embodiments. For example, one of the two headlight system embodiments described in Alden in connection with Figures 1, 2, and 5 is directed to a headlight having a one-dimensional array of individually controlled LED elements 119 and a convex lens 121 for providing selective dimming and fixed direction (*i.e.*, forward) of non-collimated light produced by the LED elements 119. (Ex. 1005, ¶¶[0025-0026, 0029].) In contrast, the other of the two headlight system embodiments described in Alden in connection with Figures 6-14 is directed to a headlight having a single point light source 129, a collimating reflector 131, electro-chromatic refractive elements 127, and a concave lens 133 for changing the direction (*i.e.*, forward, left, right, up, down) of multiple beams of collimated light produced by the single point light source 129 and collimating reflector 131. (*Id.*, ¶¶[0030-0040].)

80. Alden's non-collimated light producing LED elements 119 and convex lens 121 are incompatible with Alden's electro-chromatic refractive elements 127 and concave lens 133, which are designed to work with collimated light and, indeed, are inoperable with non-collimated light. Non-collimated light cannot be directed in any meaningful fashion by the electro-chromatic refractive elements 127 of the headlight system embodiment described in connection with

Figures 6-14. Rather, non-collimated light would blend and have different incident angles on those electro-chromatic refractive elements 127 thereby preventing any meaningful control of individual sectors as well as redirecting much of the non-collimated light they receive away from the desired segments of the distribution area. The result of any combination thereof would therefore be incapable of meeting the basic requirements of a headlight, *i.e.*, effectively illuminating the area ahead of the equipped vehicle, let alone directing its emitted light in any meaningful way.

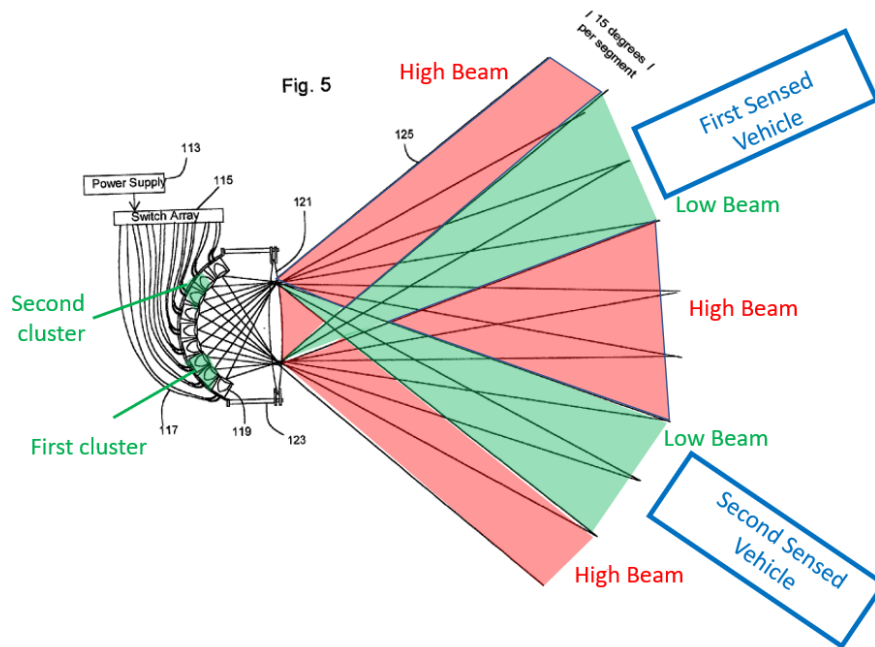
81. It is also my understanding that, in the context of anticipation, the question is not whether a prior art reference suggests a claim feature but whether the reference discloses the claim feature. Rather than suggesting combinations of various features of its different headlight system embodiments, Alden states generally that each of its two types of headlight system embodiments may employ the sensing elements discussed in connection with Figures 3 and 4. (Ex. 1005, ¶¶[0036-0038].)

82. Petitioner has also failed to support its contention that Alden renders these independent claim 32 features obvious for the same reasons as set forth in connection with independent claim 24. It is thus my understanding that Petitioner's contention that Alden renders such claim features obvious therefore fails.

3. Alden Fails to Teach the Independent Claim 40
Features of (i) “determine a second, different cluster of the LEDs illuminating at least a second portion of a second other vehicle based at least in part on data indicating a second position associated with the second other vehicle” and (ii) “wherein the first and second changes decrease intensity of first emission from the first cluster and second emission from the second cluster relative to a third emission, from the at least one headlamp, illuminating an area between the first and second portion”

83. Petitioner contends that Alden teaches the above-noted independent claim 40 features relating to illuminating a second portion of a second other vehicle based on data indicating a second position associated with the second other vehicle and changes that decrease intensity of first and second emissions from first and second clusters relative to a third emission illuminating an area between the first and second portions. However, Alden fails to provide an enabling disclosure of these claim features.

84. Petitioner relies on its annotations of Figure 5 of Alden to support its contention. Petitioner’s annotated version of Figure 5 is reproduced below.



(Petition at 49, 50, Annotated)

85. Once again, unlike the rest of the Petition, Petitioner does not annotate Figure 5 to highlight elements of Alden’s headlight system. (Petition at 10, 12, 13, 15-18, 21, 24-26.) Instead, with these annotations of Figure 5, Petitioner attempts to show how headlight 123 operates in a specific scenario. However, none of the operations purportedly shown by these annotations of Figure 5 are expressly disclosed in Alden. Petitioner’s annotations are therefore speculation.

86. In that regard, Alden does not clearly describe or specifically illustrate concurrent detection of first and second vehicles, as is required according to these claim features. Rather, those portions of Alden cited by Petitioner in connection with these claim feature states that the system can detect “the sector” ahead in which any vehicle is located, and that the system provides means for sensing

“vehicles.” (Ex. 1005, ¶[0025].) Neither of those statements specifically describes concurrent detection of multiple vehicles but rather are references to vehicles encountered in the distribution area serially over time by an equipped vehicle, as is illustrated in Figure 1 of Alden. (Ex. 1005, Fig. 1.)

87. Moreover, in its annotations, Petitioner has rendered the annotated pair of oncoming “sensed” vehicles using an inaccurate scale. Properly scaled given the size of the headlight 123, the pair of annotated “sensed” vehicles located at the distance shown in Petitioner’s annotated version of Figure 5 would span all the beam segments illuminating the distribution area. According to this embodiment of Alden’s headlight systems, this means that all the light emitting diode (LED) elements 119 would be dimmed to produce low beam illumination. As a result, Alden’s system would fail to decrease intensity of first emission from a first cluster and second emission from a second cluster relative to a third emission, from the at least one headlamp, illuminating an area between first and second portions associated with first and second other vehicles, as claimed. In addition, Petitioner’s reliance on Figure 1 of Alden concerning these claim features is also unavailing because Figure 1 clearly does not illustrate illuminating an area between vehicles. (Ex. 1005, Fig. 1.)

88. It is only by rendering the annotated “sensed” vehicles with an inaccurate scale relative to headlight 123 that Petitioner can assert that Alden

teaches these claim features. Petitioner has rendered the pair of annotated “sensed” vehicles in connection with its contentions here concerning independent claim 40 at a different scale than it previously used to render the annotated sensed vehicle in connection with its contentions concerning independent claim 24. For these reasons, Alden fails to provide an enabling disclosure of these claim features and thus, per my understanding, fails to anticipate the claimed invention.

89. Moreover, for the same reasons as set forth above in connection with independent claim 24, Alden is also ambiguous because it fails to disclose these independent claim 40 features clearly and unequivocally, and furthermore does not inherently disclose those features. Petitioner has also failed to support its contention that Alden renders these independent claim 40 features obvious for the same reasons as set forth above in connection with independent claim 24. Thus, Alden again fails to anticipate these independent claim 40 features and Petitioner’s contention that Alden renders such features obvious again fails.

IX. Conclusion

90. In my opinion, the prior art references discussed above taken alone or in any permissible combination do not disclose or suggest each and every element of the challenged claims.

91. I reserve the right to supplement my opinions to address any information obtained, or positions taken, based on any new information that comes

to light throughout this proceeding.

I declare under penalty of perjury that the foregoing is true and accurate to the best of my ability.

Executed on: 09/14/2023



Matthew A. Turk Ph.D.