

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. 10,894,503

IPR Case No.: IPR2023-01026

DECLARATION OF MATTHEW A. TURK, Ph.D.

TABLE OF CONTENTS

List of Exhibits.....	3
I. Qualifications and Professional Experience.....	5
II. Relevant Legal Standards	11
III. Overview of the ‘503 Patent.....	12
IV. The Challenged Claims	15
V. Qualifications of One of Ordinary Skill in the Art.....	15
VI. Proposed Claim Construction.....	15
VII. Overview of the Prior Art.....	16
A. Alden	16
VIII. Grounds for Challenge.....	22
A. Ground 1: Alden Fails to Anticipate the Challenged Claims	22
1. Alden Fails to Anticipate Independent Claim 1	23
2. Alden Fails to Anticipate Independent Claim 20	30
3. Alden Fails to Anticipate Independent Claim 26	33
B. Ground 1: Alden Fails to Render the Challenged Claims Obvious	36
IX. Conclusion	37

List of Exhibits

Exhibit No.	Description	Identifier
2001	Declaration of Matthew A. Turk, Ph.D.	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	Intentionally left blank	
2006	U.S. Published Patent Application US2003/0137849A1 to Alden, Prosecution History in the U.S. Patent and Trademark Office	Alden Prosecution History

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. 10,894,503 (“the ’503 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 and has been applied to a wide variety of applications including automotive lighting and controls such as those used in automotive adaptive forward lighting systems.

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, Caugmate, to commercialize computer vision and augmented reality technology for remote collaboration. Caugmate 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. I have published research on lighting and optics, including research focused on automobile-related imaging, including: “Car-Rec: A real-time car recognition system,” IEEE Workshop on Applications of Computer Vision (WACV 2011),

January 2011; “VITS – a vision system for autonomous land vehicle navigation,” IEEE Trans. On Pattern Analysis and Machine Intelligence, Vol. 10, No. 3, pp. 342-361, May, 1988; “Video road-following for the Autonomous Land Vehicle,” Proc. IEEE International Conference on Robotics and Automation, Raleigh, N. C., April, 1987; “Color road segmentation and video obstacle detection,” Advances in Intelligent Robotic Systems: Mobile Robots, SPIE, Cambridge, MA, 1986.

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 claims of the '503 Patent in light of the prior art.

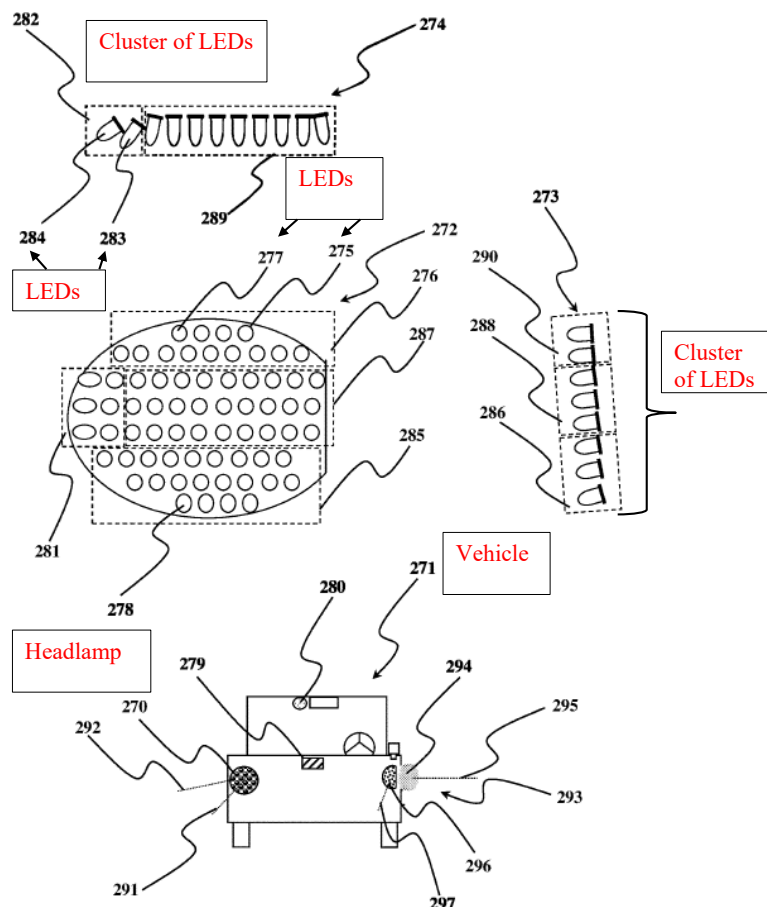
21. It is my understanding that a claimed invention is unpatentable under 35 USC § 102 if a prior art reference teaches every element of the claim. Further, it is my understanding that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention and the prior art 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 ‘503 Patent

23. The ’503 Patent is directed to “a novel multi-light source approach to the design and construction of solid-state lighting fixtures (vs. solid state lamps), which is termed a ‘Digital Lighting Fixture’, due to the control of individual lighting element ‘digits’ to provide the ‘correct’ lighting solution for the situation at hand.” (Ex.1001, 11:11-16.) The ’503 Patent further explains that “[t]he terminology ‘digital’ as used herein refers to the discrete nature of the multiple LED lamps provided in the luminaire, whereby, ‘digital’ control results from the individual control of the discrete, i.e., ‘digital’ lighting elements, the LEDs, in the luminaire.” (*Id.*, 2:67-3:5.)



(Ex. 1001, Fig. 15, Annotated)

24. “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.” (Ex.1001, 11:61-67, emphasis added.) The ’503 Patent describes using a digital light fixture (DLF) to provide multiple functions, for example “[i]n a DLF it is possible to combine a task light having a very narrow ‘spot’ beam at the correct aiming with a general area lighting ‘flood’ beam into one

fixture.” (*Id.*, 22:18-20.)

25. More specifically, the ‘503 Patent describes methods of using a multi-LED light source to segment a field of view and deliver varied, optimized illumination to the different segments within the field of view based on the presence of a detected object therein, “covering a wide scope of applications”, including transportation. (Ex.1001, 11:18-21, 4:20-24, 50:40-41.)

26. In the context of headlights,

[a]dditional features can include an optional very narrow flashlight type of beam. . . Such a beam at the correct narrow aiming can continue to illuminate far ahead (in high beam) without blinding oncoming traffic. Analysis by a detector or an imaging system of the oncoming vehicles position (using its headlights for example) can be used to determine which exact aiming is the maximum allowable for any given traffic situation and road layout.

(Ex.1001, 52:58-53:2.)

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

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

follow and illuminate distant overhead and roadside signs for a longer time, yet not blind oncoming traffic due to the narrow beam.

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

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

IV. The Challenged Claims

29. The Challenged Claims are claims 1-36. Claims 1, 20, and 26 are the only independent claims among the Challenged Claims. All other Challenged Claims depend directly or indirectly from one of those independent claims.

V. Qualifications of One of Ordinary Skill in the Art

30. I understand that the Patent Owner does not dispute Petitioner's proposed skill level for a person of ordinary skill in the art ("POSA"). (Petition at 8-9.)

VI. Proposed Claim Construction

31. To properly evaluate these claims, I understand that the terms of the claims must first be construed. In my opinion, the claims of the '503 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

32. 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].)

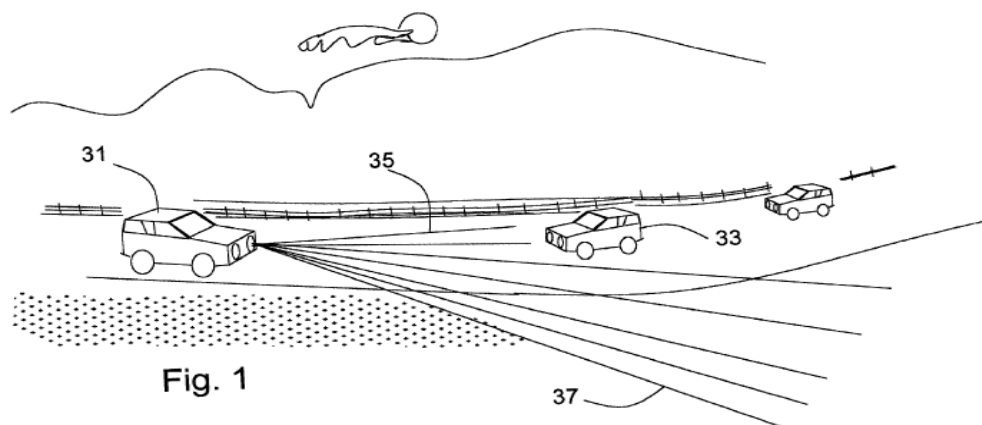


Fig. 1

(Ex. 1005, FIGURE 1)

33. 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 further include 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], Figure 3.)

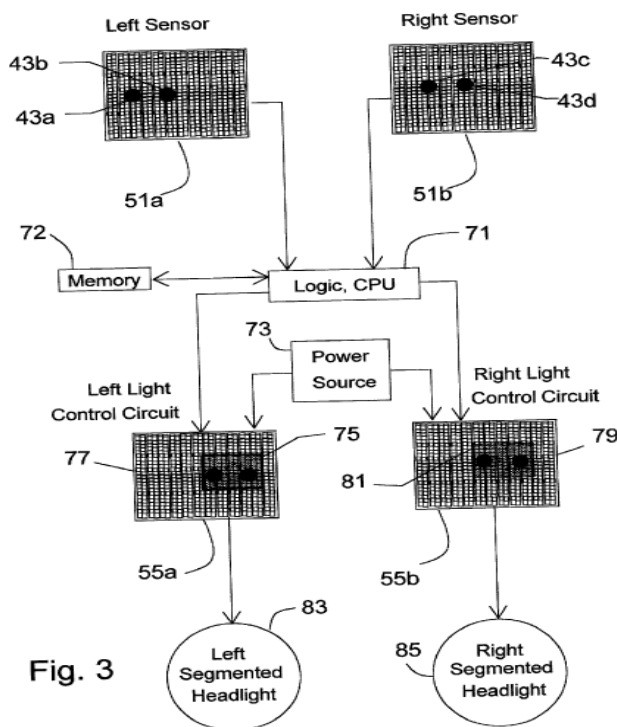
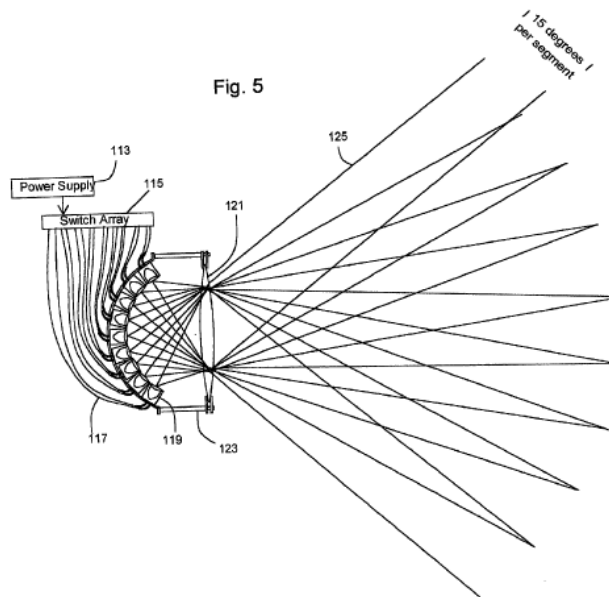


Fig. 3

(Ex. 1005, FIGURE 3)

34. In one of the two types of embodiments described, illustrated in Figures 1, 2, and 5-7, 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 one example of this type of embodiment, as shown in Figure 5, 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].) In another example of this type of embodiment, shown in Figures 6 and 7, electro-

optical dimming means are employed. (Id., ¶¶[0025, 0026, 0029].)



(Ex. 1005, FIGURE 5)

35. 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].)

36. In the other of the two types of embodiments described, illustrated in Figures 8-15, 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-optical refractive elements 127, and a concave lens 133 to produce multiple light beam segments. (Ex. 1005, ¶¶[0032-0040].)

Fig. 8

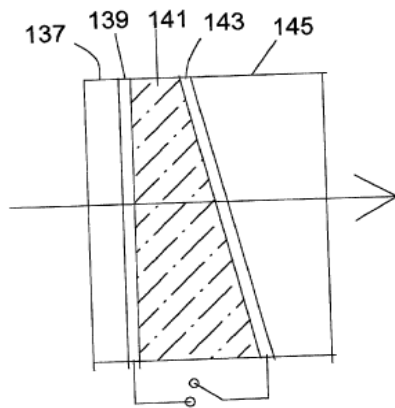
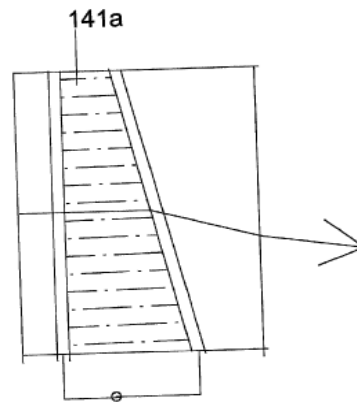
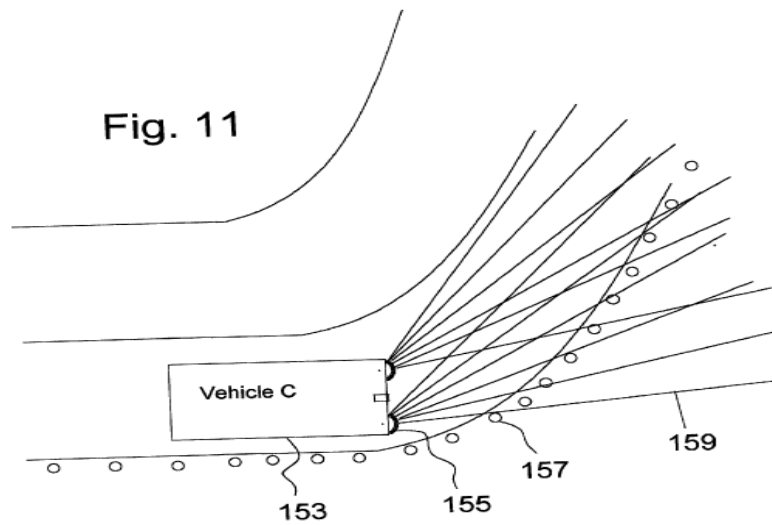


Fig. 9



(Ex. 1005, FIGURES 8, 9)

37. 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-optical 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)

38. 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 8-15 having electro-optical 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 Figure 5 produce non-collimated light. Non-collimated light cannot be directed in any meaningful fashion by the electro-optical refractive elements 127 of the headlight system embodiment described in connection with Figures 8-15. Rather, non-collimated light would blend and have different incident angles on those electro-optical 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].)

39. 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].)

40. 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.)

41. Intentionally left blank.

42. Intentionally left blank.

VIII. Grounds for Challenge

A. Ground 1: Alden Fails to Anticipate the Challenged Claims

43. To demonstrate anticipation, it is my understanding that Petitioner must show that Alden 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.

44. 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 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 Anticipate Independent Claim 1

45. I understand that Petitioner contends that Alden teaches the following independent claim 1 features of: (i) a plurality of light clusters, arranged in each of the one or more of the one or more headlamps, the headlamps capable of projecting light so as to illuminate a plurality of sub-sections of a field-of-view with different

illumination characteristics, the subsections determined in response to sensor data, wherein the light clusters operate to create a headlight beam; (ii) process . . . the sensor data to determine an illumination for at least two of the subsections, that reduces illumination to reduce glare in at least a first of the at least two subsections; and (iii) adapt the light emitted from one or more of the light-clusters so as to create the headlight beam that provides the determined illumination. (Petition at 13-16, 21-26.)

a. Alden is Ambiguous and Fails to Provide an Enabling Disclosure

46. However, Alden is ambiguous regarding these features of independent claim 1 because it fails to disclose them clearly and unequivocally. Alden also fails to provide an enabling disclosure of these claim features because it does not disclose them with sufficient precision and detail to establish their existence as prior art.

47. Petitioner's anticipation contention concerning independent claim 1 relies on the headlight system embodiment of Figure 5 of Alden that includes a headlight 123 having LED elements 119 arranged in a one-dimensional array. Significantly, however, while Alden describes in connection with Figure 4 progressing through the two-dimensional arrays of sensors 51a, 51b shown in Figure 3 to detect incoming light (Ex. 1005, ¶¶[0027-0028]), it does not clearly

describe or specifically demonstrate how those two-dimensional arrays of sensors are mapped to any of: (1) the one-dimensional array of LED elements 119 shown in Figure 5; (2) the switches 115 for that one-dimensional array of LED elements 119; or (3) the distribution area sectors ahead of the headlight 123.

48. It is noted that the headlight system embodiment discussed in connection with Figure 5 is the only embodiment of Alden that involves multiple lights, as required by independent claim 1. In contrast, the headlight system embodiment discussed in connection with Figures 6-15 of Alden involves a single point light source. (Ex. 1005, ¶¶[0029-0040].)

49. Similarly, while Alden depicts two-dimensional control circuit switch arrays in Figure 3 for dimming certain LED elements 119 of headlight 123 while leaving others on high intensity (Ex. 1005, ¶[0027]), it does not clearly describe or specifically demonstrate how operation of such two-dimensional switch arrays is mapped to the one-dimensional array of LED elements 119 of headlight 123 or the switches 115 for that one-dimensional array of LED elements 119 illustrated in Figure 5.

50. Alden does not describe either the array of LED elements 119 or the switches 115 as multi-dimensional. Indeed, 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. Alden also 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].)

51. Alden thus fails to teach how the one-dimensional array of LED elements 119 of headlight 123 depicted in Figure 5 illuminates the distribution area sectors shown therein based on light detected by the two-dimensional sensor arrays of sensors 51a, 51b depicted in Figure 3. Similarly, Alden also fails to teach how the one-dimensional array of LED elements 119 and the switches 115 of headlight 123 depicted in Figure 5 illuminate the distribution area sectors shown therein using the two-dimensional switch arrays depicted in Figure 3.

52. Alden therefore does disclose the independent claim 1 features noted above clearly and unequivocally. Alden also fails to disclose such claim features with sufficient precision and detail to establish their existence as prior art.

53. Alden also does not disclose clearly and unambiguously, nor describe with any precision or detail, 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 increasing distance from headlight 123. However, Alden's contradictory description and notation in Figure 5 indicate that each such beam

segment illuminates a 15° arc of the distribution area, which would continue to expand with increasing distance from headlight 123. (Ex. 1005, ¶[0029], Figure 5.) Thus, it is completely unclear how an oncoming vehicle at a properly scaled distance from headlight 123 (*i.e.*, well beyond the beam segment endpoints illustrated in Figure 5) 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].) Consequently, Alden is again ambiguous and fails to provide an enabling disclosure regarding the independent claim 1 features of a processor configured to process the sensor data to determine an illumination for at least two of the subsections, that reduces illumination to reduce glare in at least a first of the at least two subsections and adapt the light emitted from one or more of the light-clusters so as to create the headlight beam that provides the determined illumination, as claimed.

54. Alden is therefore ambiguous and fails to provide an enabling disclosure regarding at least the independent claim 1 features noted above. As a result, Alden fails to anticipate independent claim 1.

b. Petitioner's Combinations of Unrelated Alden Embodiments Result in An Inoperative Device and Are Unsupported by Alden

55. To the extent Petitioner's contentions of anticipation are based on picking, choosing, and/or combining various features of Alden's different headlight system embodiments not directly related to each other, those contentions fail because any resulting headlight would be inoperative.

56. Each of the two headlight system embodiments disclosed by Alden is discrete and includes features that are incompatible with the other embodiment. More specifically, the headlight system embodiment described in Alden in connection with Figure 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], Figure 5.) In contrast, the headlight system embodiment described in Alden in connection with Figures 8-15 is directed to a headlight having a single point light source 129, a collimating reflector 131, electro-optical 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.*, ¶¶[0032-0040].)

57. Alden's non-collimated light producing LED elements 119 and convex lens 121 are incompatible with Alden's electro-optical 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-optical refractive elements 127 of the headlight system embodiment described in connection with Figures 8-15 of Alden. Rather, non-collimated light would blend and have different incident angles on those electro-optical 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 fashion.

58. 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. Here, rather than suggesting combinations of various features of its two different headlight system embodiments, Alden does nothing more than state generally that each of those embodiments may employ the sensing elements discussed in connection with Figures 3 and 4. (Ex. 1005, ¶¶[0036-0038].) Petitioner's anticipation contentions again fail because they are unsupported by Alden and the resulting headlight system would be inoperative.

59. I understand that Petitioner also contends that Alden not only

anticipates these independent claim 1 features but also renders the claimed invention obvious. Yet the Petition fails to explain this contention at any level of detail. Instead, Petitioner's obviousness contention is based on conclusory statements, each consisting of a single sentence. (Petition at 11, 26, 32.) 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.

60. 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 fail.

2. Alden Fails to Anticipate Independent Claim 20

61. I understand that Petitioner contends that Alden teaches the following independent claim 20 features of: (i) process the sensor data to determine, within a field-of-view, at least a first subsection including a detected vehicle and at least a second subsection not including the detected vehicle; (ii) determine optimal use of the differently aimed directional light sources to maximize vehicle operator visibility in at least the second subsection, while minimizing a disturbing effect, resulting from the illumination output, on the vision of other traffic in at least the first subsection; and (iii) direct the control circuitry to adjust the directional light sources to achieve the determined optimal use. (Petition at 31-32.)

62. However, for the same reasons set forth previously in connection with independent claim 1, Alden fails to disclose these independent claim 20 features clearly and unequivocally. Alden also does not disclose these independent claim 20 features with sufficient precision and detail to establish their existence as prior art. Alden is therefore ambiguous and fails to provide an enabling disclosure regarding at least these independent claim 20 features.

63. Once again, Alden also does not disclose clearly and unambiguously, nor describe with any precision or detail, 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 increasing distance from headlight 123. However, Alden's contradictory description and notation in Figure 5 indicate that each such beam segment illuminates a 15° arc of the distribution area, which would continue to expand with increasing distance from headlight 123. (Ex. 1005, ¶¶0029], Figure 5.) Thus, it is completely unclear how an oncoming vehicle at a properly scaled distance from headlight 123 (*i.e.*, well beyond the beam segment endpoints illustrated in Figure 5) 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].) Consequently, Alden is again ambiguous and fails to provide an enabling disclosure regarding the independent claim 20 features of a processor configured to determine optimal use of the differently aimed directional light sources to maximize vehicle operator visibility in at least the second subsection, while minimizing a disturbing effect, resulting from the illumination output, on the vision of other traffic in at least the first subsection, as claimed. As a result, and for the same reasons set forth previously, Alden fails to anticipate independent claim 20.

64. Petitioner has also failed to support its contention that Alden renders these independent claim 20 features obvious for the same reasons as set forth above in connection with independent claim 1. Thus, Petitioner's contention that

these features of independent claim 20 are obvious based on Alden also fails.

3. Alden Fails to Anticipate Independent Claim 26

65. I understand that Petitioner contends that Alden teaches the following independent claim 26 features of: (i) determining illumination requirements for the field-of-view based on the data sensed by the sensors, including determining illumination for at least a first subsection of the field-of-view including the other vehicle or pedestrian, as indicated by the sensor data, and for at least a second subsection of the field-of-view not including the other vehicle or pedestrian; (ii) determining a control strategy for controlling one or more directional light clusters in a headlight assembly to create an output headlight beam meeting the determined illumination requirements, the headlight beam spatial light distribution shaped to provide high beam illumination for a driver of the vehicle, in at least the second subsection, while mitigating glaring light illuminating at least the first subsection including detected other vehicles or pedestrians; (iii) sending control signals implementing the control strategy to an electronic control circuitry configured to operate the light-clusters; and (iv) controlling the light clusters via the electronic control circuitry to collectively emit the headlight beam meeting the determined illumination requirements. (Petition at 33-36.)

66. However, for the same reasons set forth previously in connection with independent claim 1, Alden does not disclose these independent claim 26 features

clearly and unequivocally. Alden also does not disclose these independent claim 26 features with sufficient precision and detail to establish their existence as prior art. Alden is therefore ambiguous and fails to provide an enabling disclosure regarding at least the independent claim 26 features noted.

67. Once again, Alden also does not disclose clearly and unambiguously, nor describe with any precision or detail, 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 increasing distance from headlight 123. However, Alden's contradictory description and notation in Figure 5 indicate that each such beam segment illuminates a 15° arc of the distribution area, which would continue to expand with increasing distance from headlight 123. (Ex. 1005, ¶¶[0029], Figure 5.) Thus, it is completely unclear how an oncoming vehicle at a properly scaled distance from headlight 123 (*i.e.*, well beyond the beam segment endpoints illustrated in Figure 5) 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].) Consequently, Alden is again ambiguous and fails to provide an enabling

disclosure regarding the independent claim 20 features of determining a control strategy for controlling one or more directional light clusters in a headlight assembly to create an output headlight beam meeting the determined illumination requirements, the headlight beam spatial light distribution shaped to provide high beam illumination for a driver of the vehicle, in at least the second subsection, while mitigating glaring light illuminating at least the first subsection including detected other vehicles or pedestrians, as claimed. As a result, and for the same reasons set forth previously, Alden fails to anticipate independent claim 26.

68. Alden also does not teach shaping light emitted by either of its two types of headlight system embodiments. As previously demonstrated, the headlight system embodiment discussed in connection with Figures 5 of Alden merely dims selected LED elements 119, while the headlight system embodiment discussed in connection with Figures 8-15 merely changes the direction of light produced by the single point light source 129 and collimating reflector 131. In each embodiment, however, the overall shape of the light emitted by the headlight remains unchanged. Petitioner does not address this feature of independent claim 26. (Petition at 33-34 *citing* 13-16, 21-28, 31.) As a result, Alden fails to anticipate independent claim 26.

69. Petitioner has also failed to support its contention that Alden renders these independent claim 26 features obvious for the same reasons as set forth

above in connection with independent claim 1. Thus, Petitioner's contention that these features of independent claim 26 are obvious based on Alden also fails.

B. Ground 1: Alden Fails to Render the Challenged Claims Obvious

70. As previously noted, Petitioner contends that Alden not only anticipates independent claims 1, 20, and 26 but also renders each of those independent claims obvious. Yet the Petition fails to explain this contention at any level of detail. Instead, Petitioner's obviousness contention is based on conclusory statements, each consisting of a single sentence. (Petition at 11, 26, 32.) 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.

71. 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 fail.

IX. Conclusion

72. 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.

73. 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: October 20, 2023



Matthew A. Turk Ph.D.