Mercedes's Hearing Demonstratives for *Mercedes vs. Spero*

IPR2023-01026
IPR2020-01027

U.S. Patent No. 10,894,503

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
IPR2023-1027

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Overview of Alden

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’503 Representative Claims

1. A vehicle headlight system comprising:
one or more headlamps and a vehicle structure, arranged for affixing components of the system to the vehicle;
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;
electronic control circuitry configured to independently operate the light clusters;
one or more sensors configured to obtain and provide the sensor data predefined as pertinent to illumination requirements for the field-of-view; and
a logical controller including a processor, the processor in communication with a memory storing one or more algorithms, with the sensors, and with the control circuitry, wherein the processor is configured to process the one or more algorithms and the sensor data to determine an illumination for at least two of the sub-sections, 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.

Claim 1 is representative of Claims 20 and 26 and generally recites:

- Light sources arranged to project light into sub-sections of a field-of-view
- Control circuitry to control the light sources
- Sensors to obtain information about the field-of-view
- A processor to control the light sources to reduce illumination towards another vehicle to reduce glare

IPR2023-01026 Pet. at 11-36

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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’503 Representative Claims

37. A vehicle headlight system comprising:
one or more headlamps affixable to a first vehicle;
a plurality of light clusters arranged in each of the one or more of the headlamps and capable of illuminating sub-sections of a field-of-view with different illumination characteristics, wherein at least two of the light clusters operate to create a headlight beam;
one or more sensors configured to obtain and provide sensor data, at least a portion of the sensor data indicating a second vehicle within the field-of-view; and
at least one processor configured to:
receive the sensor data;
process the sensor data to determine a light distribution pattern for an adaptive headlight beam, such that a headlight beam adapted to the pattern substantially illuminates a first subsection of the field-of-view including at least a portion of the second vehicle with an illuminance below a predefined threshold value, while the beam substantially illuminates at least the one or more second subsections of the field-of-view to either side of the first subsection with an illuminance above the predefined threshold value; and
instruct operation of at least two of the light clusters to create the adapted headlight beam.

Claim 37 is representative of Claims 59 and 65 and generally recites:

- Light sources arranged to project light into sub-sections of a field-of-view
- Control circuitry to control the light sources
- Sensors to obtain information about the field-of-view
- A processor to control the light sources to illuminate a first subsection with illuminance below a threshold value and illuminate a second subsection with illuminance above the threshold value

IPR2023-01027 Pet. at 11-36

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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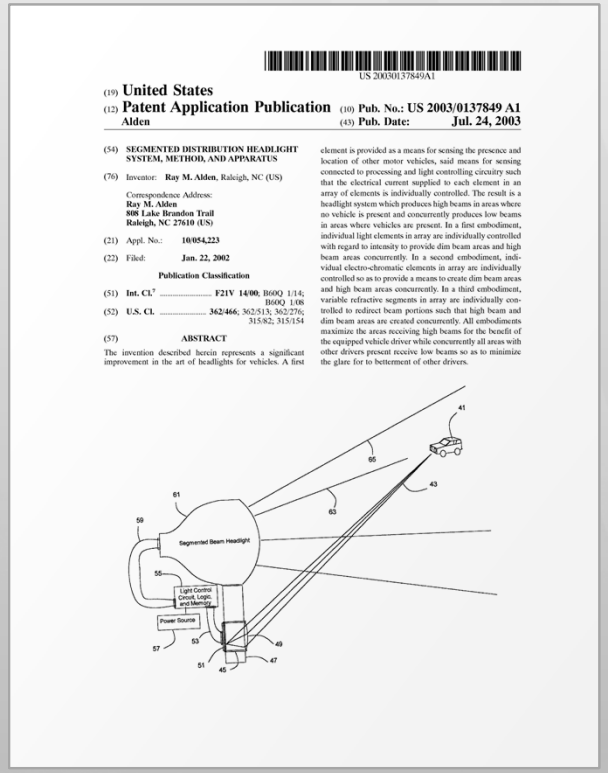
Alden Overview



US 20030137849A1

(19) United States
(12) Patent Application Publication
Alden
(10) Pub. No.: US 2003/0137849 A1
(43) Pub. Date: Jul. 24, 2003

(54) SEGMENTED DISTRIBUTION HEADLIGHT SYSTEM, METHOD, AND APPARATUS

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(21) Appl. No.: 10/054,223

(22) Filed: Jan. 22, 2002

Publication Classification

(51) Int. Cl.[7] F21V 14/00; B60Q 1/14; B60Q 1/08

(52) U.S. Cl. 362/466; 362/513; 362/276; 315/82; 315/154

(57) ABSTRACT

The invention described herein represents a significant improvement in the art of headlights for vehicles. A first element is provided as a means for sensing the presence and location of other motor vehicles, said means for sensing connected to processing and light controlling circuitry such that the electrical current supplied to each element in an array of elements is individually controlled. The result is a headlight system which produces high beams in areas where no vehicle is present and concurrently produces low beams in areas where vehicles are present. In a first embodiment, individual light elements in array are individually controlled with regard to intensity to provide dim beam areas and high beam areas concurrently. In a second embodiment, individual electro-chromatic elements in array are individually controlled so as to provide a means to create dim beam areas and high beam areas concurrently. In a third embodiment, variable refractive segments in array are individually controlled to redirect beam portions such that high beam and dim beam areas are created concurrently. All embodiments maximize the areas receiving high beams for the benefit of the equipped vehicle driver while concurrently all areas with other drivers present receive low beams so as to minimize the glare for to betterment of other drivers.

[0025] FIG. 1 depicts a vehicle employing an automatic segmented illumination means of the present invention. A first vehicle **31** emits a low beam illumination **35** in a first headlight distribution sector while concurrently emitting a high beam,illumination **37** in a second headlight distribution sector. The low beam illumination in **35** being emitted in response to the detection of an oncoming vehicle **33** (the **33** emitting light which has been omitted for drawing clarity). The **31** comprising a means to detect the sector in which **33** (or any other vehicle) is located, the **31** also comprising a means to provide a first intensity of illumination in the sector where the **33** is detected while concurrently providing a second intensity (or alternate direction) of illumination where no vehicle is detected. Specific means for sensing

Alden at [0025]

direction of the 41. Thus the driver of **41** has minimum glare while the driver of **47** has maximum light.

Alden at [0027]

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IPR2023-01027 Pet. at 9-11

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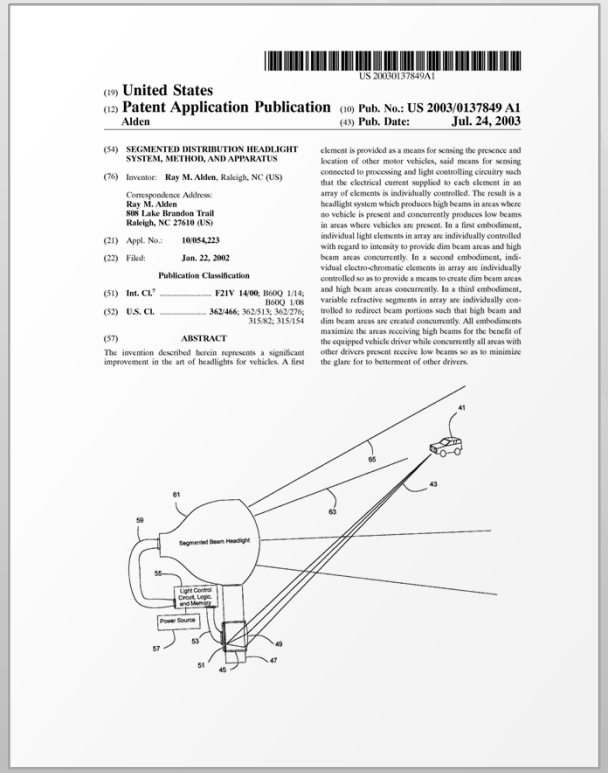
Alden Overview



US 20030137849A1

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(12) **Patent Application Publication** (10) **Pub. No.: US 2003/0137849 A1**

Alden (43) **Pub. Date: Jul. 24, 2003**

(54) **SEGMENTED DISTRIBUTION HEADLIGHT SYSTEM, METHOD, AND APPARATUS**

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(57) **ABSTRACT**

The invention described herein represents a significant improvement in the art of headlights for vehicles. A first element is provided as a means for sensing the presence and location of other motor vehicles, said means for sensing connected to processing and light controlling circuitry such that the electrical current supplied to each element in an array of elements is individually controlled. The result is a headlight system which produces high beams in areas where no vehicle is present and concurrently produces low beams in areas where vehicles are present. In a first embodiment, individual light elements in array are individually controlled with regard to intensity to provide dim beam areas and high beam areas concurrently. In a second embodiment, individual electro-chromatic elements in array are individually controlled so as to provide a means to create dim beam areas and high beam areas concurrently. In a third embodiment, variable refractive segments in array are individually controlled to redirect beam portions such that high beam and dim beam areas are created concurrently. All embodiments maximize the areas receiving high beams for the benefit of the equipped vehicle driver while concurrently all areas with other drivers present receive low beams so as to minimize the glare for to betterment of other drivers.

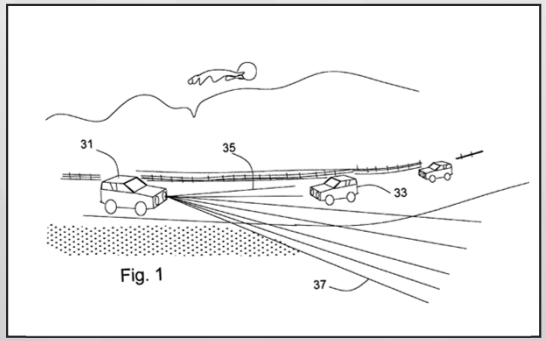


Fig. 1

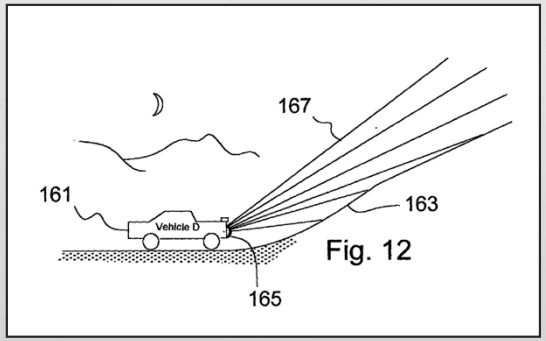


Fig. 12

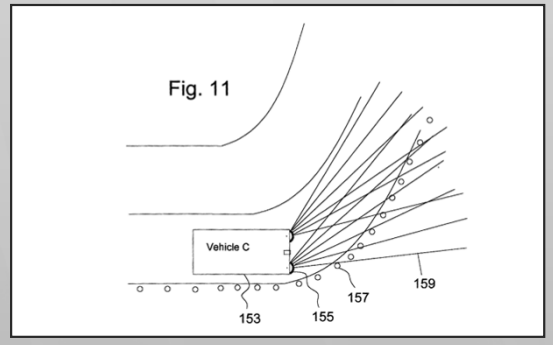


Fig. 11

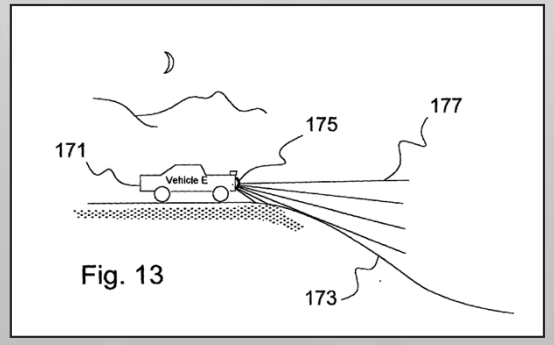
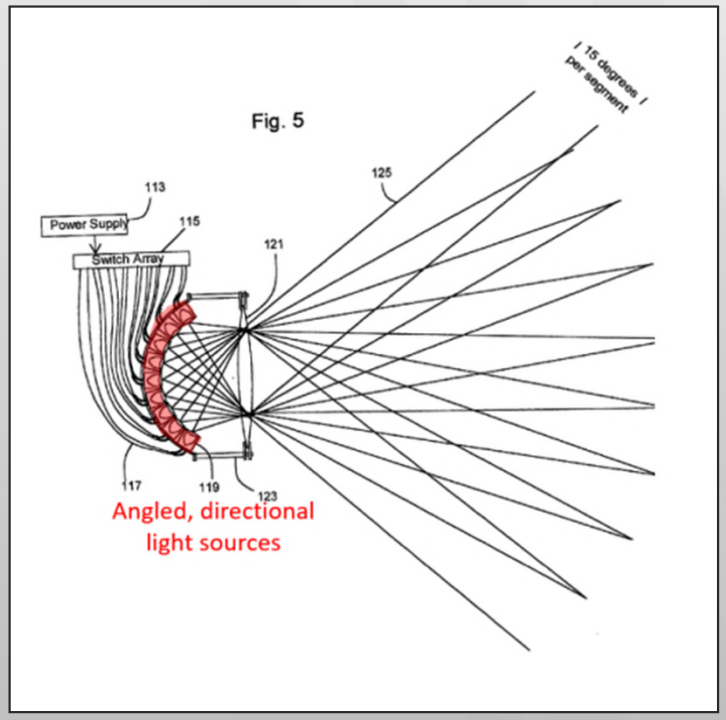


Fig. 13

Alden Discloses Controllable Directional Light Sources



Alden at Fig. 5 (annotated)

and controlling switch array in a first embodiment. The head light is comprised of an array of individual lighting elements similar to light element **119**. The light elements being part of a segmented head light **123**. The **119** can be a white LED (or alternate lighting mechanism). Each lighting element being independently controlled by a corresponding switch in an array of switches **115**. Each switch is controlled by the CPU

The **119** and other lighting elements are on a curve along the focal point of a headlight lens **121** such that the light from each lighting element goes into a specified portion (or portions) of the headlight distribution area. Element emitted

Alden at [0029]

IPR2023-01026 Pet. at 9-11, 13-16, 27-28
IPR2023-01027 Pet. at 9-11, 13-16, 22-27, 29-30

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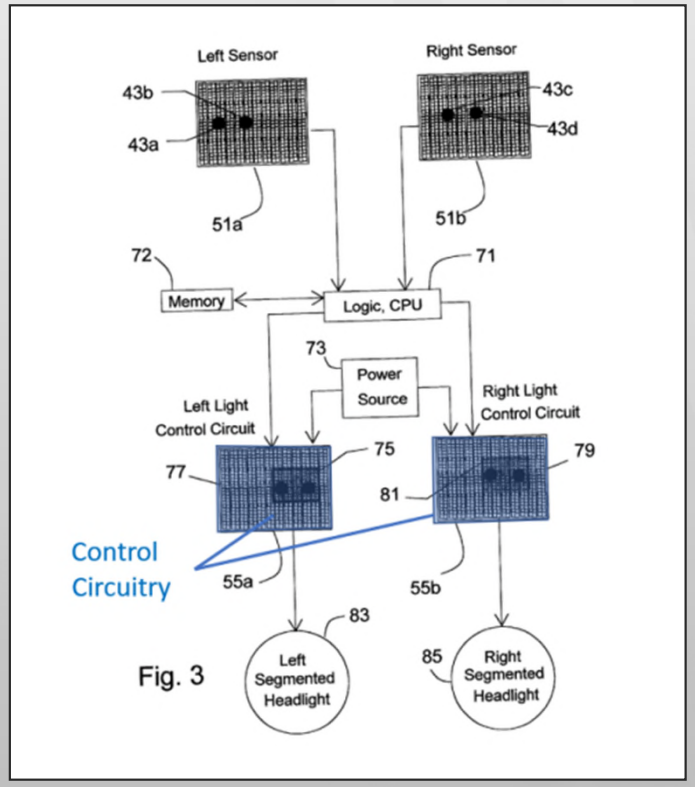
Alden Discloses Circuitry to Control the Directional Light Sources



Alden at Fig. 3 (annotated)

headlight sectors. Information from the **72** and **71** is sent to control the power flow from a power source **73** via a left light control circuit **55***a* and a right light control circuit **55***b*.

Alden at [0027]

array matrix and tell which areas are in which state.) The **55***a* controls the power flow from **73** to a left segmented headlight **83** which distributes high beams throughout its distribution areas except in a box in the direction of the **41**. Similarly, the **55***b* controls the power flow from **73** to a right segmented headlight **83** which distributes high beams throughout its distribution areas except in a box in the direction of the **41**. Thus the driver of **41** has minimum glare

Alden at [0027]

IPR2023-01026 Pet. at 9-10, 12-13, 18-26
IPR2023-01027 Pet. at 9-10, 18-22, 39-41

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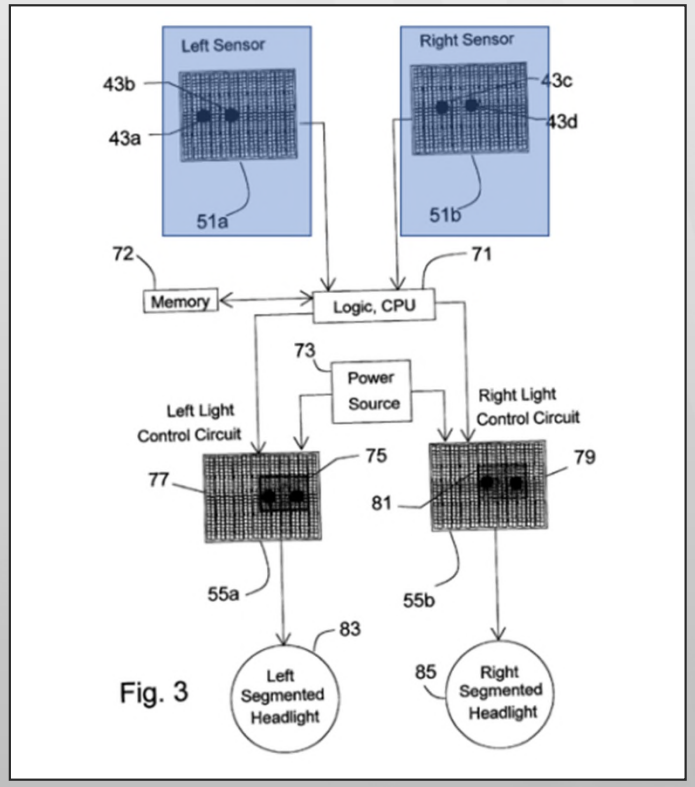
Alden Discloses Sensors to Obtain Information About the Field-of-View



Alden at Fig. 3 (annotated)

dently control each illumination sector. It is an advantage of the present invention to automatically control each illumination sector in response to sensed environmental conditions. In a first embodiment, it is an advantage of the present

Alden at [0008]

described in FIG. 2. In practice, a left sensor **51***a* and a right sensor **51***b* are used concurrently. The **51***a* detects the two headlights of **41** at a first illuminated spot **43***a* and a second illuminated spot **43***b* respectively. These spots of light fall

Meanwhile, **51***b* also detects the two headlights of **41** as a first spot **43***c* and a second spot **43***d* respectively. This

Alden at [0027]

IPR2023-01026 Pet. at 9-11, 17-21
IPR2023-01027 Pet. at 9-11, 16-22, 30-31

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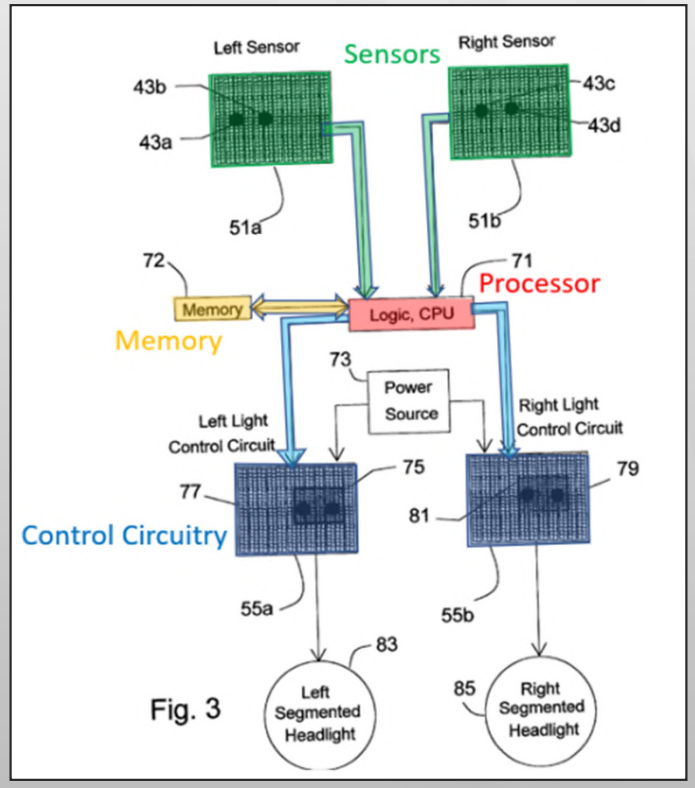
Alden Discloses a Processor to Control the Light Sources



Alden at Fig. 3 (annotated)

array of switches **115**. Each switch is controlled by the CPU and logic previously described. For example the power to **119** is controlled by the CPU which dictates its respective switch characteristics at **115** such that the power from a power supply **113** carried via segment wire **117** is controlled in response to the sensed environmental conditions. All of the other light elements are similarly individually controlled.

Alden at [0029]

IPR2023-01026 Pet. at 21-26, 30-36
IPR2023-01027 Pet. at 18-22, 27-28, 31-34

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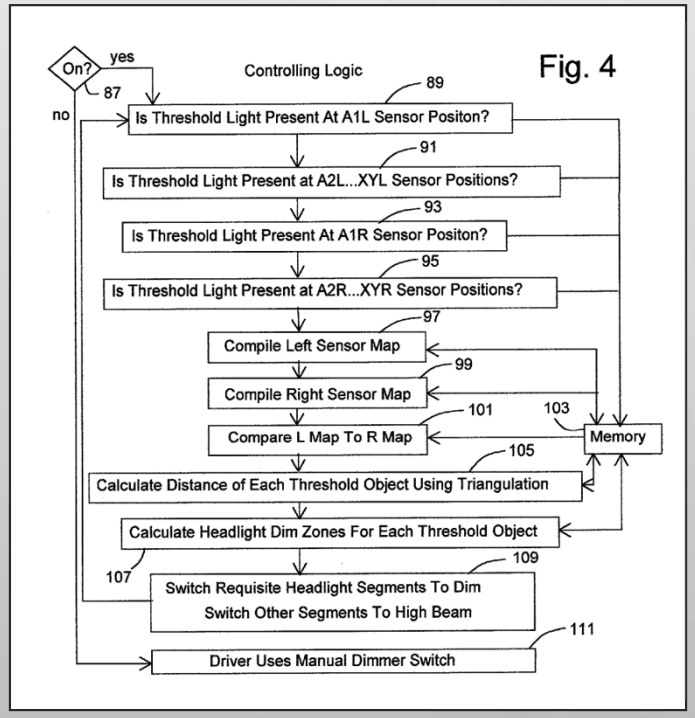
Alden's Processor Controls the LEDs Based on Sensor Information



Alden at Fig. 4

- Alden's CPU checks each sector of the left and right light sensor.
- Using the light sensor data, the CPU compiles a left and right sensor map.
- The maps are used to determine which zones need dimmed illumination and which zones need high beam illumination.
- The LEDs in the headlights are then switched to high beam or dimmed to create the desired illumination pattern.

IPR2023-01026 Pet. at 21-26, 30-36
IPR2023-01027 Pet. at 18-22, 27-28, 31-34

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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Dispute 1 – Alden Is Operative and Does Not Require Modification

All Challenged Claims

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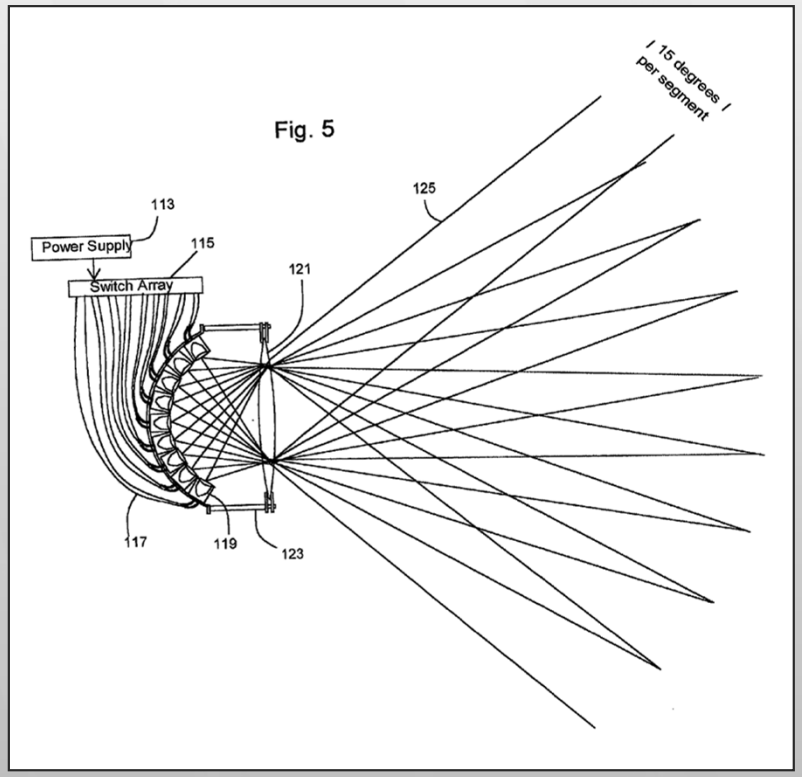
Patent Owner's "Single-Row" Argument Fails

Patent Owner argues:

"Regarding the Figure 5 LED first embodiment, Alden merely describes ***a row*** of LEDs positioned along the focal point of a lens."



Alden at Fig. 5

IPR2023-01026 POR at 17-18, 21; PO Sur-reply at 1-11
IPR2023-01027 POR at 16-22; PO Sur-reply at 1-11

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Alden's Fig. 5 Is Not Limited to a Single Row of LEDs

Fig. 5 is ***not*** limited to a single row of LEDs, as the Board correctly found at institution.

Institution Decisions

> We find this argument unpersuasive because we conclude, on the present record, that one of ordinary skill in the art (*see* Section II.A), would understand that Figure 5 is a schematic/sectional type of drawing intended to show generally how the system components are connected and how the LEDs would project light through the lens, and that for clarity it omits other LEDs that would be necessary to produce a two-dimensional lighting pattern. We

IPR2023-01026 DI at 10; IPR2023-01027 at 11

IPR2023-01026 Pet. Reply at 1-4
IPR2023-01027 Pet. Reply at 1-4
IPR2023-01026 DI at 10; IPR2023-01027 DI at 11

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Patent Owner Is Reading Fig. 5 in Isolation

- In discussing Fig. 5, Alden explains each LED is controlled by a switch in a switch array, and "[e]ach switch is controlled by the CPU and logic previously described." Alden at [0029].
- This "CPU and logic previously described" refers to Figs. 3-4 and their corresponding descriptions.
- Thus, Alden's Fig. 5 cannot be viewed in isolation; it must be read in connection with Figs. 3-4.

Q. So you would agree that in paragraph 29, it's referencing CPU and logic previously described, correct?

A. Yes, it does say that.

Q. And it's true, isn't it, that the only CPU and logic previously described is in paragraph 28 and 27, correct?

A. I believe that's the only previously described CPU and logic.

Turk Depo. at 122:12-22

IPR2023-01026 Pet. Reply at 1-4
IPR2023-01027 Pet. Reply at 1-4
IPR2023-01026 EX1012 at 122:12-22; IPR2023-01027 EX1014 at 122:12-22

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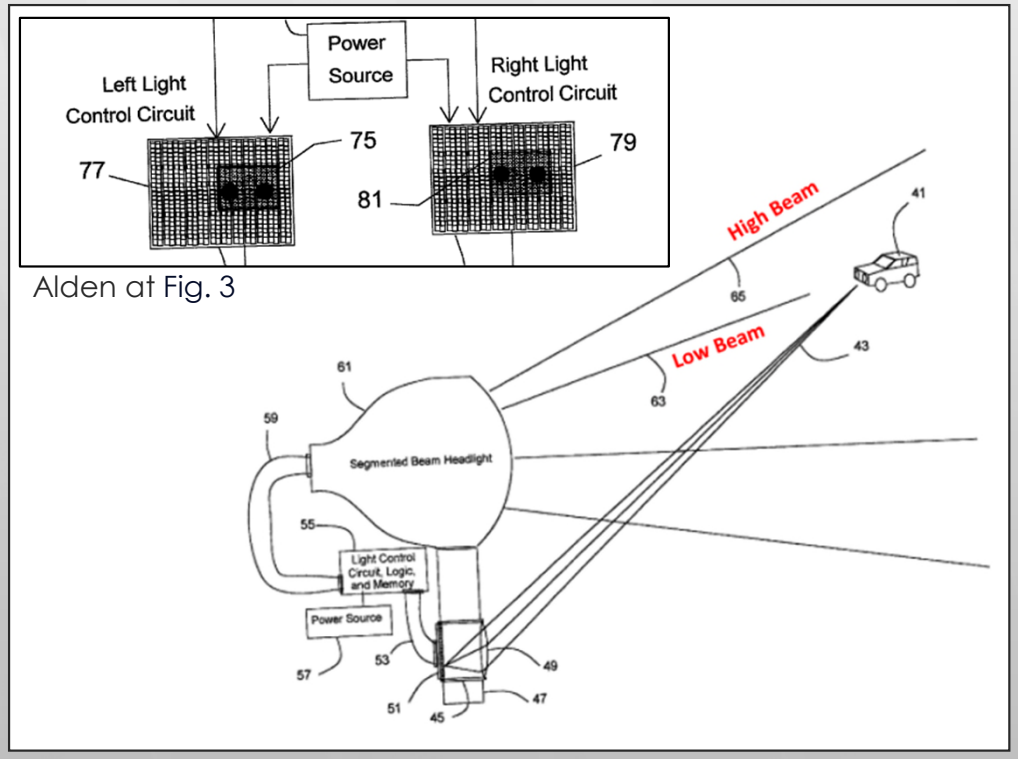
Fig. 3 Shows Differing Illumination Across a 2D Plane

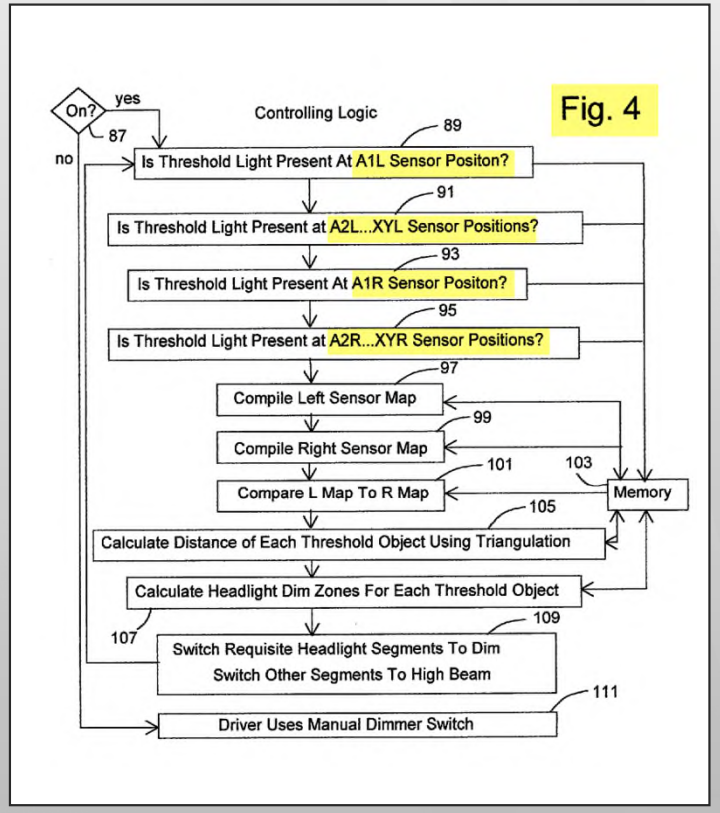
- As shown in Fig. 3, the "shaded circuit area … indicates … portions of the … headlight to be dim while a non-shaded … circuit area … represents the portions ... which will be on high beam." Alden at [0027].
- Thus, Alden "distributes high beams throughout its distribution areas except in a box in the direction" of the detected vehicle. *Id.*

Alden at Fig. 3



Alden at Fig. 1 (annotated)

Fig. 4 Discloses the CPU Compiling 2D Sensor Maps



Alden at Fig. 4 (annotated)

8. As a further example, Figure 4 discloses the CPU logic compiling two-dimensional (XY) sensor maps of the detected light and determining dimmed and high beam zones *within this XY space*. (Alden, Fig. 4, [0028].) Particularly, Alden discloses the system checks each sector of the left sensor 89, from A1L, A2L through XYL, and similarly checks each sector of the right sensor, from A1R, A2R through XYR. (*Id.*) This is a clear indication that the sensor sectors are distributed in two dimensions, X and Y. For this logic to apply to Figure 5, as Alden expressly says it could be a spherical surface. (EX2041, 119:9-17.) If the LED array were one-dimensional as Patent Owner alleges, then it could only correspond to X locations, and not the plurality of XY locations that Figure 4 and Paragraph [0028] of Alden indicate are accounted for. (Alden, Fig. 4, [0028].)

Second Papanikolopoulos Decl. (IPR2023-01026 EX1011) at ¶8

Papanikolopoulos Depo. (EX2041) at 57:12-58:4, 60:1-10, 106:22-107:10, 110:7-19
IPR2023-01026 Pet. Reply at 1-4
IPR2023-01027 Pet. Reply at 1-4

Additional Evidence that Fig. 5 Is Not Limited to Single Row

- Figure 5 shows ***a sectional view of a row of LEDs*** to illustrate the segmented lighting, with it being understood that ***the full array in the front-on view would be two-dimensional***, as similarly shown in Figures 6-7.

Alden at Figs. 5-7, [0029]-[0031]; Papanikolopoulos Depo. (EX2041) at 57:12-58:4, 106:22-107:10, 110:7-19

- Alden discloses that Figure 5 illustrates "the segmented headlight" comprised of an "***array***" of lighting elements, not a "row" of lighting elements.

Alden at [0029], Fig. 5; IPR2023-01026 EX1011 at ¶¶5-10; IPR2023-01027 EX1013 at ¶¶5-10

- For Alden's Figure 5 LEDs to direct light uphill and downhill, for example, there must be multiple rows of LEDs with some angled and positioned on the curved surface to direct light upwards and others angled and positioned to direct light downwards.

Alden at Figs. 11-13, [0037]-[0038]; IPR2023-01026 EX1011 at ¶9; IPR2023-01027 EX1013 at ¶9

Alden's Figs. 3 and 5 Are Compatible

Patent Owner argues:

"Since there are 576 switches in the Figure 3 switch array and 9 LEDs in the Figure 5 LED array as shown, absent some unspecified modification" Petitioner relies on an inoperative headlamp.

But a POSITA would know:

- Alden discloses "[e]ach lighting element being independently controlled by a corresponding switch." Alden at [0029].
- Even Patent Owner's expert admits this is how Alden works:

Q. So, Alden is saying here that there is one switch for each LED, correct?
A. I believe so, yes.
Q. So if there were nine LEDs, you would have nine switches, right?
A. I believe so.
Q. And if there were 27 LEDs, there would be 27 switches, right?
A. There should be, yes.

Turk Depo. (IPR2023-01026 EX1013; IPR2023-01027 EX1014) at 121:8-18

IPR2023-01026 POR at 23-24; PO Sur-reply at 1-11; IPR2023-01027 POR at 22-24; PO Sur-reply at 1-11
IPR2023-01026 Pet. Reply at 4-6; IPR2023-01027 Pet. Reply at 4-6
Second Papanikolopoulos Decl. (IPR2023-01026 EX1011)at ¶¶12-14; Second Papanikolopoulos Decl. (IPR2023-01027 EX1013)at ¶¶12-14

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Alden Does Not Need to be Modified

Patent Owner argues:

Absent modification Alden is unable "to reach the lumen output required."

But:

- Figure 5 of Alden is not limited to a single row of LEDs.
- The claims do not require a particular lumen output.
- The claims are directed toward a headlight system for a "vehicle," generally, and do not require compliance with standards or regulations for automobiles or otherwise.

IPR2023-01026 POR at 23-24; PO Sur-reply at 1-11; IPR2023-01027 POR at 22-24; PO Sur-reply at 1-11
IPR2023-01026 Pet. Reply at 4-6; IPR2023-01027 Pet. Reply at 4-6
Second Papanikolopoulos Decl. (IPR2023-01026 EX1011)at ¶¶12-14; Second Papanikolopoulos Decl. (IPR2023-01027 EX1013) at ¶¶12-14

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Dispute 2 – Alden Discloses the Claimed Light Modifying Elements

Claims 2, 3, 42, and 43

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Alden Discloses the Claimed Light Modifying Element (Claim 2)

one or more light emitting sources, each having a variable light-source characteristic dependent on power, and wherein the control circuitry is arranged to alter said light-source characteristic via power control; and

'503 at Claim 2[C]

4. The headlight system of claim **2**, wherein the light modifying element further comprises at least one of lenses, diffractors, optical devices, a light guide, filters, phosphors, optical coatings, prisms, controllable piezoelectric light guides, MEMS devices, light valves or optical switches.

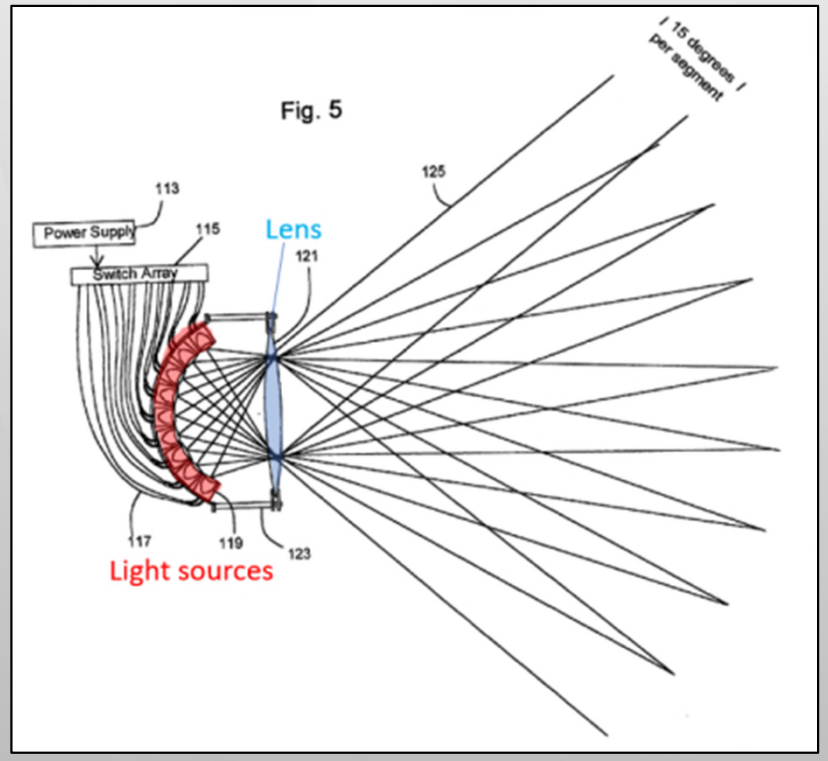
'503 at Claim 4

- Claim 2[C] requires a light modifying element in the path of the light to further control the light-source characteristics.
- Claim 4 provides examples of what the light modifying element can be, including a lens.

IPR2023-01026 Pet. at 36-43; Pet. Reply at 12-15

Alden Discloses the Claimed Light Modifying Elements (Claim 2)

- Alden discloses a light modifying element as recited in Claim 2 such as lens 121.
- Lens 121 is in the path of the emitted light and further controls light-source characteristics, including direction and intensity, by causing "the light from each lighting element [to go] into a specified portion (or portions) of the headlight distribution area."



Alden at Fig. 5 (annotated)

IPR2023-01026 Pet. at 36-43; Pet. Reply at 12-16
IPR2023-01027 Pet. at 39-45; Pet. Reply at 13-15
Turk Depo. (IPR2023-01026 EX1013) 78:7-25

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
IPR2023-1027

Alden Discloses the Claimed Light Modifying Elements (Claim 2)

Patent Owner argues:

"The 'light modifying element' needs to control a 'light source characteristic' that is 'dependent on power'" (*i.e.*, intensity), and "Alden discloses that the lens 121 'adjusts' the direction of light emitted by the light element 119, not its intensity."

IPR2023-01026 POR at 43-44, 49-50, 51; PO Sur-reply at 16-18

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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Alden Discloses the Claimed Light Modifying Elements (Claim 2)

- In Alden, the intensity of the light measured at a particular sector with no lens would be different than the intensity measured in the same sector with the lens, which focuses light into the sector.
- Thus, even assuming the claims require the light modifying element to control a light-source characteristic dependent on power, Alden's lens does this.

Q. And so if there were no lens, then the light to 125, if we measured the intensity, again, that would be lower than if the lens were there, right?

MS. SHAH: Objection, vague.

A. You're talking about measuring at the end of segment 125?

BY MR. HUGHES:

Q. Yes.

A. Most likely that would be the case if nothing else changed.

Q. And similarly, if we remove the lens, we would get a different intensity measurement on light in, for example, the ends of some of the middle segments than we do with the lens present, correct?

A. Yes, the lens affects the path of light that goes through it and it's going to affect, therefore, the measurements you make further down the line.

Q. Including measurements for intensity of the light?

A. Most likely, yes.

Turk Depo. (IPR2023-01026 EX1013) 78:7-25

Turk Depo. (IPR2023-01026 EX1013) 78:7-25
IPR2023-01026 Pet. at 36-43; Pet. Reply at 12-16; Second Papanikolopoulos Decl. (EX1011) at ¶¶27-33
IPR2023-01027 Pet. at 39-45

Mercedes EX1016
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Alden Discloses the Claimed Light Modifying Elements (Claim 2)

- In fact, Claim 2[C] does not require the light-source characteristics are dependent on power.
- That is, the ***singular*** "variable light source characteristic dependent on power" of Claim 2[B] does not provide antecedent basis for the plural "light source characteristic**s**" of Claim 2[C].

Claim 2
2[A] a structure to position the light cluster, such that the projected light from the at least one cluster has an aiming direction in relation to a forward travel direction of the vehicle; 2[B] one or more light emitting sources, each having a **variable light-source characteristic dependent on power**, and wherein the control circuitry is arranged to alter said light-source characteristic via power control; and 2[C] one or more light modifying elements provided in the path of light emitted from at least one of the sources, further controlling the **light-source characteristics** 2[D] wherein the structure combined with control of the light sources and light modifying elements results in an emitted light-cluster light characteristic including at least one of direction, intensity, beam spread, spatial light distribution or spectral light distribution.

IPR2023-01026 Pet. at 36-43; Pet. Reply at 12-15

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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Alden Discloses the Claimed Light Modifying Elements (Claim 2)

- Claim 2[D] discloses that light characteristics can include things like "intensity" and "direction."
- Claim 4 recites light modifying elements that can control light characteristics not dependent on power, such as a static light guide.

Claim 2
2[A] a structure to position the light cluster, such that the projected light from the at least one cluster has an aiming direction in relation to a forward travel direction of the vehicle; 2[B] one or more light emitting sources, each having a variable light-source characteristic dependent on power, and wherein the control circuitry is arranged to alter said light-source characteristic via power control; and 2[C] one or more light modifying elements provided in the path of light emitted from at least one of the sources, further controlling the light-source characteristics 2[D] wherein the structure combined with control of the light sources and light modifying elements results in an emitted light-cluster **light characteristic including at least one of direction, intensity**, beam spread, spatial light distribution or spectral light distribution.

IPR2023-01026 Pet. at 36-43; Pet. Reply at 12-15

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IPR2023-1027

The Light Modifying Element Does Not Need to be Controllable (Claims 2 and 42 anticipation)

- For Claims 2[D] and 42[C], Patent Owner argues lens 121 cannot be the light modifying element because it is not controllable.
- These elements simply recite that the structure combined with control of the light sources and the *inclusion* of the light modifying elements results in an emitted light characteristic.
- This is further supported by Claims 4 and 44, which depend from Claims 2 and 42 and recite the light modifying elements may include optical coatings, which are not controllable, or lenses like that of Alden.

> wherein the structure combined with control of the light sources and light modifying elements results in an emitted light-cluster light characteristic including at least one of direction, intensity, beam spread, spatial light distribution or spectral light distribution.

'503 at Claim 2[D]

> wherein control of the light sources and light modifying elements results in a specified emitted light-source light characteristic, where said emitted light-source light characteristic includes at least one of direction, intensity, beam spread, spatial light distribution or spectral light distribution.

'503 at Claim 42[C]

IPR2023-01026 PO Sur-reply at 17; IPR2023-01027 POR at 44-45; PO Sur-reply at 17-18
IPR2023-01026 Pet. at 43, 45; Pet. Reply at 12-14
IPR2023-01027 Pet. at 42-46, 53; Pet. Reply at 13-15; Second Papanikolopoulos Decl. (EX1013) at ¶¶31-32

Mercedes EX1016
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Alden's Lens Anticipates Claim 3

- Alden's lens is a static light modifier.
- The "variable light modifier circuitry" recited in Claim 3 is only limiting with respect to the use of a "variable light modifier."
- By definition, a static light modifying element is not alterable during operation, and thus variable light modifier circuitry is neither required or of use.

> **3**. The headlight system of claim **2**, wherein the one or more light modifying elements is at least one of a static light modifier or a variable light modifier, said light modifying element comprising at least one of reflectors or refractors, and wherein variable light modifier control circuitry is configured to control the light-cluster light characteristic by altering the light modifying elements in the path of the light emitted from the at least one of the light sources.

'503 at Claim 3

IPR2023-01026 PO Sur-reply at 18
Papanikolopoulos Decl. (IPR2023-01026 EX1003) at ¶99; Second Papanikolopoulos Decl. (IPR2023-01026 EX1011) at ¶¶34-35
IPR2023-01026 Pet. at 44-45; Pet. Reply at 15-16

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Variable Light Modifier Circuitry Is Not Required for a Static Light Modifier (Claim 3)

35. Further, as explained in my first declaration, the ”variable light modifier circuitry” language of Claim 3 is only limiting with respect to the use of a “variable light modifier.” (EX1003, ¶99.) When the light modifying element is a static light modifier like the lens, variable light modifier circuity is neither required nor of use. By definition, a static light modifier is a light modifying element that is not alterable during operation. As such, there cannot be control circuity that alters the light modifying element. If there were, the light modifying element would be variable, not static.

Second Papanikolopoulos Decl. (EX1011) at ¶35

Papanikolopoulos Decl. (IPR2023-01026 EX1003) at ¶99; Second Papanikolopoulos Decl. (IPR2023-01026 EX1011) at ¶¶34-35
IPR2023-01026 Pet. at; Pet. Reply at 15-16

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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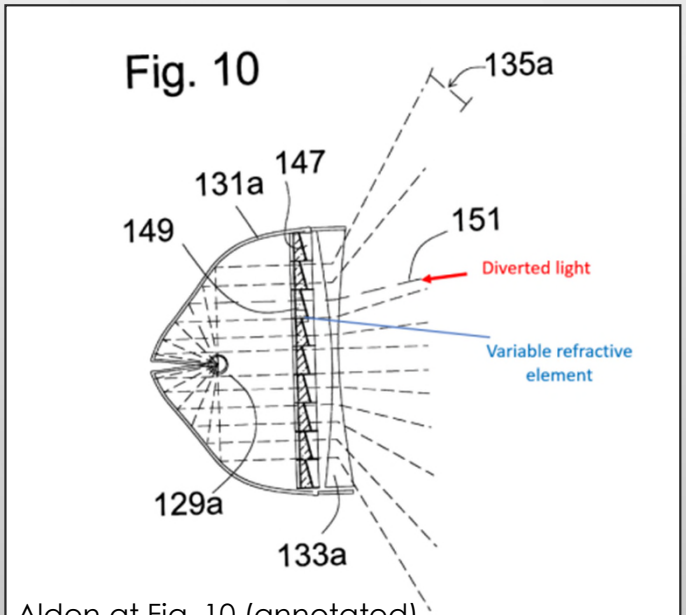
Alden Further Discloses a Liquid Crystal Variable Refractive Element (Claims 2, 3, 42, and 43 obviousness)

Additionally, Alden renders obvious the claims because a POSITA would include Alden's liquid crystal variable refractive element in Alden's Figure 5.



Alden at Fig. 10 (annotated)

illumination emitting, filtering, and/or diverting sectors. One or more methods employed herein may be used in combination to vary illumination in a segmented system. Many

Alden at [0033], [0061]

IPR2023-01026 Papanikolopoulos Decl. (EX1003) ¶¶95-96; Second Papanikolopoulos Decl. (EX1011) at ¶¶31-33
IPR2023-01027 Papanikolopoulos Decl. (EX1003) ¶¶107; Second Papanikolopoulos Decl. (EX1013) at ¶¶27-30
IPR2023-01026 Pet. at 40-45; Pet. Reply at 14-16; IPR2023-01027 Pet. at 42-46, 53; Pet. Reply at 13-15

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A POSITA Would Know How and Why to Include a Liquid Crystal Variable Refractive Element (Claims 2, 3, 42, and 43 obviousness)

- Alden explains the liquid crystal element allows light to pass straight through when a circuit is open and has a second refractive state causing light to bend when the circuit is closed.
- Implementing a liquid crystal refractor would be the use of a known optical element in a system having different light distribution sectors that Alden describes the liquid crystal as acting upon.

> **[0033]** In a third embodiment, the electro-optic material **141** of **FIG. 8** is a liquid crystal. The alignment of the liquid crystal causes a first refractive index in a first state when the circuit is open. This causes the light to pass straight through the elements of **FIG. 8**. Realigned liquid crystal **141***a* assumes a second state of alignment when the circuit is closed as illustrated in **FIG. 9** causing the light to bend due to refraction after passing there through. The liquid crystal birefringent principals are well known in the prior art. The surfaces of **139** generally not being parallel to the **143** surfaces.

Alden at [0033]

IPR2023-01026 Papanikolopoulos Decl. (EX1003) ¶¶95-96; Second Papanikolopoulos Decl. (EX1011) at ¶¶31-33
IPR2023-01027 Papanikolopoulos Decl. (EX1003) ¶¶107; Second Papanikolopoulos Decl. (EX1013) at ¶¶27-30
IPR2023-01026 Pet. at 40-45; Pet. Reply at 14-16; IPR2023-01027 Pet. at 42-46, 53; Pet. Reply at 13-15; Papanikolopoulos Depo. (EX2041) 79:18-80:24

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A POSITA Would Know How and Why to Include a Liquid Crystal Variable Refractive Element (Claims 2, 3, 42, and 43 obviousness)

- A liquid crystal refractor would provide an additional means of modifying the direction or intensity of individual light sectors.
- A POSITA would have known to use the variable refractive element to bend light towards upcoming road curves to help perform Alden's road curve accommodation function.

33. Regarding why a POSITA would implement such a liquid crystal refractor, the liquid crystal refractor would provide an additional means of modifying the direction or intensity of individual light sectors, allowing more variable control of lighting subsections of the headlight beam. (*Id.*) For example, as I explained at my deposition, Alden is concerned not only with dimming light when other vehicles are detected, but also illuminating curves in the road. (EX2066, 79:3-83:7.) To achieve this additional control of intensity and direction of light at a curve, Alden's Figure 5 headlight could include a light source with a variable refractive element at either end, so as to be able to bend the light directed towards the sides of the road, and thus any upcoming curves. (*Id.*)

Second Papanikolopoulos Decl. (IPR2023-01026EX1011) at ¶33

IPR2023-01026 Papanikolopoulos Decl. (EX1003) ¶¶95-96; Second Papanikolopoulos Decl. (EX1011) at ¶¶31-33
IPR2023-01027 Papanikolopoulos Decl. (EX1003) ¶¶107; Second Papanikolopoulos Decl. (EX1013) at ¶¶27-30
IPR2023-01026 Pet. at 40-45; Pet. Reply at 14-16; IPR2023-01027 Pet. at 42-46, 53; Pet. Reply at 13-15; Papanikolopoulos Depo. (EX2041) 79:18-80:24

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Dispute 3 – Alden Determines / Identifies Where Vehicles Are and Are Not

Claims 11, 20, 26, 38, and 50

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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Alden Determines/Identifies Where Vehicles Are and Are Not

Claim 11	Claim 20	Claim 26	Claim 38	Claim 50
identify entities including at least one of beings, **vehicles**, roadway, or street signs and wherein the logical controller is further configured to modify the headlight beam to change illumination of the identified entity.	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**,	**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	**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	**identify** entities including at least one of beings, **vehicles**, roadway, or street signs, and

IPR2023-01026 Pet. at 26-36, 49
IPR2023-01027 Pet. at 36-37, 47-48

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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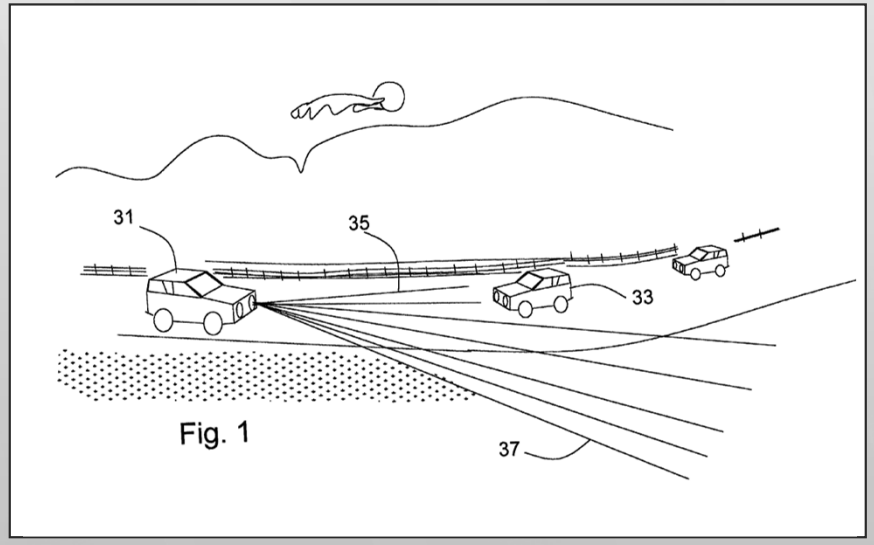
Alden Determines/Identifies Where Vehicles Are and Are Not

[0006] The present invention is a system for automatically controlling the distribution of a headlight in response to environmental conditions wherein, a means for sensing the locations of other vehicles is provided, said means dividing the exterior space into sectors and determining if an automobile is present in each respective sector. Additionally a

Alden at [0006]

The **31** comprising a means to detect the sector in which **33** (or any other vehicle) is located, the **31** also comprising a means to provide a first intensity of illumination in the sector where the **33** is detected while concurrently providing a second intensity (or alternate direction) of illumination where no vehicle is detected. Specific means for sensing locations of vehicles and independent sector illumination control within the light distribution area will be discussed later.

Alden at [0025]



Alden at Fig. 1

IPR2023-01026 Pet. at 26-36, 49; Pet. Reply at 16-17
IPR2023-01027 Pet. at 36-37, 47-48; Pet. Reply at 11, 16-17

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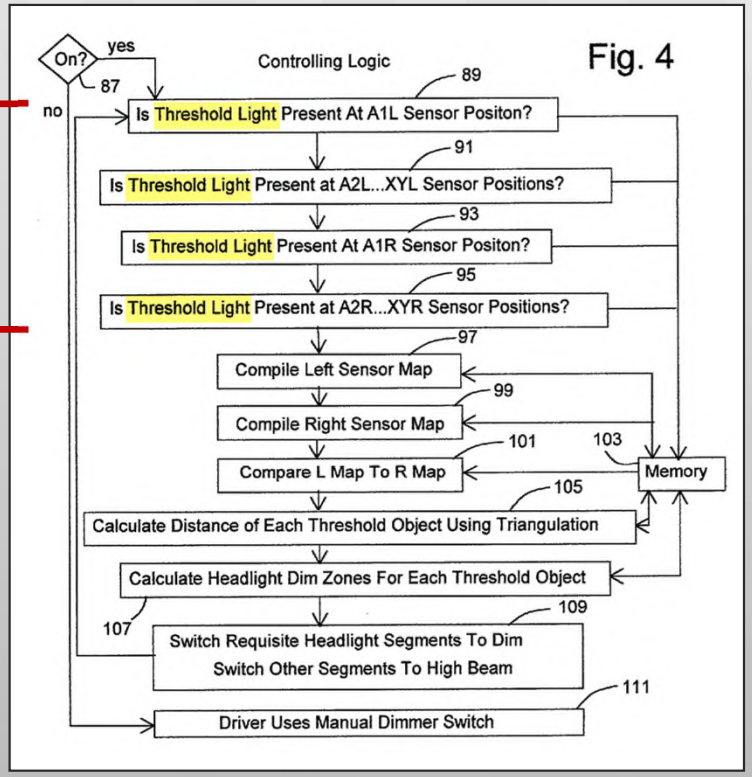
Alden Checks Each Sector to Determine Which Include a Vehicle

Alden teaches checking for light above a certain "threshold" at each location of the sensor array.



Alden at Fig. 4 (annotated)

sensor **51***b* are used concurrently. The **51***a* detects the two headlights of **41** at a first illuminated spot **43***a* and a second illuminated spot **43***b* respectively. These spots of light fall upon a photon detector array which otherwise doesn't receive significant light (in this illustration). Electrons corresponding to the position and intensity of light are categorized by a logic and CPU **71** and stored in a memory **72**. Meanwhile, **51***b* also detects the two headlights of **41** as a first spot **43***c* and a second spot **43***d* respectively. This

Alden at [0027]

When the system is on and the headlights are on, the CPU checks the status of each respective sector **89** of the light sensors. In a process to check the left sensor **89**, the first

Alden at [0028]

IPR2023-01026 Pet. at 26-36, 49; Pet. Reply at 9-11, 16-17
IPR2023-01027 Pet. at 36-37, 47-48; Pet. Reply at 11, 16-17

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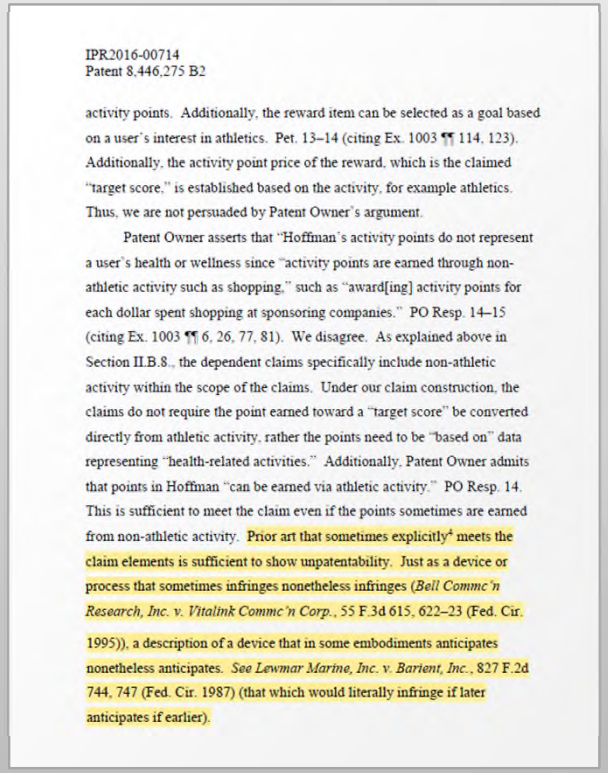
Identifying Vehicles with Perfect Accuracy Is Not Legally Required



IPR2016-00714
Patent 8,446,275 B2

activity points. Additionally, the reward item can be selected as a goal based on a user's interest in athletics. Pet. 13–14 (citing Ex. 1003 ¶¶ 114, 123). Additionally, the activity point price of the reward, which is the claimed "target score," is established based on the activity, for example athletics. Thus, we are not persuaded by Patent Owner's argument.

Patent Owner asserts that "Hoffman's activity points do not represent a user's health or wellness since "activity points are earned through non-athletic activity such as shopping," such as "award[ing] activity points for each dollar spent shopping at sponsoring companies." PO Resp. 14–15 (citing Ex. 1003 ¶¶ 6, 26, 77, 81). We disagree. As explained above in Section II.B.8., the dependent claims specifically include non-athletic activity within the scope of the claims. Under our claim construction, the claims do not require the point earned toward a "target score" be converted directly from athletic activity, rather the points need to be "based on" data representing "health-related activities." Additionally, Patent Owner admits that points in Hoffman "can be earned via athletic activity." PO Resp. 14. This is sufficient to meet the claim even if the points sometimes are earned from non-athletic activity. Prior art that sometimes explicitly[4] meets the claim elements is sufficient to show unpatentability. Just as a device or process that sometimes infringes nonetheless infringes (*Bell Commc'n Research, Inc. v. Vitalink Commc'n Corp.*, 55 F.3d 615, 622–23 (Fed. Cir. 1995)), a description of a device that in some embodiments anticipates nonetheless anticipates. *See Lewmar Marine, Inc. v. Barient, Inc.*, 827 F.2d 744, 747 (Fed. Cir. 1987) (that which would literally infringe if later anticipates if earlier).

from non-athletic activity. Prior art that sometimes explicitly[4] meets the claim elements is sufficient to show unpatentability. Just as a device or process that sometimes infringes nonetheless infringes (*Bell Commc'n Research, Inc. v. Vitalink Commc'n Corp.*, 55 F.3d 615, 622–23 (Fed. Cir. 1995)), a description of a device that in some embodiments anticipates nonetheless anticipates. *See Lewmar Marine, Inc. v. Barient, Inc.*, 827 F.2d 744, 747 (Fed. Cir. 1987) (that which would literally infringe if later anticipates if earlier).

Fitbit, Inc. v. Aliphcom, Inc., IPR2016-00714, Paper No. 27 at 22-3 (PTAB Sept. 13, 2017)

IPR2023-01027 POR at 46
IPR2023-01027 Pet. Reply at 16-17

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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Dispute 4 – Illuminance Above and Below a Predefined Threshold / Illuminance

Claim 37, 59, and 65

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Mercedes-Benz USA LLC v. Spero
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Alden Renders Obvious Claims 37, 59, and 65

Claim 37	Claim 59	Claim 65
a headlight beam . . . **illuminates a first subsection** of the field-of-view including at least a portion of the second vehicle **with an illuminance below a predefined threshold value**, while the beam substantially **illuminates at least the one or more second subsections** of the field-of-view to either side of the first subsection **with an illuminance above the predefined threshold value**	the illumination aimed at the first subsection substantially resulting in **light below a first predefined illuminance in the first subsection**, and that aims illumination at one or more second subsections of the field of view to either side of the first subsection, the illumination aimed at the one or more second subsections substantially resulting in **light above the first predefined illuminance in the one or more second subsections**	an illumination level for the first subsection that substantially **illuminates the first subsection below a predefined illuminance**, and determining an illumination level for the one or more second subsections that substantially **illuminates the one or more second subsections above the predefined illuminance**

IPR2023-01027 Pet. at 11-36

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Alden Discloses Claims 37, 59, and 65

which are not dimmed remain on high beam. Thus (assuming the sensed light is above a threshold intensity or distance) the light sent to the sensed vehicle location is dimmer than the light sent to all other areas of the headlight distribution area. The process then begins again so as to be

Alden at [0028]

array matrix and tell which areas are in which state.) The **55***a* controls the power flow from **73** to a left segmented headlight **83** which distributes high beams throughout its distribution areas except in a box in the direction of the **41**. Similarly, the **55***b* controls the power flow from **73** to a right segmented headlight **83** which distributes high beams throughout its distribution areas except in a box in the direction of the **41**. Thus the driver of **41** has minimum glare while the driver of **47** has maximum light.

Alden at [0027]

IPR2023-01027 POR 28-33; PO Sur-reply at 11-12
IPR2023-01027 Pet. at 25; Pet. Reply at 6-7; Papanikolopoulos Decl. (EX1003) at ¶67; Second Papanikolopoulos Decl. (EX1013) at ¶17

Alden Discloses Claims 37, 59, and 65

17. First, as explained in my first declaration, Alden discloses a threshold because Alden teaches the intensity of its low beam light must be dim enough such that it produces "minimum glare." (EX1003, ¶67.) Stated differently, a POSITA would have understood from these teachings that Alden contemplated a certain threshold light intensity that the dim, low beam is lower than to ensure it does not cause glare for other drivers, and that the high beam light would similarly be above this threshold to provide "maximum" visibility. (*Id.*)

IPR2023-01027 POR 28-33; PO Sur-reply at 11-12
IPR2023-01027 Pet. at 25; Pet. Reply at 6-7; Papanikolopoulos Decl. (EX1003) at ¶67; Second Papanikolopoulos Decl. (EX1013) at ¶17

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Alden in View of Stam Renders Obvious Claims 37, 59, and 65

- Stam discloses dimming headlamps to avoid an illuminance of 0.1 fc incident on other vehicles.
- It would have been obvious to a POSITA to use this value as a predefined threshold so as to not cause glare to other drivers.

> on Nov. 17, 1998. In order to avoid an illuminance of 0.1 foot candles (fc) incident on another vehicle at these angles, the vehicle high beam headlamps should be dimmed within 700 feet of another vehicle if the vehicles are at an angle of 0°, within 350 feet of another vehicle if the vehicles are at a horizontal position of 3°, and 200 feet of the other vehicle if the position of the other vehicle is at an angle of 6° to the longitudinal axis of the controlled vehicle. It can thus be seen that a preceding vehicle directly in front of the

Stam at 1

IPR2023-01027 Pet. at 22-27; Pet. Reply at 7-8

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
IPR2023-1027

Dispute 5 – Alden Detects and Increases Illumination for Upcoming Road Curves

Claims 15, 21, 32, 33, 54, 60, and 70

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
IPR2023-1027

Alden Detects Upcoming Road Curves (Claims 15, 21, 32, 33, 54, 60, and 70)

Claim 15/21	Claim 32/33	Claim 54/60	Claim 70
determine at least a road curvature, indicated by the sensor data, ahead of the vehicle	determining illumination for an upcoming [curve / turn] indicated by the sensor data	determine at least a road curvature, indicated by the sensor data, ahead of the first vehicle	determining illumination that increases illumination of an upcoming curve indicated by the data

IPR2023-01026 Pet. at 52-54
IPR2023-01027 Pet. at 50-52, 53

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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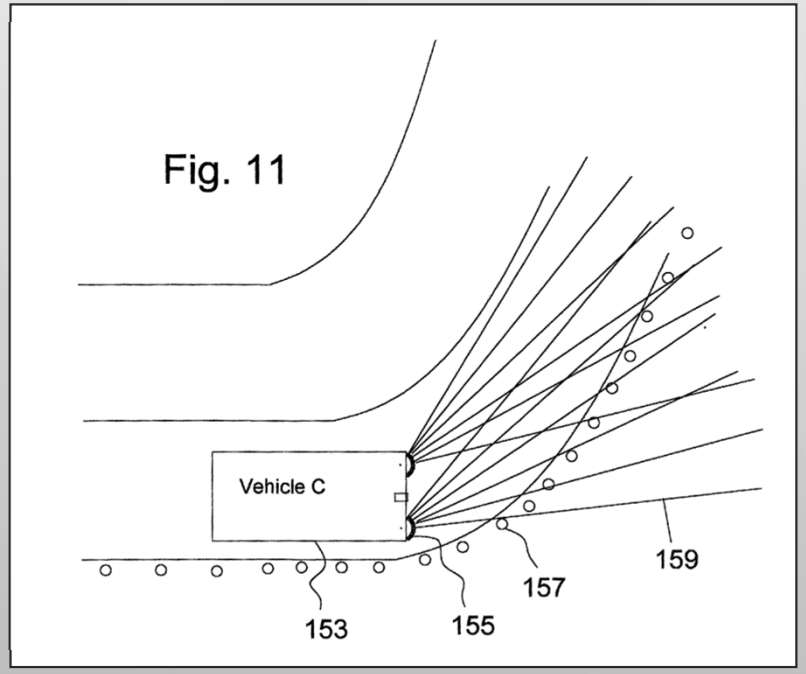
Alden Detects Upcoming Road Curves (Claims 15, 21, 32, 33, 54, 60, and 70)

[0036] **FIG. 11** illustrates the art of the present invention being used to concentrate light to look around corners in response to road conditions. An equipped vehicle **153** senses that the road turns by receiving light from reflectors such as a reflector **157**. The responding headlights **155** direct light into the corner to maximize the driver's ability to see there. The directing of light can be achieved with the segmented sensing elements and segmented light distribution elements described herein.

Alden at [0036]



Alden at Fig. 11

IPR2023-01026 Pet. at 52-54; Pet. Reply at 16-17
IPR2023-01027 Pet. at 50-52, 53; Pet. Reply at 17-18

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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Alden Can Distinguish Between Headlights and Reflectors

Patent Owner argues:

"Without knowing the difference between vehicles and reflectors, and absent a teaching to help differentiate between the two, Alden has no way of determining whether it should dim in response to detected light per the Figure 5 embodiment or perform some curve-accommodation per Figure 11"

But:

- Alden clearly discloses that it can ***both*** diminish glare and accommodate a curve.
- In describing Fig. 11 where the system is "used to concentrate light to look around corners," Alden discloses this "can be achieved with the segmented sensing elements and segmented light distribution elements described herein." Alden at [0036].
- Alden further discloses "one or more methods employed herein may be used in combination to vary illumination in a segmented system." Alden at [0061].

IPR2023-01026 POR at 53-56, 60; PO Sur-Reply at 19-21; IPR2023-01027 POR at 47-51; PO Sur-reply at 19-21
IPR2023-01026 Pet. at 52-55; Pet. Reply at 16-17
IPR2023-01027 Pet. Reply at 17-18

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Alden Can Distinguish Between Headlights and Reflectors

A POSITA would Understand:

- The logic of Figure 4 would apply to detecting roadside reflectors.
- As explained in [0036], instead of dimming where a curve is detected, the system will now "direct light into the corner" by switching LEDs aimed at the curve (*e.g.*, reflectors) to high beam and switching LEDs not aimed at the curve to low.
- To distinguish between different objects, such as roadside reflectors and oncoming vehicles, the threshold would simply be adjusted based on the type of object.

38. As explained in my first declaration, Alden teaches its system detects different objects by checking for light above a certain "threshold" intensity or distance at each location of the sensor array. (*See e.g.*, EX1003, ¶¶66, 77; Alden, Fig. 4, [0028].) To distinguish between different objects, such as roadside reflectors or oncoming vehicles, a POSITA would have understood from Alden that the threshold intensity or distance of the process described in Figures 3 and 4 may, for example, simply be adjusted based on the type of object. Additionally, Alden's system also evaluates the location/distance of detected lights in determining the headlight distribution pattern, which could also be used to differentiate between different objects. (Alden, [0028].) For example, differently from an oncoming vehicle which is continuously moving, a roadside reflector is usually fixed at a certain location and is often at the opposite side from the oncoming vehicle. Thus, a POSITA would understand that Alden's system can identify different objects not only based on the light intensities but also based on their locations. As I explained

IPR2023-01026 Second Papanikolopoulos Decl. (EX1011) at ¶38

IPR2023-01026 Papanikolopoulos Decl. (EX1003) at ¶¶66, 77; Second Papanikolopoulos Decl. (EX10011) at ¶¶37-38
IPR2023-01027 Papanikolopoulos Decl. (EX1003) at ¶¶60-61, 78, 142; Second Papanikolopoulos Decl. (EX10011) at ¶¶35-36
IPR2023-01026 Pet. Reply at 16-17
IPR2023-01027 Pet. Reply at 17-18

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Alden Increases Illumination for Upcoming Road Curves (Claims 15, 21, 54, 60, and 70)

Claim 15	Claim 21	Claim 54	Claim 60	Claim 70
wherein the required illumination includes **increasing illumination** in a direction of the road curvature	adjust the directional light sources to **increase illumination** in a direction of the road curvature.	determine a second illumination pattern defining **increased illumination** in a direction of the road curvature.	determine light output that **aims illumination in a direction of the road curvature**	determining illumination that **increases illumination** of an upcoming curve indicated by the data

IPR2023-01026 Pet. at 52-54,
IPR2023-01027 Pet. at 50-52, 53

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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Alden Increases Illumination for Upcoming Road Curves

Patent Owner argues:

Alden cannot increase illumination because "[t]he lamp already emits high beams everywhere there is not glare reduction."

But a POSITA would understand:

- Alden can be used for "many applications," including dimming where other vehicles are sensed and directing light into the area of road curves.
- The road curve accommodation functionality does not default all LEDs to high beam, but as explained by Dr. Papanikolopoulos, "the system can selectively switch certain LEDs to high beam—for example those at one of the extreme ends of the headlight curve in Figure 5—such that they would then direct high beam light into the area of the road curvature."

IPR2023-01026 Second Papanikolopoulos Decl. (EX1011) at ¶41

IPR2023-01027 Second Papanikolopoulos Decl. (EX1013) at ¶39

- Again, Fig. 4 shows the LEDs are not high beam by default, but rather Alden must "switch other segments to high beam."

IPR2023-01026 POR at 57-59; PO Sur-reply at 21; IPR2023-01027 POR at 51-54
IPR2023-01026 Pet. at 52-55; Pet. Reply at 18-20
IPR2023-01027 Pet. at 50-52; Pet. Reply at 18-20
Papanikolopoulos Depo. (EX2041) at 50:9-51:3, 73:25-74:24, 78:22-80:24

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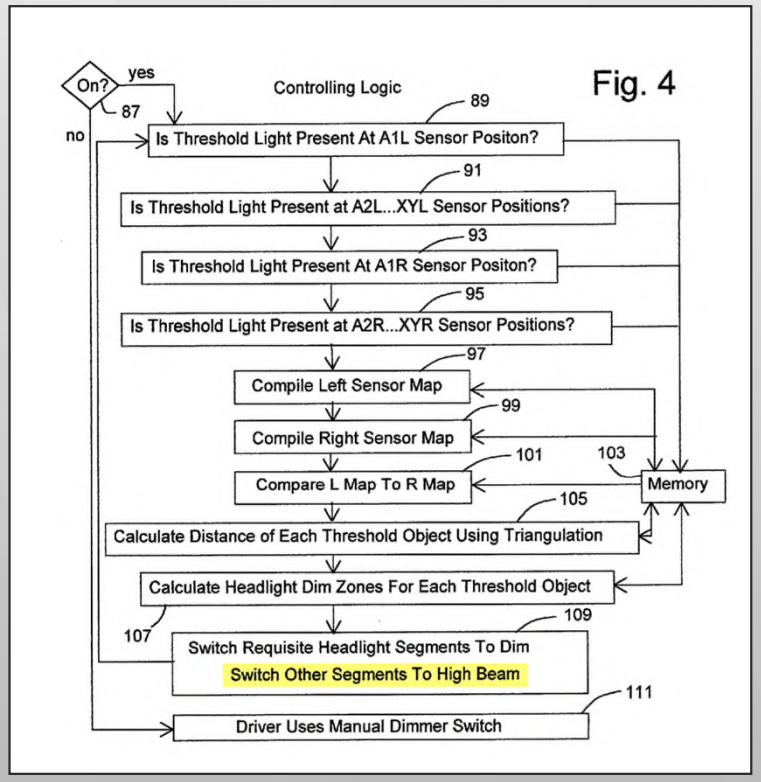
Alden Increases Illumination for Upcoming Road Curves

As Dr. Papanikolopoulos explained (EX2041 at 78:16-80:8), the road curve accommodation functionality is achieved using "the same logic" described in Fig. 4, with the system now configured to detect light from roadside reflectors and switch LEDs aimed at segments including the reflectors to high beam.



Alden at Fig. 4

IPR2023-01026 POR at 57-59; IPR2023-01027 POR at 51-54
IPR2023-01026 Pet. at 52-55; Pet. Reply at 18-20; Second Papanikolopoulos Decl. (EX1011) at ¶¶39-41
IPR2023-01027 Pet. at 50-52; Pet. Reply at 18-20; Second Papanikolopoulos Decl. (EX1013) at ¶¶37-41

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Other Disputes

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Alden Determines Illumination for Each Subsection

Claims 1, 26, 38, 59, and 65

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Alden Disclose Determine Illumination for a Subsection (Claims 1, 26, 38, 59, and 65)

Claim 1	Claim 26	Claim 38	Claim 59	Claim 65
determine an illumination for at least two of the sub-sections, that reduces illumination to reduce glare in at least a first of the at least two subsections	determining illumination for at least a first subsection …, and for at least a second subsection;	determine illumination for at least one first subsection … and for at least one second subsection	determine light output for the headlight system that aims illumination at the first subsection … and that aims illumination at one or more second subsections	determining illumination for at least a first subsection including the second vehicle and at least one or more second subsections

IPR2023-01026 Pet. at 11-26, 23-36
IPR2023-01027 Pet. at 11-36

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Alden Disclose Determine Illumination for a Subsection (Claims 1, 26, 38, 59, and 65)

Alden clearly discloses using maps of sensed light to determine whether and how the different subsection should be illuminated, as described in [0027]-[0028] and illustrated in Fig. 4:

> distance **41** is from **47**. Triangulation is thus used by the CPU to determine the distance which **41** is from **47**. This distance information is used to determine the intensity of light that will be produced by the **61** in the corresponding headlight sectors. Information from the **72** and **71** is sent to control the power flow from a power source **73** via a left light control circuit **55***a* and a right light control circuit **55***b*.

Alden at [0027]

IPR2023-01026 Pet. at 21-26, 32-36; Pet. Reply at 7-9, 10; EX1003 at ¶¶63-70, 79-86; EX1011 at ¶¶16-20, 22-23
IPR2023-01027 Pet. at 32-33, 34-37; Pet. Reply at 8-10, 10-11; EX1003 at ¶¶80-94; EX1013 at ¶¶20-26

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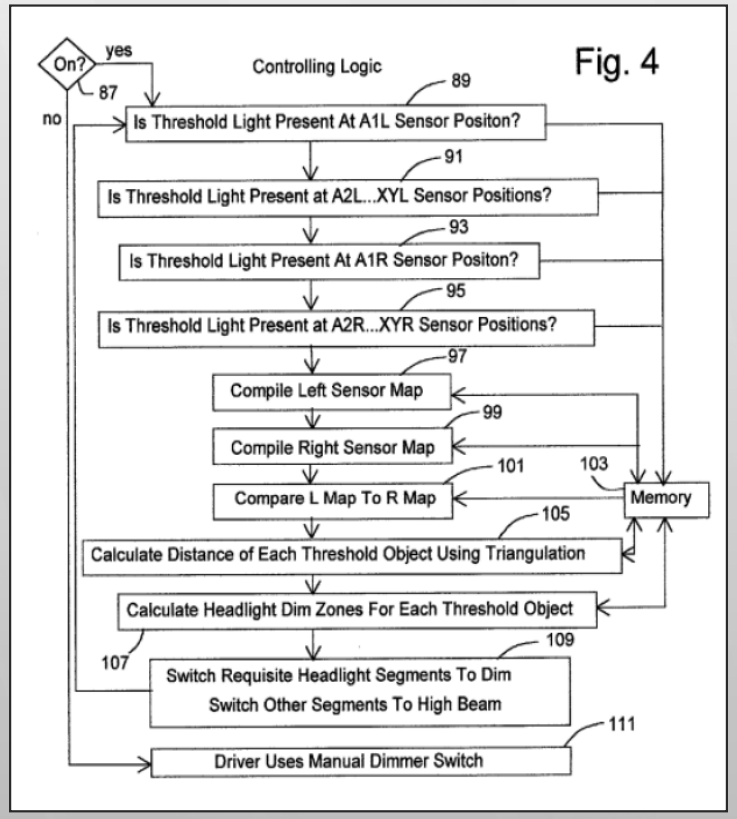
Alden Disclose Determine Illumination for a Subsection (Claims 1, 26, 38, 59, and 65)

- As shown in Fig. 4, Alden:
  - detects light at different sensor positions
  - determines sectors where the threshold light is present by compiling and comparing sensor maps
  - calculates distances to detected objects
  - determines the intensity of light that will be produced in the corresponding headlight sectors
  - switches the corresponding sectors to the appropriate illumination level



Alden at Fig. 4

IPR2023-01026 Pet. at 21-26, 32-36; Pet. Reply at 7-9, 10; EX1003 at ¶¶63-70, 79-86; EX1011 at ¶¶16-20, 22-23
IPR2023-01027 Pet. at 32-33, 34-37; Pet. Reply at 8-10, 10-11; EX1003 at ¶¶80-94; EX1013 at ¶¶20-26

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The Petitions Explain How and Why the References Would Be Combined

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Alden in View of Harbers (Claims 5, 28, 29, 45, 68, and 69)

- The claims recite illuminating sub-sections of the field-of-view with different colors.
- Harbers discloses vehicle headlights with LEDs that can be controlled to change the color of different headlight beam segments.
- It would have been obvious to apply these teachings to Alden to further improve a driver's vision by selectively illuminating areas with yellow light or blue light.

> Preferably, a first beam segment has a spectral characteristic which is rich in green-yellow light, and a second beam segment has a spectral characteristic which is rich in blue-green light. On the one hand, in the on-axis part of the light beam (the first beam segment) a spectral characteristic of the light is presented which is adapted to the photopic eye-sensitivity curve, i.e. rich in green-yellow light. On the other hand, in the off-axis parts of the light beam (the second beam segment) a spectral characteristic of the light is presented which is adapted to the scotopic eye-sensitivity curve, i.e. rich in blue-green light.

> Under unfavorable weather conditions, in particular fog and snow, when visibility is reduced by backscattering caused by fog or snow particles, both the configuration and the spectral composition of the light beams generated by the light source 4; 5 can be adapted by activating different combinations of LEDs and by changing the output levels of the various LEDs. As a result of these adaptations, the spatial and/or spectral distribution of the light is changed. An example of such an adaptation is shown in Fig. 4A, wherein a relatively wide beam 16 is obtained which is substantially composed of yellow light. The absence of the blue component in the visible light causes the effect of backscattering to be substantially reduced.

Harbers at 6:1-7, 10:6-14

IPR2023-01026 POR 64-67; PO Sur-reply at 22-23; IPR2023-01027 POR 57-61; PO Sur-reply at 22
IPR2023-01026 Pet. at 49, 60-66; Pet. Reply at 21-22
IPR2023-01026 Pet. at 49, 55-57; Pet. Reply at 22-23

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Alden in view of Bergkvist (Claim 6 and 46)

- The claims recite the headlight further comprises outputting infrared or ultraviolet wavelengths.
- Bergkvist discloses a headlamp that outputs both visible and UV light to better illuminate roadside objects in the environment.
- It would have been obvious to apply Bergkvist's teaching to additionally include a UV light source to better illuminate roadside objects such as road signs and pedestrians in areas where visible light is not being projected.

A vehicle headlamp comprises a reflector and a headlamp glass constructed to produce a so-called full beam lobe when a light source is located in a predetermined position in relation to the reflector. The invention is characterized in that the light source (**11**) is constructed to transmit both a large proportion of visible light and a large proportion of ultraviolet light, and in that a filter (**19; 22; 23**) is located in the beam path of the headlamp and is effective in filtering that part of the light emitted by the light source (**11**) which gives rise to a light lobe corresponding to the difference between a so-called full beam lobe and a so-called dipped beam lobe. The headlamp is further characterized in that the filter (**19; 22; 23**) is constructed firstly to filter light so that substantially no light within the visible light spectrum will be transmitted through the filter, and secondly to transmit ultraviolet light.

Bergkvist at Abstract

IPR2023-01026 POR at 64-68; PO Sur-reply at 23-24; IPR2023-01027 POR at 61-62; PO Sur-reply at 22-23
IPR2023-01026 Pet. at 68-69; Pet. Reply at 22-23
IPR2023-01027 Pet. at 61-62; Pet. Reply at 23-24

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Alden in view of Beam (Claims 8 and 48)

- Claims 8 and 48 recite sensors configured to image lights indicative of preceding vehicles.
- Beam discloses sensing headlights *and taillights* of vehicles ahead of the equipped vehicle that could be "dazzled" by headlights.
- The Petition explains a POSITA would apply Beam's teaching of detecting both headlights and taillights to Alden to additionally reduce glare to preceding vehicles.

> The instant invention solves all of the enumerated problems by automatically sensing the presence and location of headlights and taillights ahead of the car on which it is mounted. It will then control the light output of a group selected from a multiplicity of narrow angle beams (microbeams) which comprise the overall headlight beam pattern. By controlling an area determined by analyzing the position of the lights sensed ahead, the area of the beam that would dazzle the driver w ill be darkened, while maintaining fall intensity elsewhere. This can be done for any number of

Beam at 2:53-62

IPR2023-01026 POR, 68-69; PO Sur-reply at 24; IPR2023-01027 POR at 62-63; PO Sur-reply at 23-24
IPR2023-01026 Pet. at 69-73; Pet. Reply at 23-24
IPR2023-01027 Pet. at 70-72; Pet. Reply at 24-25

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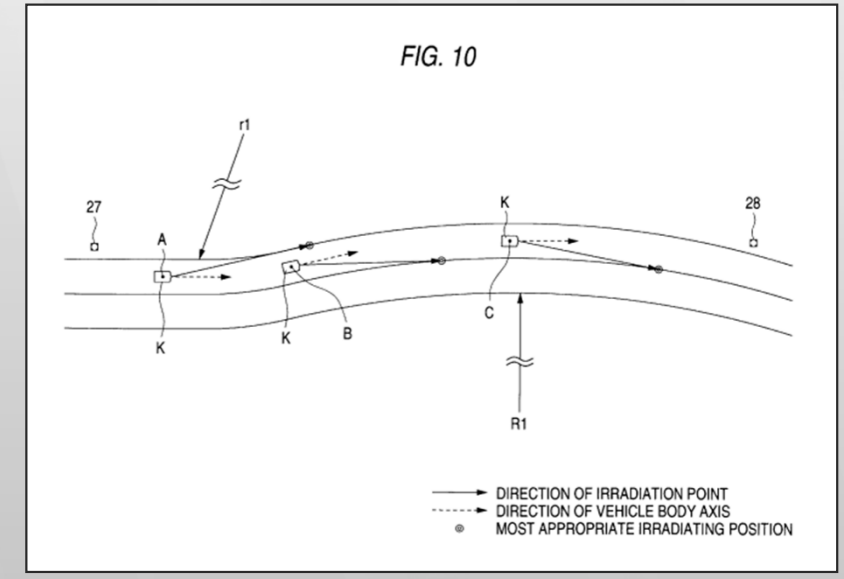
Alden in view of Kobayashi (Claims 9 and 49)

- Claims 9 and 49 recite that one of the sensors includes a GPS sensor.
- Kobayashi discloses a GPS sensor to gather information about the road profile to adjust the headlights to accommodate the road ahead.
- A POSITA would have been motivated to add Kobayashi's GPS sensor to Alden's system to, for example, have multiple sensors to assist in detecting road curves in different environments.



GPS navigation device **29** sends information about the road profile and the present vehicle position to ECU **10**.

Kobayashi at Fig. 10, 17:39-40

IPR2023-01026 POR at 70; IPR2023-01026 POR at 63-64
IPR2023-01026 Pet. at 76-78; Pet. Reply at 24-25
IPR2023-01027 Pet. at 69-71; Pet. Reply at 25-26

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Alden in view of Braun (Claims 66 and 67)

- The claims recite determining illumination using data indicating road-signs and pedestrians.
- Braun discloses using cameras to image the roadway and using pattern recognition to identify objects including roadway signs and people in a road.
- It would have been obvious to a POSITA to apply Braun's pattern recognition to detect objects in the roadway with Alden's ability to adjust light in response to sensed environmental conditions.

> In accordance with an embodiment of the present invention, 3D range-cameras 112 (Fig. 5) image the roadway scene and determine distances to objects and features in the scene. The pattern recognition application processes the images of the roadway scene and identifies roadway signs 121 and 122. Controller 118 optionally controls luxels in illuminators 116 of

> Other functions and variations of functions of headlights 101 and 102 and variations thereof, in accordance with embodiments of the present invention will occur to persons of the art. For example, headlights 101 and 102 might "pattern recognize" presence of people in a road in front of vehicle 100 and spotlight the people to alert the driver to their presence.

Braun at 24:2-5, 26:29-32

IPR2023-01027 POR at 64-66; PO Sur-reply at 24
IPR2023-01027 Pet. at 71-74; Pet. Reply at 26

Mercedes EX1016
Mercedes-Benz USA LLC v. Spero
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