

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

YECHEZKAL EVAN SPERO,
Patent Owner.

U.S. Patent No. 9,955,551 to Spero

Case No.: IPR2023-00336

DECLARATION OF MATTHEW A. TURK Ph.D.

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List of Exhibits

Exhibit No.	Description	Identifier
2001	Patent Owner Notice of Disclaimer	Notice
2002	Declaration of Matthew A. Turk, PhD	Turk Decl.
2003	Curriculum Vitae of Matthew A. Turk, PhD	Turk CV
2004	Best Practices and FAQs for Filing Requests for Reexamination Compliant with 37 CFR 1.510 and 1.915, PTAB, May 2010	Best Practices
2005	Intentionally left blank	
2006	Petition challenging U.S. Patent No. 9,955,551, Volkswagen Group of America, Inc. v. Yechezkal Evan Spero, IPR2023-00315, Paper 2, December 9, 2022	The '315 IPR Petition
2007	Petition challenging U.S. Patent No. 9,955,551, Volkswagen Group of America, Inc. v. Yechezkal Evan Spero, IPR2023-00318, Paper 2, December 22, 2022	The '318 IPR Petition

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

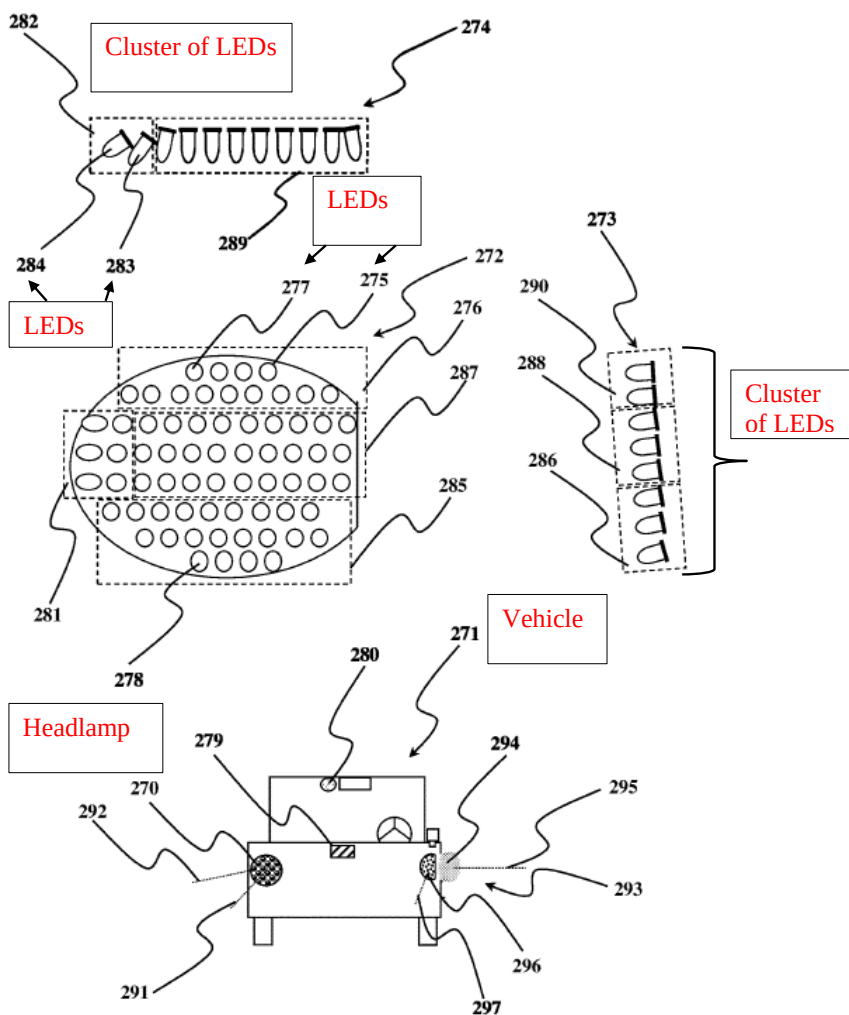
subject matter.

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

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.* at 2:65-3:3.)



(Ex. 1001, Fig. 15, Annotated)

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, emphasis added.) 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.” (Ex. 1001, 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.)

A. The Challenged Claims

28. The Challenged Claims include claims 7 and 8¹. Claim 7 depends from claim 6, and claim 8 is independent. Claims 6-8 are reproduced below, with emphasis added:

6. An illuminating device having automatic control of the light provided to an illuminated area comprising:
a structure for incorporating illuminating device elements;
one or more light sources incorporated in the structure and in communication with a power source;

¹ I understand that Patent Owner has disclaimed claims 1-4. (Ex. 2001.)

electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements;

one or more cameras placed on the structure for detecting coordinate-specific information about the illuminated area, said camera in communication with power and control device elements;

a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. The illumination device of claim 6, where one or more light sources are directional wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, where different sub-areas of the illuminated area need to be illuminated at a different intensity and/or at a different spectrum than another sub-area of the illuminated area, comprising:

a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions thereby illuminating different sub-areas of the illuminated

area, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction;

a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people;

a controller for adjusting a light intensity and a direction of each of the directional light sources;

a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processor, upon calculating the required illumination parameters according to best practice standards, directs the controller to adjust the directional light sources that illuminates the specific sub-areas to meet the illumination requirements of the visual activities.

(Ex. 1001, claims 6-8, emphasis added.)

B. 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 (“POSITA”) 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 POSITA for the invention claimed in the ‘551 Patent, would have had a Master of Science Degree (or a similar technical Master Degree, or higher degree) in an academic area emphasizing electrical engineering, computer engineering, or computer science with experience or education in optics and imaging systems or, alternatively, a Bachelor’s Degree (or higher degree) in an academic area emphasizing electrical, computer engineering or computer science and having two or more years of experience in the field of optical and imaging systems.

31. At the time of the filing of the ‘551 Patent, a skilled artisan developing a lighting system utilizing LEDs and corresponding controls would have encountered new challenges with respect to both optics and LED controls.

Accordingly, it is my opinion that a POSITA would have had experience with both, i.e., engineering and optics.

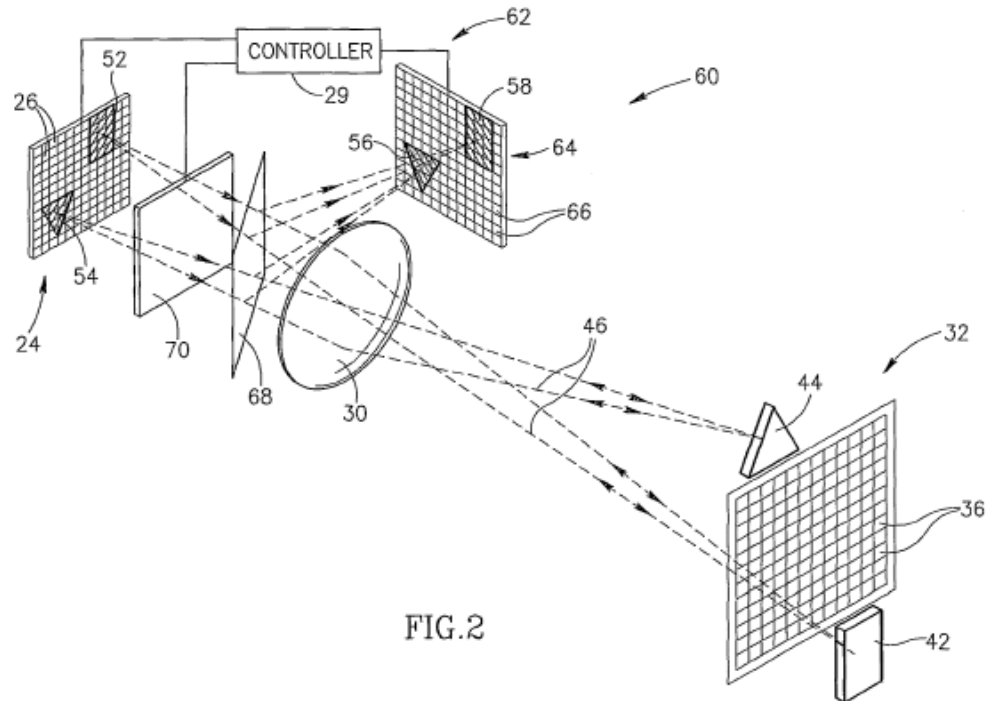
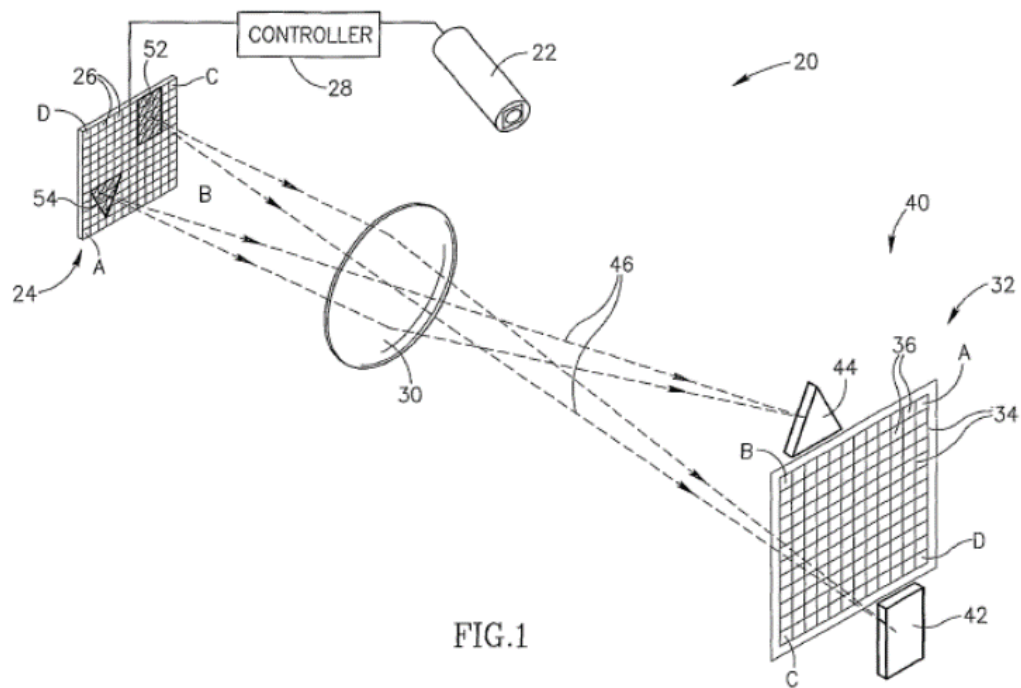
C. Proposed Claim Constructions

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.

IV. Overview of the Prior Art

A. Braun

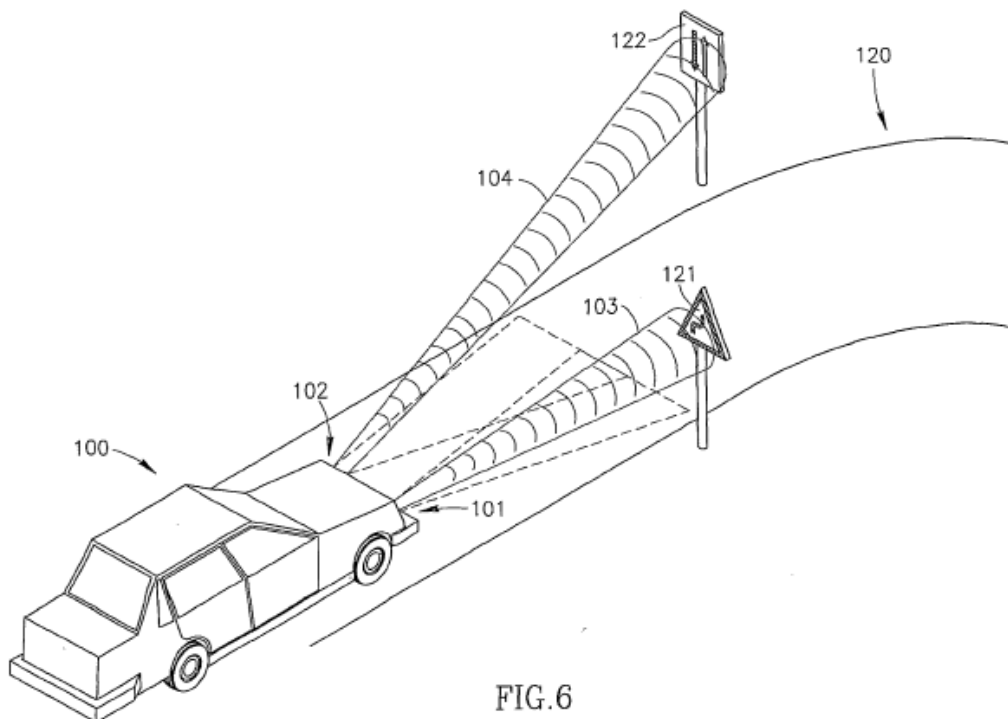
33. Braun discloses an illumination system 60 having an illuminator 24 with multiple light providing regions, referred to as “luxels” 26, arranged in a planar array. The luxels 26 are controlled by a controller 29 to illuminate different regions of an illumination plane 32 in a scene to be illuminated. The illumination plane 32 is divided into multiple mesh square regions 36, each of which corresponds to and is illuminated by one of the luxels 26 in a one-to-one correspondence. (Ex. 1005, 17:6-19:8, Figure 2 14:12-17:7, Figure 1.)



(Ex. 1005, FIGS. 1, 2)

34. Braun's illumination system 60 may also include a 3D range-camera 62 operating as a range finder. The range-camera 62 includes a photosurface 64 having multiple pixels 66. Using a beam splitter 68, a portion of light reflected from the illuminated scene is collected to capture multiple images of the scene on the photosurface 64 over time. Photosurface 64 may be boresighted with the illuminator 24 so that the image on the photosurface 64 is substantially coincident with the illuminator 24. In the embodiment shown in Figure 2, the pixels 66 of photosurface 64 have a one-to-one correspondence to the luxels 26 of the illuminator 24. (Ex. 1005, 7:8-24, 18:24-19:8, Figure 2.)

35. In operation, controller 29 uses images of the scene captured on photosurface 64 to identify objects present in the scene. For example, objects 42, 44 appearing in areas 58, 56 of the image on photosurface 64 (Figure 2) may be identified as roadside signs 121, 122 (Figure 6) present in the scene. (Ex. 1005, 22:17-23:7, 23:28-24:27, Figure 6.)



(Ex. 1005, FIG. 6)

36. Areas 58, 56 of the image on photosurface 64 correspond to areas 52, 54 in illuminator 24, and each of the areas 52, 54 includes multiple luxels 26 that are used to illuminate the roadside signs 121, 122. As vehicle 100 equipped with illumination system 60 moves along roadway 120, the positions of the roadside signs 121, 122 in the scene change over time. Consequently, the positions of the areas 58, 56 in the images captured on photosurface 64 change, as do the positions of the corresponding areas 52, 54 in illuminator 24 corresponding to those areas 58, 56 in the captured images. In response, the controller 29 changes the particular luxels 26 of illuminator 24 that are selected over time to illuminate roadside signs 121, 122 as their position in the scene changes. (Ex. 1005, 8:11-24, 12:3-10,

24:22-27.)

37. Braun thus utilizes the one-to-one correspondence between the planar array of luxels 26 in illuminator 24 and the mesh regions 36 of the illumination plane 32, images of which are captured by the pixels 66 of the photosurface 64, to determine and control the particular luxels 26 selected over time to illuminate an object, including an object (e.g., roadside sign 121) whose position in the scene relative to the illuminator 24 changes over time. Braun does not move either the illuminator 24 or the luxels 26 to illuminate such an object.

B. Dowling

38. Dowling discloses a lighting subsystem 130 equipped with a processor 140, and which may have additional components, such as a transmitter 136, receiver 138, or environmental sensor. The transmitter and receiver may be optical or radio frequency based, and the environmental sensor may take the form of a proximity sensor, motion sensor, light sensor, camera, or other electromagnetic sensor (e.g., photosensor), sound sensor, temperature sensor, vibration sensor, or another sensor. Multiple lighting subsystems 202, 212, 214, 216 may also be connected in a networked system 200. (Ex. 1027, 4:9-22, 5:19-6:12, 8:18-21, 10:15-22, 38:1-19, 40:14-19, Figures 1, 5, 6.)

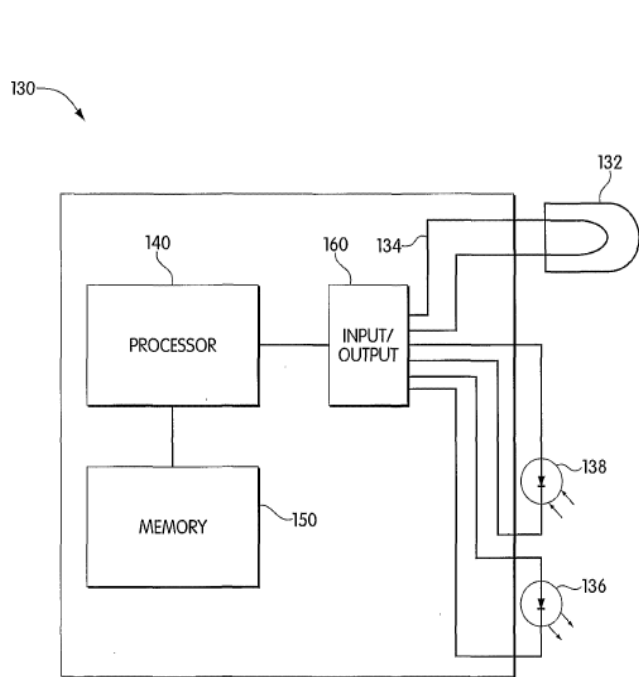


Fig. 5

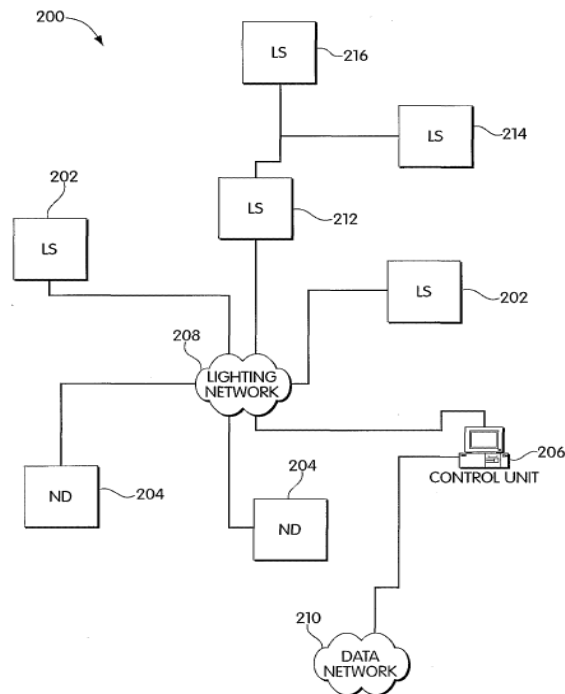


Fig. 6

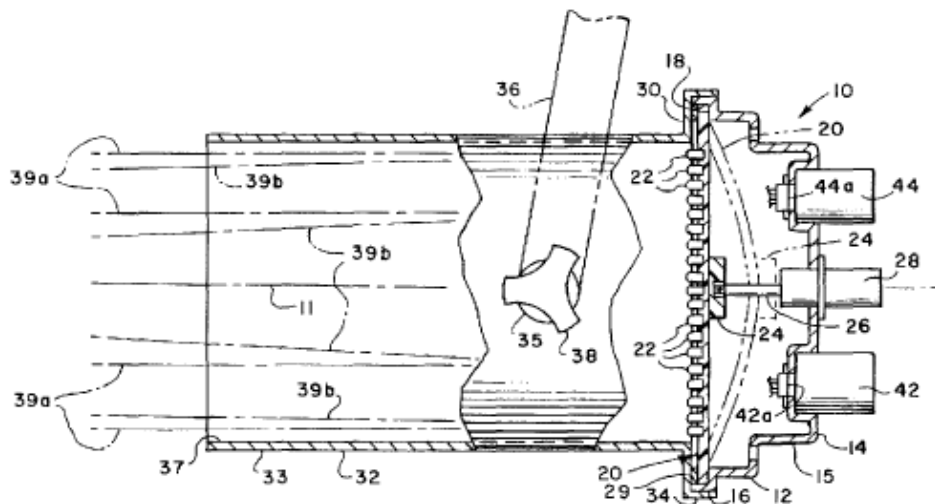
(Ex. 1027, FIGS. 5, 6)

39. Dowling states that the lighting system 200 and lighting subsystems 130, 202, 212, 214, 216 may be used for communication, building automation, and system monitoring. (Ex. 1027, Abstract, 4:9-22, 5:19-6:12, 8:18-21, 10:15-22, 20:3-15, 38:1-19, 40:14-19, 48:6-18, Figures 1, 5, 6, 10.) For example, Dowling discloses increasing illumination or activating a light in response to a proximity sensor sensing a person. (Ex. 1027, 9:4-6, 22:20-21.)

C. Bailey

40. Bailey discloses a stage light apparatus 10 having a housing 12 for a flexible base 20 that supports a grid-like array of light emitting diodes 22. The light apparatus 10 also includes a can-like shield 32 for projecting parallel light

beams from the LEDs 22. The shield 32 may include bosses 35 for mounting on a support structure 36. (Ex. 1035, Abstract, 2:60-63, 3:30-34, 3:38-41, Figure 2.)



(Ex. 1035, FIG. 2)

41. The flexible support base 20 may be selectively deflected to concentrate light beams generated by the LEDs 22 of the array on a target. Specifically, the flexible base 20 is connected to an actuator 28 which is controlled to deflect the base 20. The actuator 28 includes a rod 26 attached to a hub 24 of the flexible base 20. The rod 26 is moved by the actuator 28 to deflect the flexible base 20 to form a concave surface (shown in phantom in Figure 2). (Ex. 1035, Abstract, 1:64-2:10, 2:63-3:16, Figure 2.)

D. Begemann

42. Begemann discloses a luminaire 1 for illuminating an object. The luminaire 1 has one or more lighting modules 2 in a housing 10. Each lighting

module 2 has multiple lighting units 20, each of which comprises an LED chip 30.

(Ex. 1006, Abstract, Figure 2.)

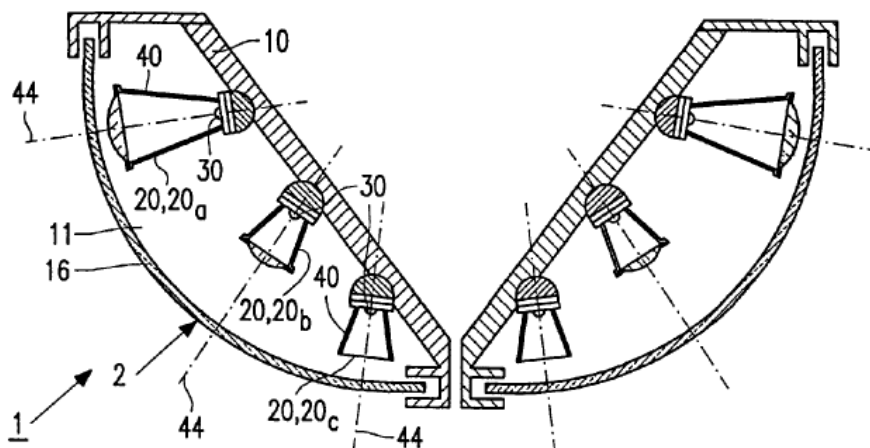


FIG. 2

(Ex. 1006, FIG. 2)

43. Each lighting unit 20 has a hemispherical mounting member 22 accommodated in a mating recess 12 in a heat sink 13. The mating recess 12 and mounting member 22 allow for adjusting a predetermined light beam direction during assembly of the luminaire 1 based on the conditions of its intended use, e.g., as a street lighting luminaire to illuminate different sections of a road or road area. Mounting member 22 is fixed in mating recess 12 by adhesive 14. (Ex. 1006, 4:7-13, 6:1-9, Figure 3.)

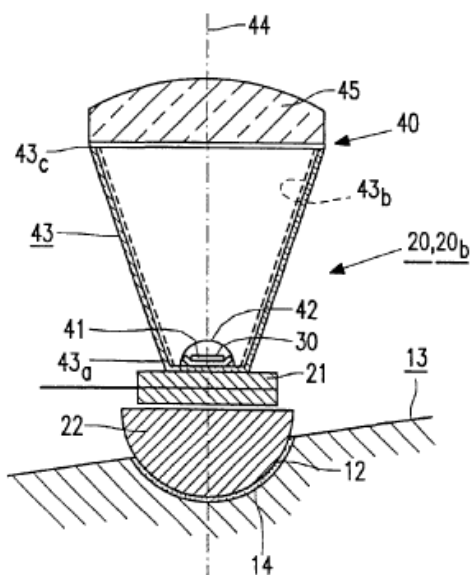


FIG. 3

(Ex. 1006, FIG. 3)

44. In one embodiment, an interior lighting system receives signals from a daylight sensor and a proximity sensor that detects the presence of person in a room to be illuminated. (Ex. 1006, 4:66-5:3.)

45. In another embodiment, a luminaire 401 includes a lighting module 402b with a first variety of lighting units 420p aimed in fixed predetermined directions to illuminate driving lanes d_p on a road. Luminaire 401 also includes lighting modules 402a, 402c with a second variety of lighting units 420q aimed in fixed predetermined directions to illuminate peripheral portions d_{q1} , d_{q2} that are provided with vegetation and have a different reflectivity than driving lanes d_p . The different varieties of lighting units 420p, 420q produce different wavelengths of light relative to each other, contributing to the visibility of objects present in peripheral portions d_{q1} , d_{q2} . (Ex. 1006, 8:5-35, Figure 11.)

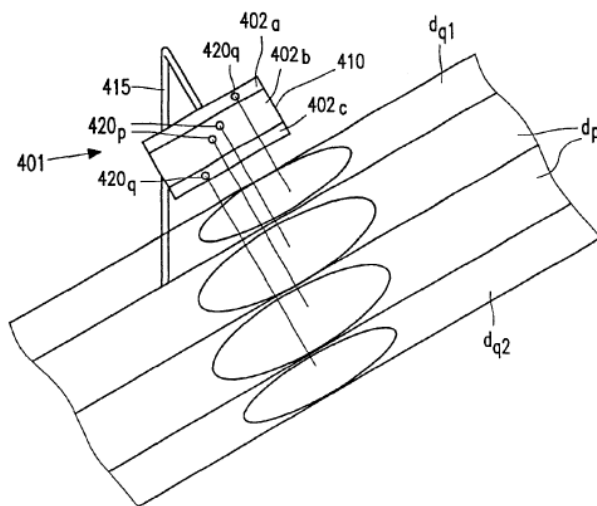


FIG. 11

(Ex. 1006, FIG. 11)

46. In another embodiment, a luminaire 501_a is one of a group of multiple identical luminaires for illuminating a road. Luminaire 501_a includes multiple lighting modules 502_{bI}, 502_{bII}, 502_{cI}, 502_{cII}, 502_{fI}, 502_{fII}, each having 24 lighting units. Lighting modules 502_{bI}, 502_{bII} are aimed in fixed predetermined directions to illuminate road sections b_I and b_{II}, respectively. Lighting modules 502_{cI}, 502_{cII} are aimed in fixed predetermined directions to illuminate road sections c_I and c_{II}, respectively. Lighting modules 502_{fI}, 502_{fII} are aimed in fixed predetermined directions to illuminate road sections f_I and f_{II}, respectively. A control system 550 activated by a central signal 553 receives signals 551, 552 from weather condition sensors. Depending on the absence or presence of a sensor signal indicating a particular weather condition (i.e., rain, snow, fog), control system 550 controls

lighting modules 502_{bI}, 502_{bII}, 502_{cI}, 502_{cII}, 502_{fI}, 502_{fII} according to pre-defined settings to improve visibility. (Ex. 1006, 8:38-9:21, Figure 12.)

47. Begemann discloses that energy savings are produced by using only one of the lighting modules 502_{bI}, 502_{bII}, 502_{cI}, 502_{cII}, 502_{fI}, 502_{fII} in response to low traffic density. A control mode of the control system 550 also realizes energy savings “where modules are switched on temporarily when they are about to be passed by a vehicle.” (Ex. 1006, 9:21-29.)

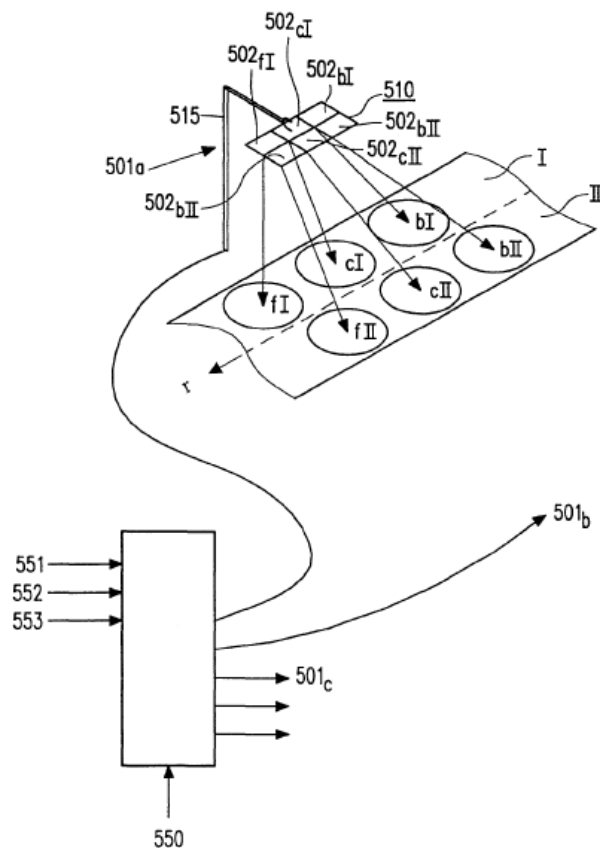


FIG. 12

(Ex. 1006, FIG. 12)

E. Lee

48. Lee discloses a system for automatic control of devices in a local environment (e.g., a home). Regions R1, R2 (e.g., rooms) of the local environment each have a local camera C1, C2, light L1, L2, and heater H1, H2, each of which is connected to a control unit 20. (Ex. 1026, Abstract, 4:48-5:24, Figure 2.)

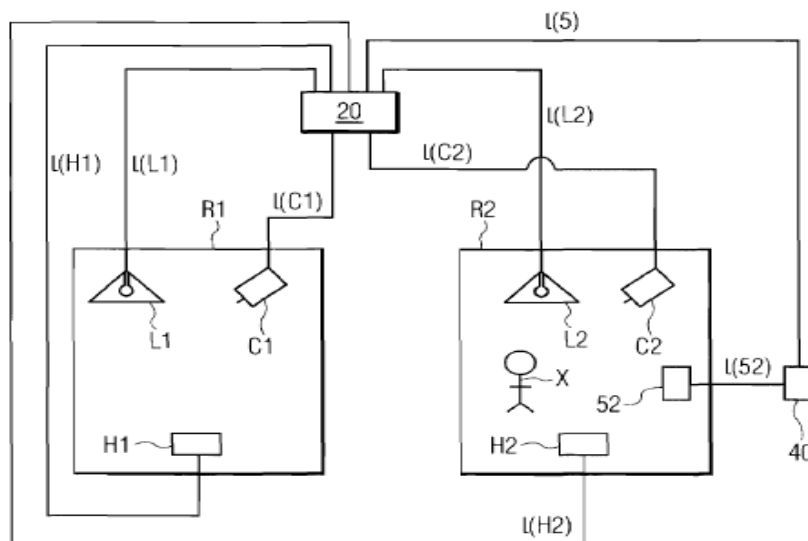


FIG. 2

(Ex. 1026, FIG. 2)

49. The cameras C1, C2 capture images of any person present in regions R1, R2, such as person X present in region R2, which images are provided to the control unit 20. Using image processing, the control unit 20 may determine the identity of person X. The control unit 20 may also store personal preferences of person X for lighting and heating conditions. Upon determination of the identity of person X, the control unit 20 may control the light L2 and the heater H2 according

to stored preferences of person X. (Ex. 1026, Abstract, 2:47-3:12, 3:53-4:11, 5:56-6:30, 6:38-49, 7:28-37, 8:7-9, 8:25-32, 8:40-47, 9:13-24, 10:23-28, Figure 2.)

F. Pederson

50. Pederson discloses an LED warning signal light 10. In one embodiment, the light 10 includes a support panel 12 for multiple LED light sources 30. (Ex. 1011, ¶¶[0144-0146], Figure 3.)

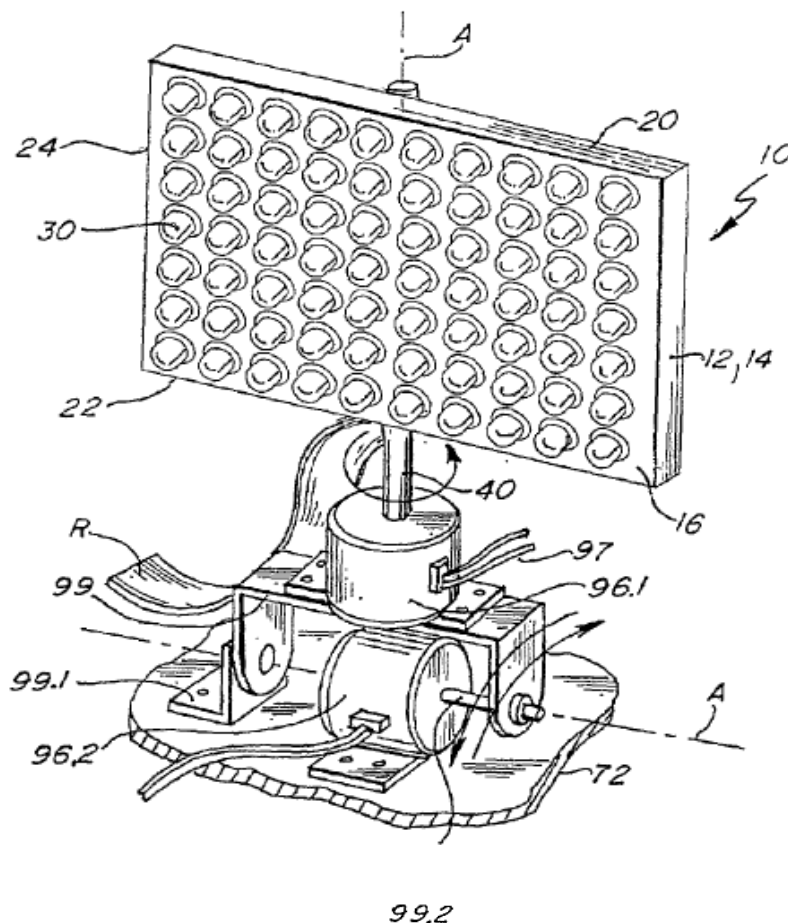


Fig. 3.

(Ex. 1011, FIG. 3)

51. In this embodiment, Pederson's light 10 also includes a gyrotor 90 having motors 96.1, 96.2. To create a warning signal, motor 96.1 rotates the panel

12 around a vertical axis and/or motor 96.2 rotates the panel 12 about a horizontal axis while LEDs 30 are activated. (Ex. 1011, ¶¶[0183-0185], Figure 3.)

V. Grounds for Challenge

A. Petitioner's Combination of Braun and Dowling Does Not Teach All of the Features of Claim 7

52. It is my understanding that Petitioner must show where each claim limitation is found in the applied references. Failure to do so defeats a claim of obviousness. To establish obviousness, all of the claimed features must be taught or suggested by the applied references.

1. Ground 2: The Combination of Braun and Dowling Does Not Teach the Claim 7 Features of “one or more detectors . . . configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare”

53. Petitioner relies on Braun for satisfying the claim 7 features of “one or more detectors . . . configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.” (Ex. 1001, Claim 7, emphasis added; Petition at 43.)

54. Braun states the following:

According to an aspect of some embodiments of the present invention, the pattern recognition application identifies oncoming

vehicles and automatically adjusts illumination provided by the luxels to prevent glare from light provided by the luxels from blinding a driver of the oncoming vehicle.

In some embodiments of the present invention, the automotive light is a headlight. Optionally, the controller process images provided by the photosurface to identify oncoming vehicles and when an oncoming vehicle is identified, the controller controls the light providing regions to prevent blinding the driver of the oncoming vehicle.

(Ex. 1005, 6:4-7, 12:17-20.)

55. Based on these statements, Petitioner argues that it would have been obvious to a person of ordinary skill in the art (“POSITA”) that Braun’s 3D range-camera 62 senses or derives the presence of glare on a person’s eyes by measuring the amount of light reflected by objects in the scene (e.g., a driver’s head), and that Braun’s controller 29 adjusts the intensity of the luxels 26 of illuminator 24 to reduce that glare. (Petition at 43-44.)

56. Petitioner’s argument is not taught by Braun. Except for the above-noted statements, Braun is silent about glare reduction for other vehicles or drivers of other vehicles. There is no teaching in Braun of (i) detecting a person’s head or eyes; (ii) how to sense or derive the presence of glare on a person’s eyes based on reflected light and/or whether reflected light is indicative of glare; (iii) the claimed

detectors; or (iv) how to adjust light source intensity to reduce glare. The remaining sections of Braun cited by Petitioner on this point simply describe detection of objects, distances, or visibility using reflected light. (Ex. 1005, 3:15-21, 11:18-25, 17:12-23, 18:9-23.)

57. Braun therefore does not teach “one or more detectors . . . configured to sense a presence of glare on a person’s eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare,” as claimed.

B. A Person of Ordinary Skill in the Art Would Not Have Been Motivated to Combine (i) Braun, Dowling, and Bailey, or (ii) Begemann, Lee, and Pederson

58. It is my understanding that must be some articulated reasoning with some rational underpinning to support a legal conclusion of obviousness.

1. Petitioner’s Rationale for Combining the Applied References Renders the Primary Reference Inoperable or Unsatisfactory for Its Intended Purpose or Changes its Principle of Operation

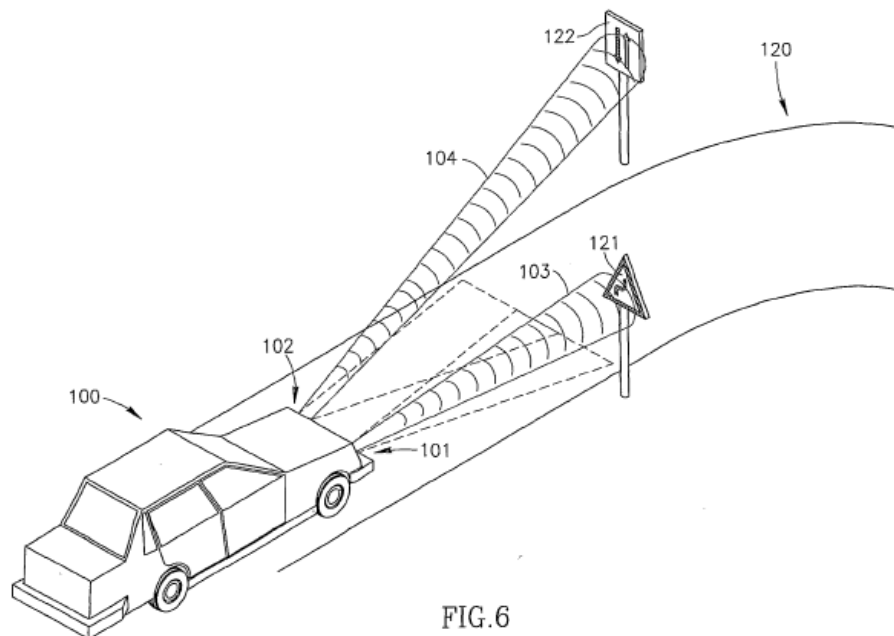
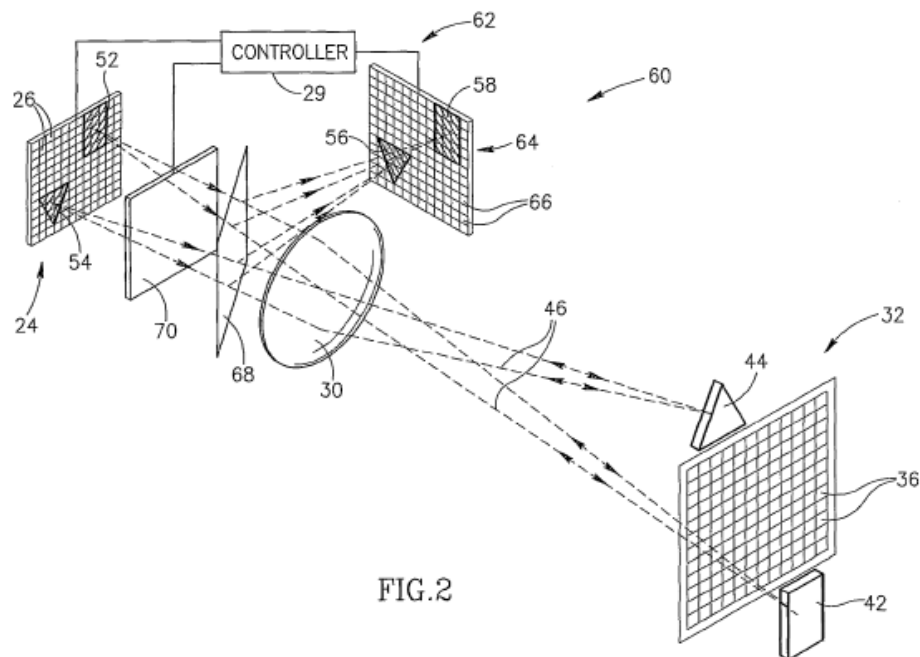
59. It is also my understanding that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. It is further my understanding that if a proposed modification or combination 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.

**a. Ground 3: Petitioner’s Combination
Renders Braun Inoperable or Unsatisfactory
for Its Intended Purpose, or Changes its
Principle of Operation**

60. Claim 8 requires “a light fixture . . . having movable structure for aiming the directional light sources mounted thereon in a defined direction.” (Ex. 1001, Claim 8, emphasis added.) Petitioner relies on Bailey for satisfying these claim features for Ground 3. Petitioner proposes modifying Braun to include Bailey’s flexible support base 20 for LEDs 22 and Bailey’s actuator 28 for moving that flexible support base 20. (Petition at 46-48.)

61. Braun discloses an illumination system 60 having an illuminator 24 with multiple luxels 26 arranged in a planar array. The luxels 26 are controlled by a controller 29 to illuminate different regions of an illumination plane 32 in a scene. The illumination plane 32 is divided into multiple mesh square regions 36, each of which corresponds to and is illuminated by one of the luxels 26 in a one-to-one correspondence. (Ex. 1005, 14:12-17:7, 17:6-19:8, Figures 1, 2.)



(Ex. 1005, FIGS. 2, 6)

62. A 3D range-camera 62 in Braun's system 60 includes a photosurface 64 having multiple pixels 66. Using a beam splitter 68, a portion of light reflected from the illuminated scene is collected to capture multiple images of the scene on

the photosurface 64 over time. Photosurface 64 is boresighted with the illuminator 24 so that the image on the photosurface 64 is substantially coincident with the illuminator 24. (Ex. 1005, 7:8-24, 18:24-19:8, Figure 2.)

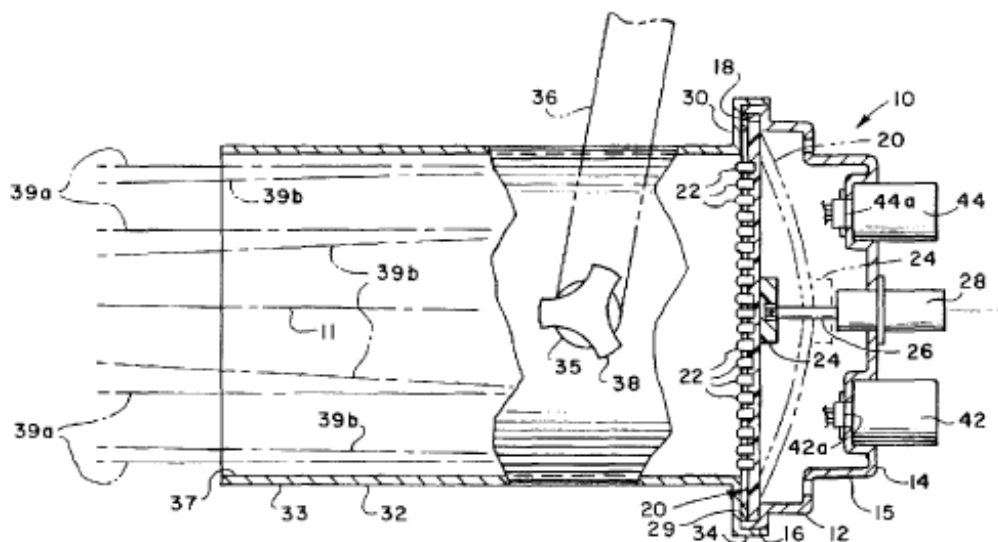
63. In operation, controller 29 uses images of the scene captured on photosurface 64 to identify objects present in the scene. For example, objects 44, 42 appearing in areas 56, 58 of the image on photosurface 64 (Figure 2) may be identified as roadside signs 121, 122 (Figure 6) present in the scene. (Ex. 1005, 22:17-23:7, 23:28-24:27, Figures 2, 6.)

64. Areas 58, 56 of the image on photosurface 64 correspond to areas 52, 54 in illuminator 24, and each of the areas 52, 54 includes multiple luxels 26 that are used to illuminate the roadside signs 121, 122. As vehicle 100 equipped with illumination system 60 moves along roadway 120, the positions of the roadside signs 121, 122 in the scene change over time. Consequently, the positions of the areas 56, 58 in the images captured on photosurface 64 change, as do the positions of the areas 54, 52 in illuminator 24 corresponding to those areas 56, 58 in the captured images. In response, the controller 29 changes the particular luxels 26 of illuminator 24 that are selected over time to illuminate roadside signs 121, 122 as their position in the scene changes. (Ex. 1005, 8:11-24, 12:3-10, 24:22-27.)

65. Braun's controller 29 thus utilizes the one-to-one correspondence between the planar array of luxels 26 in illuminator 24 and the mesh regions 36 of

the illumination plane 32, images of which are captured by the pixels 66 of the photosurface 64 coincident with the illuminator 24, to determine and control the particular luxels 26 selected over time to illuminate an object, including an object (e.g., roadside sign 121) whose position in the scene relative to the illuminator 24 changes over time. Braun therefore has no need to move either the illuminator 24 or the luxels 26 to illuminate such an object and does not do so.

66. Petitioner's proposed modification of Braun to mount at least a portion of Braun's planar array of luxels 26 of illuminator 24 on Bailey's flexible support base 20 and deflect that flexible support base 20 using Bailey's actuator 28 would render Braun's illumination system 60 inoperable or unsatisfactory for its intended purpose or would change its principle of operation. (Ex. 1035, Abstract, 1:64-2:10, 2:63-3:16, Figure 2.)



(Ex. 1035, FIG. 2)

67. Braun's system 60 illuminates objects in a scene using the one-to-one correspondence between the planar array of luxels 26 and the mesh regions 36 of illumination plane 32 in the scene, as well as the coincident relationship between the illuminator 24 and the photosurface 64. Deflecting Braun's planar array of luxels 26, or any portion thereof, into a concave shape as taught by Bailey using its flexible support base 20 and actuator 28 would destroy that correspondence and coincidence, thereby rendering Braun's system inoperable or unsatisfactory for its intended purpose. Any such deflection of Braun's planar array of luxels 26 into a concave shape may also result in certain mesh regions 36 of the illumination plane 32 in the scene (and hence certain characteristics or features of that scene) that are left un-illuminated or un-illuminable, once again rendering Braun's system inoperable or unsatisfactory for its intended purpose.

68. Petitioner does not address these engineering issues. Petitioner offers no explanation as to how a POSITA, after the proposed modification, would maintain the correspondence between the luxels 26 of a concave-shaped illuminator 24 and the mesh regions 36 of the illumination plane 32, or the coincidence between the illuminator 24 and the photosurface 64, required for operation of Braun's illumination system 60. This includes those statements made in the Declaration offered by Petitioner in support of the Petition concerning the combination of Braun and Bailey which purport to relate to improving the teaching

of Bailey using three additional references that are not part of the applied combinations relied upon by Petitioner. (Ex. 1003, ¶¶0180-1082.)

69. For example, after deflection of Braun's illuminator 24 into a concave shape, Braun's controller 29 would be unable to determine which luxels 26 of the illuminator 24 should be activated to intentionally illuminate an object in the scene without equating the concave surface of the illuminator 24 to the flat surface of the illumination plane 32. Even if a POSITA could somehow equate the concave-shaped illuminator 24 to the illumination plane 32, Petitioner's proposed modification of Braun would change its principle of operation.

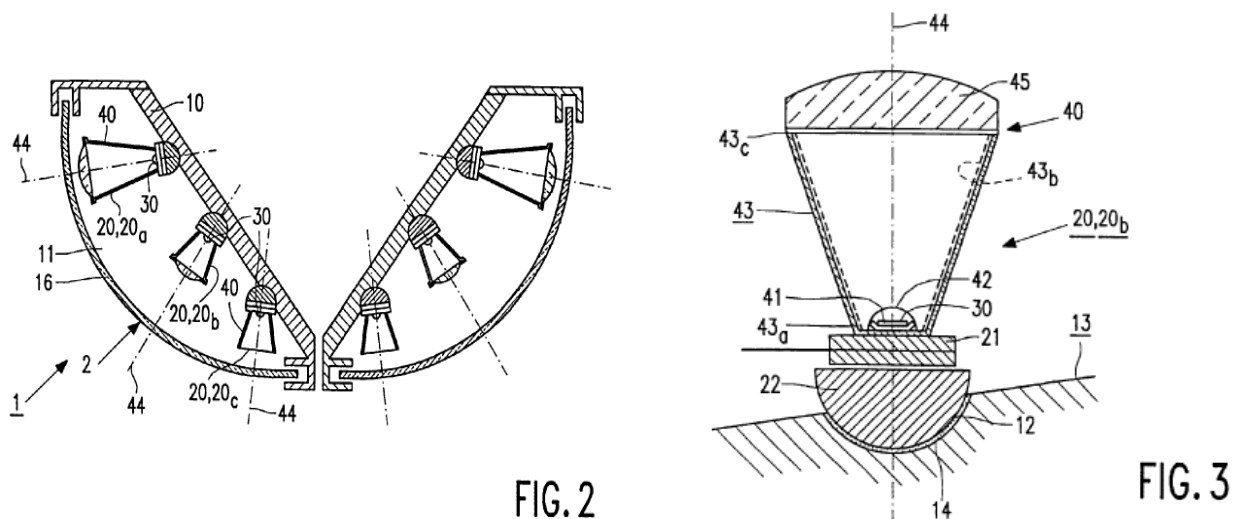
70. Therefore, there is no suggestion or motivation to make Petitioner's proposed modification of Braun to include Bailey's flexible support base 20 for LEDs 22 and Bailey's actuator 28 for moving that flexible support base 20.

**b. Ground 5: Petitioner's Combination
Changes the Principle of Operation of
Begemann and Renders It Unsatisfactory for
Its Intended Purpose**

71. Claim 8 requires "a light fixture . . . having movable structure for aiming the directional light sources mounted thereon in a defined direction." (Ex. 1001, Claim 8, emphasis added.) Petitioner relies on Pederson for satisfying these claim features for Ground 5. Petitioner proposes modifying Begemann to add Pederson's gyrator 90 to each of Begemann's lighting units 20 to make those

lighting units 20 moveable. (Petition at 76-78.)

72. Begemann discloses a luminaire 1 having one or more lighting modules 2, each having multiple lighting units 20, where each lighting unit 20 comprising an LED chip 30. During assembly of the luminaire 1, each lighting units 20 has a mounting member 22 that is fixed by an adhesive 14 in a mating recess of a heat sink 13 after the lighting unit 20 has been aimed in a predetermined direction based on the conditions of the intended use of the luminaire 1, e.g., as a street lighting luminaire to illuminate different sections of a road or road area. (Ex. 1006, Abstract, 4:7-13, 6:1-9, Figures 2, 3.)



(Ex. 1006, FIGS. 2, 3)

73. Begemann thus illuminates a specific section of a road or road area using a lighting unit 20 that is aimed in a fixed predetermined direction to associate the lighting unit 20 with that specific section. (Ex. 1006, 8:5-9:21, Figures 11, 12.)

Begemann therefore has no need to move the luminaire 1, lighting modules 2, or lighting units 20 to aim any of them in a defined direction to illuminate such sections, and does not do so.

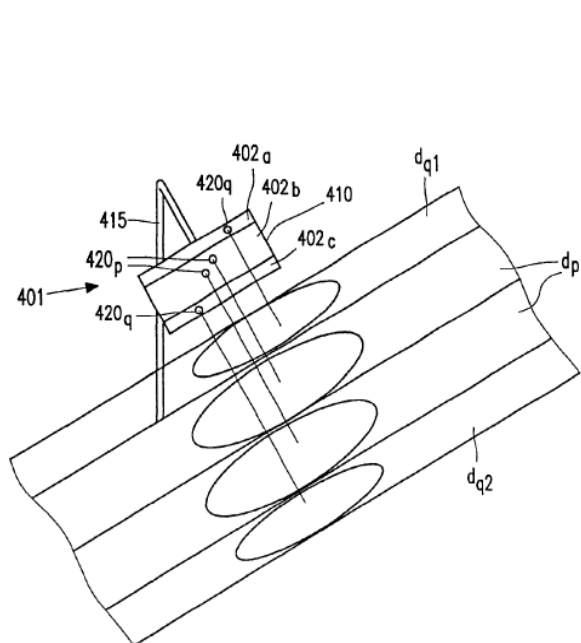


FIG. 11

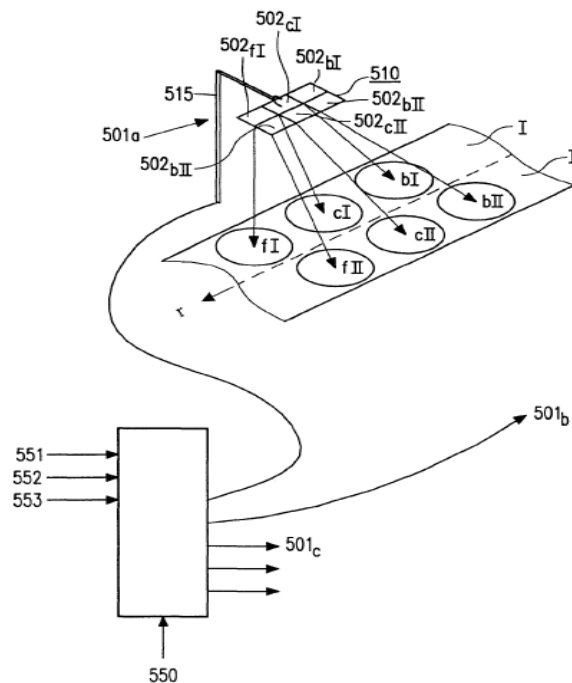


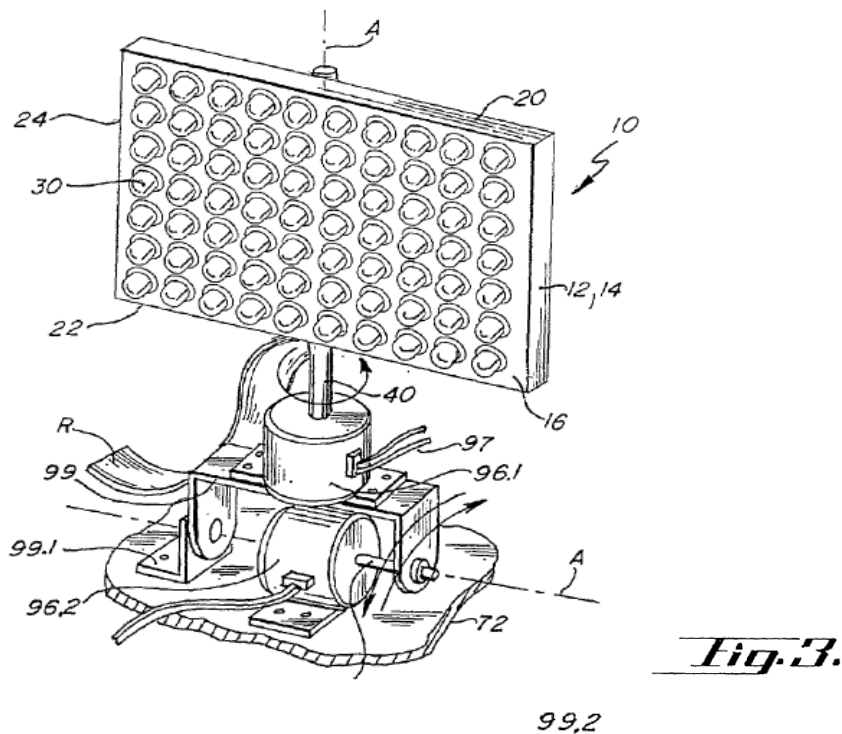
FIG. 12

(Ex. 1006, FIGS. 11, 12)

74. Petitioner's proposed modification of Begemann to add a gyrator 90 as taught by Pederson to each of Begemann's lighting units 20 to make those lighting units 20 moveable would therefore change the principle of operation of Begemann's luminaire 1 and render it unsatisfactory for its intended purpose. Making each of Begemann's lighting units 20 moveable using a gyrator 90 as taught by Pederson would alter the association between the lighting units 20 and the sections of the road or road area, thus changing Begemann's principle of

operation. Such a modification may also result in road or road area sections that are inadequately illuminated, thus rendering Begemann's luminaire 1 unsatisfactory for its intended purpose.

75. Petitioner's proposed modification also ignores the claim 8 requirement that the moveable structure is for aiming the directional light sources mounted thereon in a defined direction. (Ex. 1001, Claim 8.) There is no teaching in Pederson that its gyrator 90 aims LEDs 30 in any direction at all, let alone a defined direction. Rather, Pederson's gyrator 90 uses motors 96.1, 96.2 to rotate and oscillate activated LEDs 30 on support panel 12 to create a warning signal. (Ex. 1011, ¶¶[0183-0185], Figure 3.)



(Ex. 1011, FIG. 3)

76. Petitioner does not address these engineering issues, offering no explanation as to how a POSITA would aim each of the lighting units 20 of Begemann's luminaire 1 in a defined direction using gyrators 90 as taught by Pederson. Again, Pederson provides no such teaching of selective aiming, and Begemann discloses that the lighting units 20 are aimed in fixed predetermined directions, for a specific reason, during assembly of luminaire 1. (Ex. 1006, Abstract, 4:7-13, 6:1-9, Figures 2, 3.)

77. Therefore, there is no suggestion or motivation to make Petitioner's proposed modification Begemann to add Pederson's gyrator 90 to each of Begemann's lighting units 20 to make those lighting units 20 moveable.

2. Petitioner Does Not Explain How or Why a POSITA Would Have Combined the Applied References

78. It is my understanding that for a proposed combination of applied references, Petitioner must explain how and why a POSITA would have modified or combined the prior art. It is also my understanding that it is impermissible to use the disclosure of a patent in hindsight to supply teachings or motivations missing from the prior art.

a. Ground 3: Petitioner Does Not Explain Why or How a POSITA Would Have Combined Braun's Illumination System with Bailey's Flexible Support Base and Actuator

79. Petitioner relies on Bailey's flexible support base 20 for LEDs 22 and

Bailey's actuator 28 for moving that flexible support base 20 to satisfy the claim 8 features of a "light fixture . . . having movable structure for aiming the directional light sources mounted thereon in a defined direction" for Ground 3. (Ex. 1001, Claim 8, emphasis added; Petition at 44-49.) However, Petitioner fails to explain why a POSITA would have combined Bailey's flexible support base 20 and actuator 28 with Braun's illuminator 24 and luxels 26, or how such a combination would work.

80. Petitioner states that Braun does not explicitly describe how to mechanically adjust the light direction of luxels 26 to "match changes in the position" of objects in a scene, and that a POSITA would therefore have been motivated to look to Bailey for such details. (Ex. 1005, 10:8-17; Petition at 44; Ex. 1006, ¶166.) Petitioner's stated motivation to combine Braun and Bailey is that Bailey's mechanical adjustment of the light emissions direction might be needed, for example to selectively focus (i.e., change the direction of) the light beams. (Petition at 45.) (See, e.g., Ex.1035, 2:4-10 ("[A]n actuator . . . may be controlled to deflect the base to change the directional characteristics of light beams being projected by each LED so that the resultant or collective light beam generated . . . may be focused or concentrated on a target distant from the apparatus."))

81. Thus, Petitioner acknowledges that Braun does not teach mechanical adjustment of luxels 26 to "match changes in the position" of objects in a scene.

(Ex. 1005, 10:8-1; Petition at 44; Ex. 1003, ¶166.) As previously demonstrated, Braun's controller 29 utilizes the one-to-one correspondence between the planar array of luxels 26 in illuminator 24 and the mesh regions 36 of the illumination plane 32, images of which are captured by the pixels 66 of the photosurface 64 coincident with the illuminator 24, to determine and control the particular luxels 26 selected over time to illuminate an object, including an object (e.g., roadside sign 121) whose position in the scene relative to the illuminator 24 changes over time. (Ex. 1005, 8:11-24, 12:3-10, 24:22-27.) Braun therefore has no need to move either the illuminator 24 or the luxels 26 to illuminate such an object and does not do so. (See ¶¶60-70, *supra*.)

82. Petitioner's proposal to mount at least a portion of Braun's luxels 26 on Bailey's flexible support base 20 and move that flexible support base 20 using Bailey's actuator 28 to change the direction of light emitted by Braun's luxels 26 is therefore completely unnecessary, in addition to being significantly problematic.

83. Petitioner similarly acknowledges that Dowling also does not explicitly describe how to mechanically adjust light direction to track a moving object and contends that a POSITA would therefore have been motivated to look to Bailey for such details. (Petition at 44.) Like Braun, Dowling also does not teach mechanical adjustment of light direction. Instead, Dowling describes a hand-off technique to activate adjacent lighting or other elements associated with the

changing location of a moving object. (Ex. 1027, 17:6-18:2, 21:10-16, 25:8-26:4.)
Petitioner's proposal to combine Braun and Bailey as suggested therefore remains completely unnecessary.

84. Petitioner offers no articulated reasoning with a rationale underpinning as to why a POSITA would have combined Braun and Bailey as suggested. Petitioner's rationale to combine therefore fails because it is an attempt to piece together teachings of Braun and Bailey to satisfy the limitations of the claim based impermissible hindsight reconstruction using Patent Owner's disclosure.

85. Moreover, as also previously demonstrated, Braun's system 60 illuminates objects in a scene using the one-to-one correspondence between the planar array of luxels 26 and the mesh regions 36 of illumination plane 32 in the scene, as well as the coincident relationship between the illuminator 24 and the photosurface 64. Deflecting Braun's planar array of luxels 26, or any portion thereof, into a concave shape as taught by Bailey using its flexible support base 20 and actuator 28 would destroy that correspondence and coincidence. (See ¶¶60-70, *supra*.)

86. Again, Petitioner does not address these engineering issues. Petitioner offers no explanation as to how a POSITA, after the proposed modification, would maintain the correspondence between the luxels 26 of a concave-shaped

illuminator 24 and the mesh regions 36 of the illumination plane 32, or the coincidence between the illuminator 24 and the photosurface 64, required for operation of Braun's system 60. Petitioner thus offers no articulated reasoning with a rationale underpinning as to how a POSITA would have combined Braun and Bailey as suggested. The obviousness ground is therefore improper.

b. Ground 5: Petitioner Does Not Explain Why or How a POSITA Would Have Combined Begemann's Luminaire with Pederson's Gyrator

87. Petitioner relies on Pederson's gyrator 90 to satisfy the claim 8 features of a "light fixture . . . having movable structure for aiming the directional light sources mounted thereon in a defined direction" for Ground 3. (Ex. 1001, Claim 8, emphasis added; Petition at 73-77.) However, Petitioner fails to explain why a POSITA would combine Pederson's gyrator 90 with Begemann's lighting units 20, or how such a combination would work.

88. Petitioner contends that Begemann does not describe how to automatically adapt the direction of its lighting units 20 according to changing environment and application, and that a POSITA would therefore have been motivated to look to Pederson for such details. (Ex.1005, 10:8-1; Petition at 44.) Petitioner's stated motivation to combine Begemann and Pederson is that Begemann's controller 550 could then selectively vary and automatically adjust the

direction of Begemann's lighting units 20. (Petition at 73-74.)

89. However, Begemann already teaches automatically adapting its lighting units 20 to changing environments and applications by selectively varying and automatically adjusting those lighting units 20. As previously described, depending on the absence or presence of a sensor signal indicating a particular weather condition (i.e., rain, snow, fog), Begemann's control system 550 controls lighting modules 502_{bI}, 502_{bII}, 502_{cI}, 502_{cII}, 502_{fI}, 502_{fII} according to pre-defined settings to improve visibility. (Ex.1006, 8:38-9:21, Figure 12.) Begemann's control system 550 also produces energy savings by using only one of the lighting modules 502_{bI}, 502_{bII}, 502_{cI}, 502_{cII}, 502_{fI}, 502_{fII} in response to low traffic density, and by temporarily turning lighting modules on in response to an approaching vehicle. (Ex. 1006, 9:21-29.) (See ¶¶58-59, 71-77, *supra*.)

90. Moreover, Begemann performs such adaptation without needing to move its lighting units 20, or the luminaires 1 or lighting modules 2 of which they are a part to aim any of them in a defined direction. Rather, Begemann's luminaires 1, lighting modules 2, and lighting units 20 are already aimed in fixed predetermined directions. As previously described, Begemann illuminates a specific section of a road or road area using a lighting unit 20 that is aimed in a fixed predetermined direction to associate the lighting unit 20 with that specific section. (Ex. 1006, Abstract, 4:7-13, 6:1-9, Figures 2, 3.) Begemann therefore has

no need to move the luminaire 1, lighting modules 2, or lighting units 20 to illuminate such sections and does not do so. (Ex.1006, Abstract, 4:7-13, 6:1-9, Figures 2, 3.) (See ¶¶58-59, 71-77, *supra*.)

91. Petitioner does not explain any deficiency in Begemann's adaptation of its lighting units 20 to changing environments and applications by selectively varying and automatically adjusting those lighting units 20. Nor does Petitioner explain any advantage or benefit that imparting movement to Begemann's lighting units 20 would provide over the luminaire and system already taught by Begemann. Petitioner's proposal to add a gyrator 90 as taught by Pederson to each of Begemann's lighting units 20 to make them moveable is therefore completely unnecessary. There are also significant problems created by this combination as well – namely, an oscillating, distracting, and potentially dangerous light-source that was previously designed to function as a fixed-beam streetlamp.

92. Petitioner thus offers no clear explanation as to why a POSITA would have combined Begemann and Pederson as suggested.

93. Petitioner's proposed modification also ignores the claim 8 requirement that the moveable structure is for aiming the directional light sources mounted thereon in a defined direction. (Ex.1001, Claim 8.) There is no teaching in Pederson that its gyrator 90 aims LEDs 30 in any direction at all, let alone a defined direction. Rather, Pederson's gyrator 90 uses motors 96.1, 96.2 to rotate

and oscillate activated LEDs 30 on support panel 12 to create a warning signal. (Ex.1011, ¶¶[0183-0185], Figure 3.)

94. Petitioner does not address these engineering issues, offering no explanation as to how a POSITA would aim each of the lighting units 20 of Begemann's luminaire 1 in a defined direction using gyrators 90 as taught by Pederson. Again, Pederson provides no such teaching, and Begemann discloses that the lighting units 20 are aimed in fixed predetermined directions during assembly of luminaire 1. (Ex.1006, Abstract, 4:7-13, 6:1-9, Figures 2, 3.) As a result, even if Begemann and Pederson were properly combinable as suggested, such a combination would fail to result in the claim 8 features of a "light fixture . . . having movable structure for aiming the directional light sources mounted thereon in a defined direction." (Ex. 1001, Claim 8, emphasis added.)

95. To the extent Petitioner is contending in the Petition that Pederson teaches aiming, then Petitioner's proposed combination adds purported features from Pederson that are already present in Begemann without any reason to do so.

3. Petitioner's Combinations Add Features Already Present in a Primary Applied Reference; the Rationale to Combine Suffers from Impermissible Hindsight Bias

96. It is my understanding that where a secondary reference adds features already present in a primary reference -- without a countervailing reason -- there is

no motivation to combine and that such an attempt would be impermissible hindsight reconstruction in view of the disclosure of the patent being considered.

a. Ground 3: Petitioner's Combination of Braun and Dowling is Based on Impermissible Hindsight By "Adding" Features Already Present in Braun

97. Petitioner proposes to modify Braun's illumination system 60 by adding Dowling's monitoring of the flow of objects such that traffic flow and traffic patterns can be determined. (Petition at 50.) However, Braun already discloses detecting motion of objects and tracking objects as their positions in a scene change over time, which Petitioner acknowledges. (Ex. 1005, 6:4-15, 8:11-24, 12:17-20, 21:21-22:16, 26:19-28, 27:5-20, Figure 7; Petition at 29, 34, 36, 48, 52.) In so doing, Braun monitors and determines traffic flow and traffic patterns.

98. Petitioner does not explain any deficiency in Braun's detecting of objects. Neither does Petitioner explain any new or different functionality provided by the proposed combination of Braun and Dowling. Moreover, Petitioner's proposal to add Dowling's monitoring features to Braun's illumination system is divorced from Petitioner's stated motivation to combine, i.e., that both Braun and Dowling disclose wireless communication. (Petition at 34-35.)

99. Petitioner's proposed combination thus adds features from Dowling that are already present in Braun without any reason to do so. There is therefore no

motivation to combine Braun and Dowling as suggested.

b. Ground 5: Petitioner's Combination of Begemann and Lee is Based on Impermissible Hindsight By "Adding" Features Already Present in Begemann

100. Petitioner's stated motivation to combine Begemann's luminaire 1 with Lee's camera C2 and control unit 20 for capturing and processing images is that such a combination would enable Begemann's control system 550 to detect and identify objects -- namely, people, rain, snow, fog, traffic density, and approaching vehicles. (Petition at 58.) However, Begemann already discloses sensors to detect people, rain, snow, fog, traffic density, and approaching vehicles.

101. More specifically, Begemann discloses a proximity sensor to detect the presence of a person in a room to be illuminated. (Ex. 1006, 4:67-5:3.) Begemann also discloses a control system 550 that uses signals 551, 552 from sensors for the detection of rain, snow, fog, traffic density, and approaching vehicles to control lighting modules 502_{bl}, 502_{bll}, 502_{cl}, 502_{cll}, 502_{fl}, 502_{fll} of luminaire 501_a according to various lighting system settings. (Ex. 1006, 8:37-9:29.) Petitioner acknowledges all these teachings of Begemann. (Petition at 69, 78, 80, 82.)

102. Petitioner does not explain any deficiency in Begemann's sensors or its detection of people, rain, snow, fog, traffic density, and approaching vehicles.

Moreover, there is no teaching in Lee that its control unit 20 uses image processing to detect or identify rain, snow, fog, traffic density, or approaching vehicles. Finally, while Petitioner notes that Lee's control unit 20 uses image processing to determine the identity of a person, Petitioner does not explain any advantage or benefit that such an identity would provide to Begemann's control system 550.

103. Petitioner's proposed combination thus adds features from Lee that are already present in Begemann without any reason to do so. There is therefore no motivation to combine Begemann and Lee as suggested.

VI. Conclusion

104. 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.

105. 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: 4/18/2023


Matthew A. Turk Ph.D.