

Spero's Demonstratives

Mercedes-Benz USA, LLC v. Yechezkal Evan Spero

IPR2023-01026 | IPR2023-01027

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

Consolidated Oral Hearing October 16, 2024

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Grounds – 1026 IPR

Petition:

V. PRECISE RELIEF REQUESTED

The relief requested is cancellation of the challenged claims, as follows:

Ground	References	Claims ²	Basis
1	Alden	1-4, 7, 10-17, 19, 20, 21-23, 25, 26, 27, 30-36	102 / 103
2	Alden/Harbers	5, 28-29	103
3	Alden/Bergkvist	6	103
4	Alden/Beam	8, 18, 24	103
5	Alden/Kobayashi	9	103

1026 Pet., 4-5

Institution Decision:

Regarding obviousness in view of Alden alone, Patent Owner argues that Petitioner has “failed to establish or demonstrate multiple elements that are required to support an obviousness conclusion, including explaining how

Alden must be modified (*i.e.*, identifying the differences between the claimed invention and Alden) and explaining why a POSA would be motivated to so modify Alden (*i.e.*, providing some articulated reasoning with some rational underpinning to support an obviousness conclusion).” Prelim. Resp. 37. In general, we agree. With the possible exception of claims 2–4, Petitioner has not provided any basis on which to account for differences between Alden and the challenged claims based on Alden’s disclosures alone.

1026 DI, 13-14

Grounds – 1027 IPR

Petition:

V. PRECISE RELIEF REQUESTED

The relief requested is cancellation of Claims 37-70, as follows:

Ground	References	Claims ²	Basis
1	Alden, alone or in view Stam	37-44, 47, 50-56, 58-59, 60-62, 64-65, 70	102 / 103
2	Alden (alone or with Stam) / Harbers	45, 68-69	103
3	Alden (alone or with Stam) / Bergkvist	46	103
4	Alden (alone or with Stam) / Beam	48, 57, 63	103
5	Alden (alone or with Stam) / Kobayashi	49	103
6	Alden (alone or in view of Stam) / Braun	66-67	103

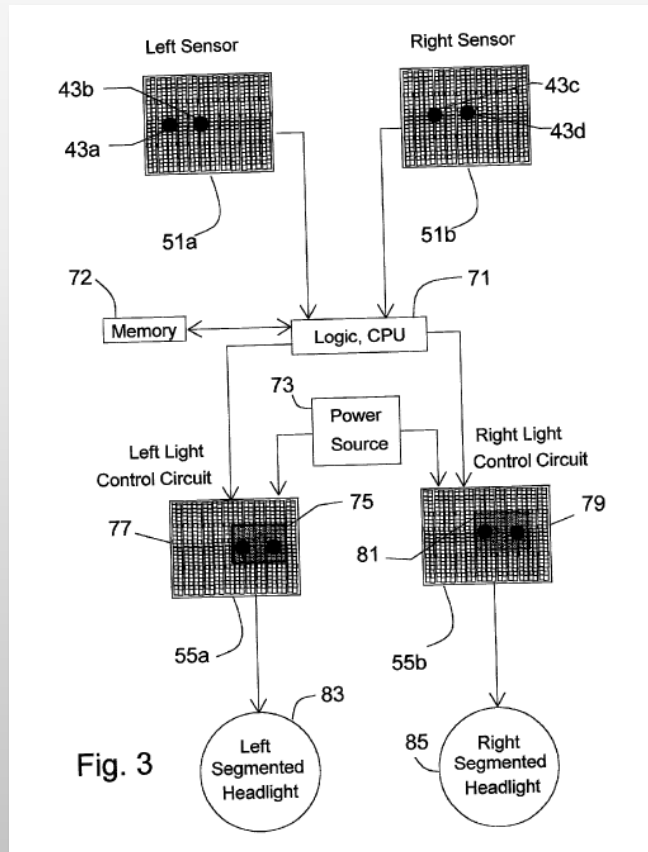
1027 Pet., 4-5

Institution Decision:

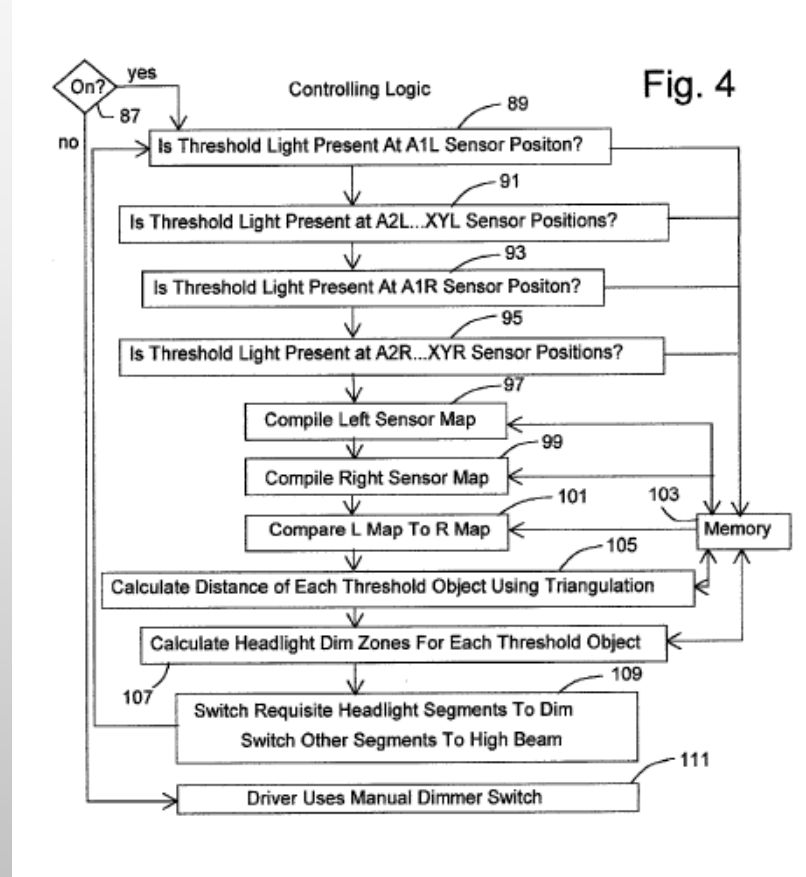
Regarding obviousness in view of Alden alone, Patent Owner argues that Petitioner has “failed to establish or demonstrate multiple elements that are required to support an obviousness conclusion, including explaining how Alden must be modified (i.e., identifying the differences between the claimed invention and Alden) and explaining why a POSA would be motivated to so modify Alden (i.e., providing some articulated reasoning with some rational underpinning to support an obviousness conclusion).” Prelim. Resp. 37. We agree. It does not appear that Petitioner has provided any basis on which to account for differences between Alden and the challenged claims based on Alden’s disclosures alone.

1027 DI, 10

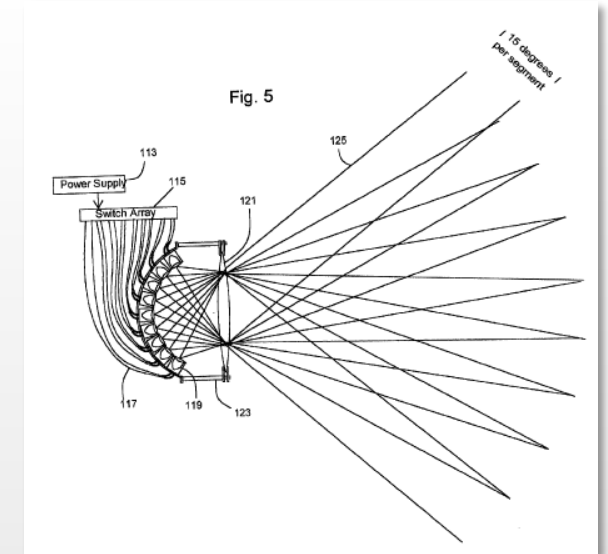
Alden



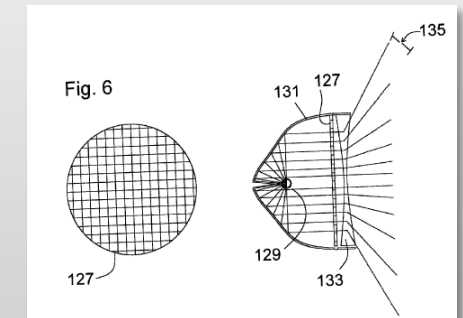
Ex. 1005, Fig. 3



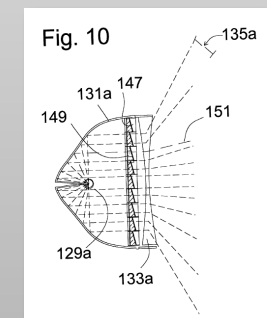
Ex. 1005, Fig. 4



Ex. 1005, Fig. 5



Ex. 1005, Fig. 6



Ex. 1005, Fig. 10

Alden—two modes low and high beam

Petition:

“Where Alden wants a sector of the headlight beam to be low or high, a determination is made to power the lighting elements for those sectors to produce low or high beam intensity light, as opposed to light at an intensity in the range between low and high.”
(Papanikolopoulos Decl., ¶67.)

1026 Pet., FN 6; *see also* 1027
Pet., FN 6

1. Anticipation & Petitioner's Burden

Petitioner's Burden

It is of "the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify 'with particularity' the 'evidence that supports the grounds for the challenge to each claim.'" *Id.* at 1369 (quoting 35 U.S.C. § 312(a)(3)). "A reply may only respond to arguments raised in the corresponding opposition or patent owner response." *Id.* (quoting 37 C.F.R. § 42.23(b)).

Colas Sols., Inc. v. Blacklidge Emulsions, Inc., 759 F. App'x 986, 989 (Fed. Cir. 2019)

1026 POR, 27-28; Sur-Reply, 3-4; see also 1027 POR, 26-27; Sur-Reply, 4

Anticipation and Petitioner's Burden

“A patent claim is invalid as anticipated only if each and every element of the claim is expressly or inherently disclosed in a single prior art reference.” *Guangdong Alison Hi-Tech Co. v. Int’l Trade Comm’n*, 936 F.3d 1353, 1363–64 (Fed. Cir. 2019) (citing 35 U.S.C. § 102 (2006) and *SRI Int’l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1192 (Fed. Cir. 2008)). In that regard, “[p]rior art that must be modified to meet the disputed claim limitation does not anticipate the claim ... Such modifications are permissible only in an obviousness analysis.” *Apple Inc. v. Corephotonics, Ltd.*, 861 F. App’x 443, 450 (Fed. Cir. 2021). Similarly, “inoperative embodiments cannot be anticipatory.” *Corephotonics*, 861 F. App’x at 451.

1026 POR, 14-15; see also 1027 POR, 14

Petitioner’s anticipation proofs must thus establish that the “four corners” of Alden “describe every element of the claimed invention either expressly or inherently.” *VirnetX Inc. v. Apple Inc.*, 665 Fed. App’x 880, 885 (Fed. Cir. 2016).

1026 POR, 17; see also 1027 POR, 16-17

Anticipation cannot be proven merely by “multiple, distinct teachings in a single prior art document that the artisan might somehow combine to achieve the claimed invention.” *Microsoft Corp. v. Biscotti, Inc.*, 878 F.3d 1052, 1069 (Fed. Cir. 2017) (emphasis added).

1026 POR, 16; see also 1027 POR, 16

Ambiguous References Cannot Anticipate a Claim

Anticipation also requires that a single reference “describe the claimed invention *with sufficient precision and detail* to establish that the subject matter existed in the prior art.” *Wasica v. Continental Automotive*, 853 F.3d 1272, 1284 (Fed. Cir. 2017) (emphasis added); *see also*, *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116, 1120 (Fed. Cir. 2002). **For this reason, as a matter of law, ambiguous references do not anticipate a claim.** *See, e.g.*, *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554 (Fed. Cir. 1983) (refusing to find claims anticipated when the prior art references were “unacceptably vague”); *see also*, *In re Hughes*, 345 F.2d 184, 188 (CCPA 1965); *In re Turlay*, 304 F.2d 893, 899 (CCPA 1962) (“It is well established that an anticipation rejection cannot be predicated on an ambiguous reference.”).

1026 POPR, 17-18; *see also* 1027 POPR, 17-18

Wasica v. Continental Automotive, 853 F.3d 1272, 1284 (Fed. Cir. 2017)

Anticipation– a POSA cannot “fill in” missing limitations

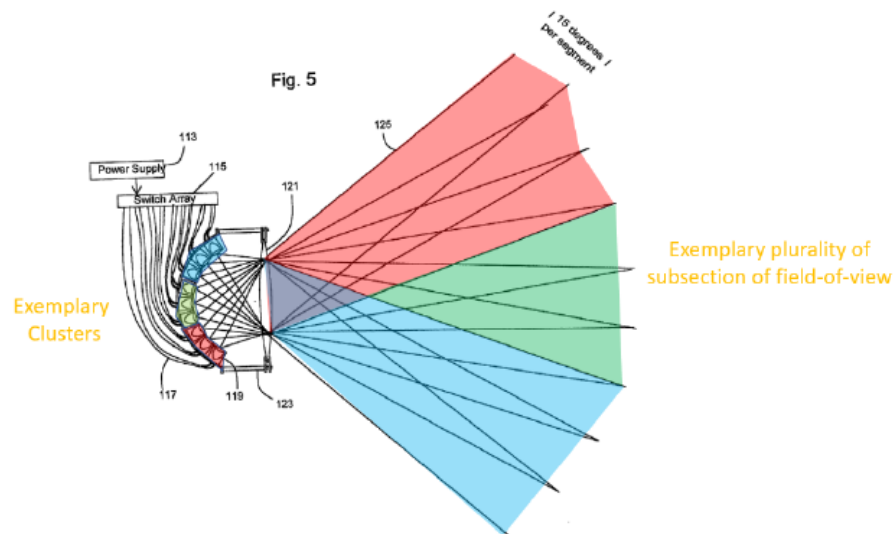
Prior art must be viewed as it is written and as it would be understood by persons in the field of the invention—not as it might have been written to describe a different development. See *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 851 F.3d 1270, 1274-75 (Fed. Cir. 2017) (This court’s precedent “does not permit the Board to fill in missing limitations” **even if** “a skilled artisan would immediately envision them.”) (citation omitted).

1026 Sur-Reply, 9; see also 1027 Sur-Reply, 8-9

2. Failure of Proof - Fig 5

Per Petition, Fig 5 is a 1D Array

Alden's system includes a "plurality of light clusters" to create a headlight beam, as it includes a plurality of lighting elements (e.g., LEDs) arranged in the headlamps to project light. (Alden, [0027], Fig. 5.) Further, these lighting elements are "on a curve along the focal point of a headlight lens 121," with different groups projecting light into different areas in front of the vehicle, e.g., left, center, right:



1026 Pet., 14; *see also* 1027 Pet., 13-14

As shown, each element is directed at a different angle or direction relative to the front of the first vehicle. (Nikos Decl., ¶76.)

1027 Pet., 30 (Claim 59); *see also*
1026 Pet., 28 (Claim 20)

only with dimming light when other vehicles are detected, but also illuminating curves in the road. (EX2041, 79:18-80:24.) 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.)

1026 Reply, 14-15; *see also* 1027 Reply, 14

Impermissible New Figure 5 Theory - Reply

Petition Argument:

"Alden's system includes . . . a plurality of lighting elements (e.g., LEDs) arranged in the headlamps . . . [T]hese lighting elements are 'on a curve along the focal point' of a headlight lens 121,' with different groups projecting light into different areas in front of the vehicle, e.g., left, center, right[.]

[E]ach lighting element is directed at a different angle relative to the front of the vehicle, based on its position along the curve. (Papanikolopoulos Decl., ¶73.)

1026 Pet., 14, 28; see also 1027 Pet., 13-14, 30

Reply Argument:

"Moreover, as the Board correctly found in its Institution Decision ("DI"), Alden is clear that Figure 5 is not limited to a single row of LEDs. (DI, 9-11; Second Declaration of Dr. Nikolaos Papanikolopoulos (EX1011), ¶¶5-15.) Nowhere does Alden call the LEDs a 'row' or indicate they are 'one dimensional.' . . . Figure 5 is simply a sectional view of one row in this array."

1026 Reply, 1-2; see also 1027 Reply, 2

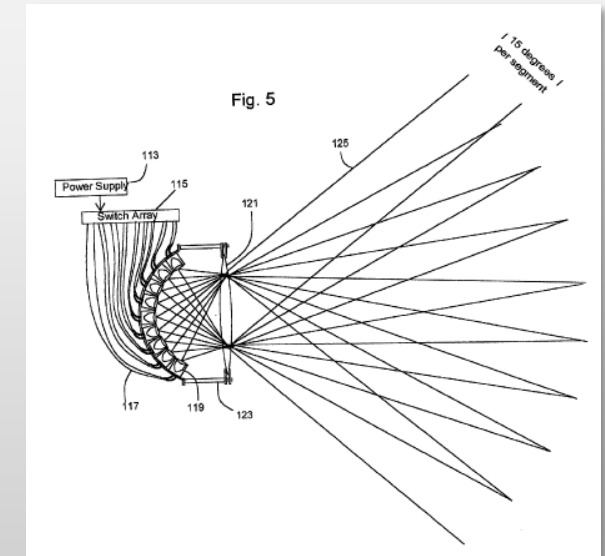
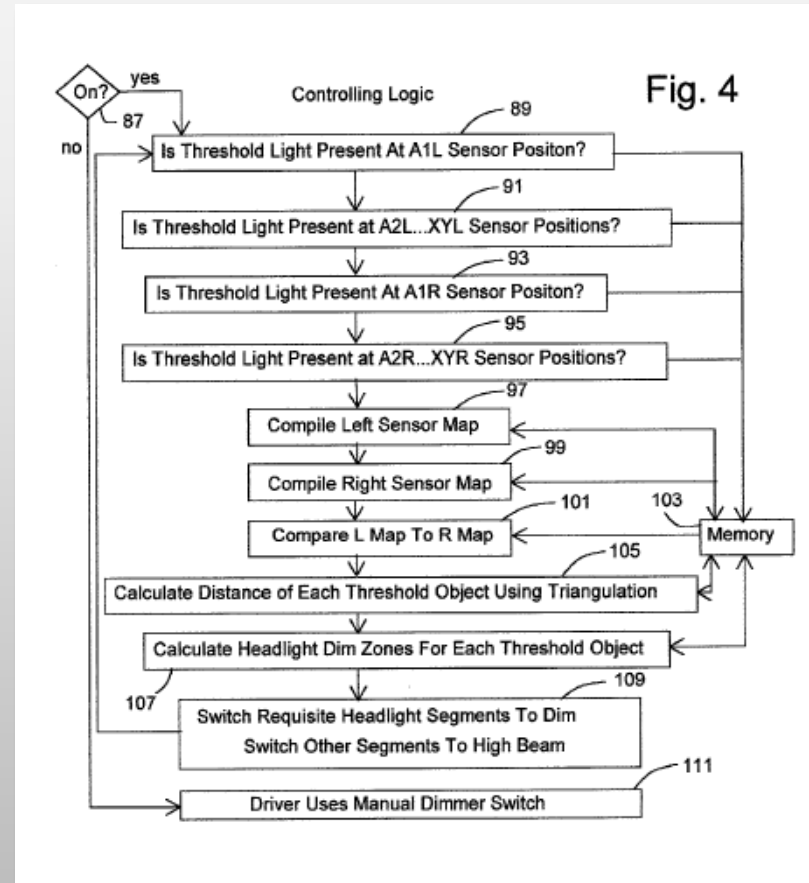
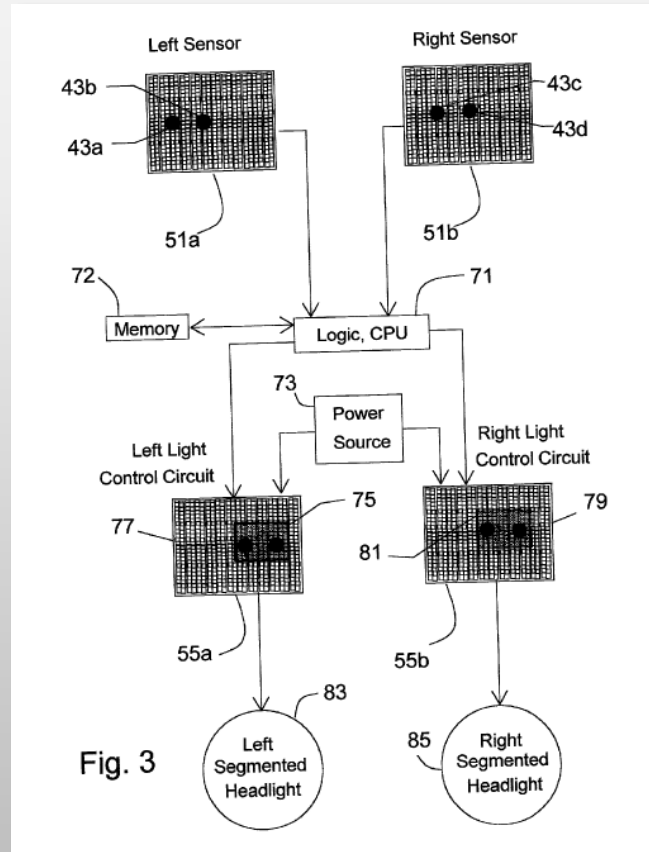
In sum, inherency was an all or nothing theory. Colas's Petition and its evidence were tailored to prove inherency. That theory failed. Colas's belated attempt to stretch that evidence to fit its alternative "overlapping ranges" theory only underscores that this theory was an afterthought raised for the first time in its Reply. Thus, the Board correctly concluded the theory was waived.

Colas Sols., Inc. v. Blacklidge Emulsions, Inc., 759 F. App'x 986, 990 (Fed. Cir. 2019)

Petitioner:

Additionally, Alden explains Figure 5's LED "array" is controlled by corresponding switches from a switch array using the "CPU and logic previously described" in Figures 3 and 4. (Alden, [0029] (emphasis added); First Deposition

1026 Reply, 2



Ex. 1005, Figs. 3-5 (annotated)

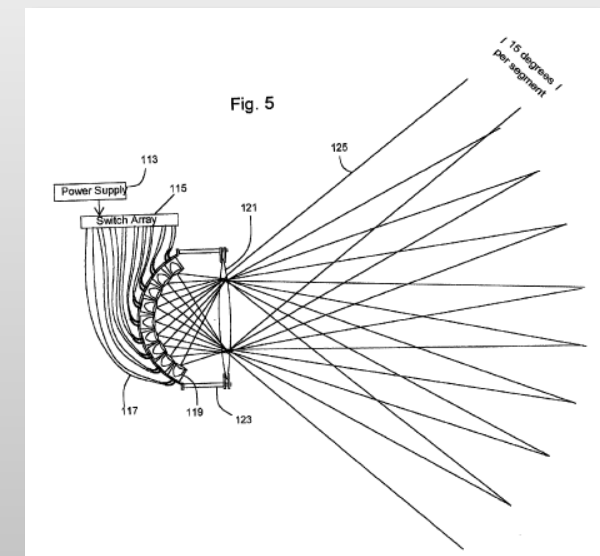
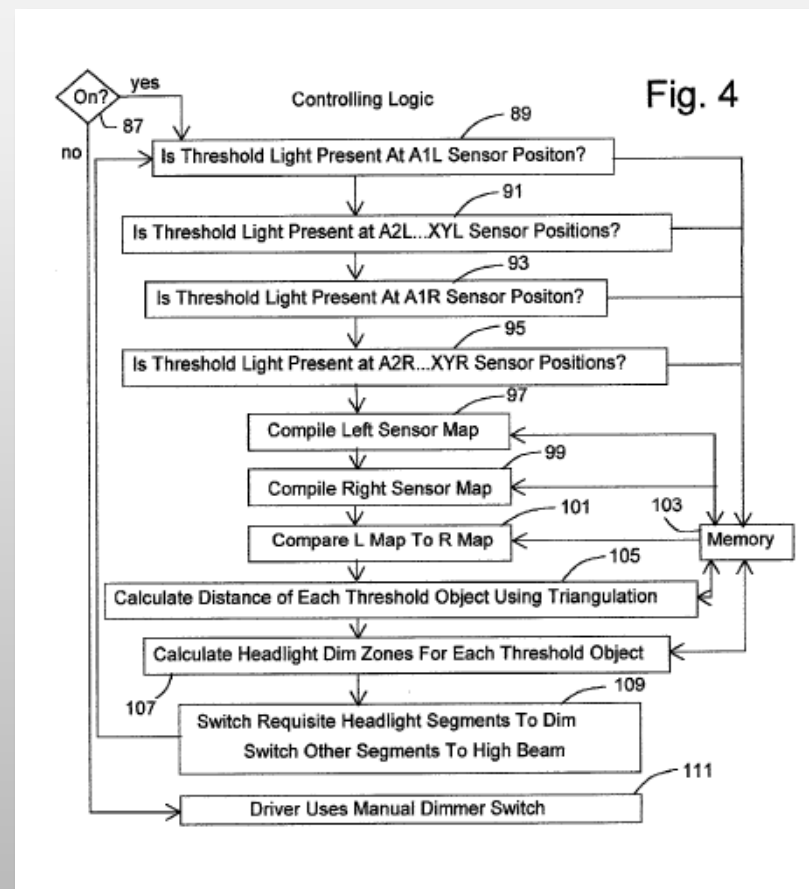
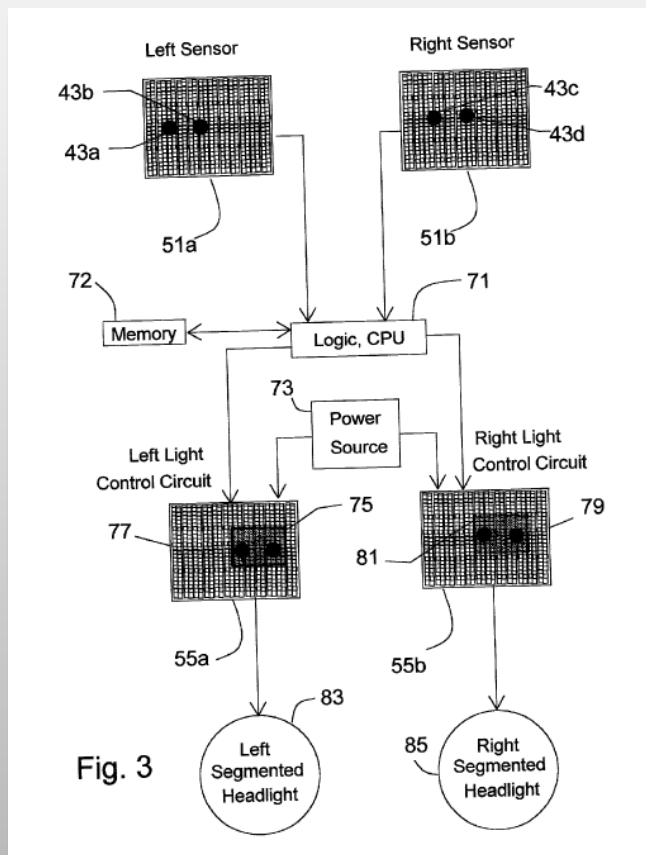
Petitioner:

Figures 3-4 disclose the CPU and logic selectively providing high beam and dimmed low beam light in different sectors across a two-dimensional plane, a POSITA would understand Figure 5 to likewise use multiple rows of LEDs. (Alden, Figs. 3-4, [0027]-[0028]; EX1011, ¶¶5-15.)

1026 Reply, 3; see also 1027 Reply, 4

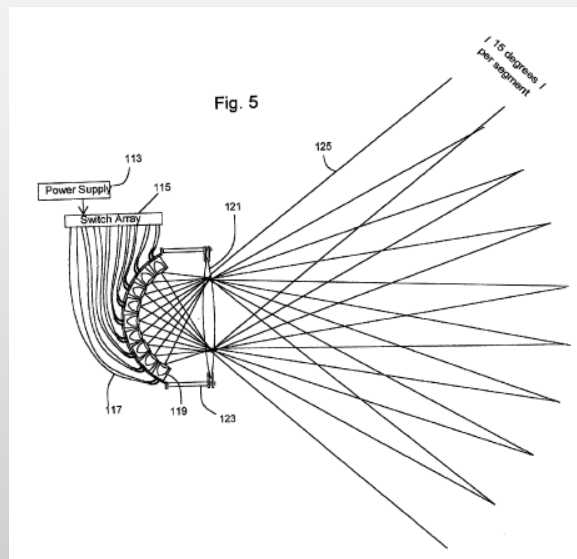
Further, Figure 4 discloses the CPU logic compiling two-dimensional (XY) sensor maps of the detected light and determining dimmed and high beam zones within this XY space. (Alden, Fig. 4, [0028]; EX1011, ¶¶5-15.) For this logic to apply to Figure 5, as Alden says it does, a POSITA would understand that a two-dimensional array would be used. (EX1011, ¶8; EX2041, 59:14-60:18; EX2066,

1026 Reply, 3; see also 1027 Reply, 4



Ex. 1005, Figs. 3-5 (annotated)

Alden's Actual Fig 5 Teachings



Ex. 1005, Fig. 5

[0029] FIG. 5 illustrates the segmented headlight means and controlling switch array in a first embodiment. The headlight 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 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. 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 light 125 being an example of an element's light being directed into one sector of the light distribution area. In the illustration, the 125 from 119 falls across a 15 degree section of the headlight distribution area. Each other lighting element similarly falls within a defined area of the light distribution area. Thus the light sent to the area of 41 is dimmed using a headlight with segmented lighting means.

Ex. 1005, ¶[0029]; see also ¶[0047]

New theory improperly relying on distinct embodiments

As stated in the POR, Alden **presents three distinct embodiments** with varying structural configurations of light sources, optics and materials. A POSA would not look to the second and third embodiments to interpret the first LED embodiment, let alone as clear support to **modify** the actual Figure 5 disclosure. (POR, 7-11.)

1026 Sur-Reply, 5-6; see *also* 1027 Sur-Reply, 5

Under Petitioner's new reply argument, a POSA would modify the express depiction and description of the Figure 5 LED embodiment, so it matches Figures 6-7 from the second embodiment and the two-dimensional switch array from Figure 3. ... **Petitioner could have presented this argument in its Petition, but did not**[.]

1026 Sur-Reply, 3; see *also* 1027 Sur-Reply, 2-3

Moreover, Figure 6's and 7's showings of two-dimensional elements undercuts Petitioner's position, as it establishes that **when Alden intended to show two-dimensional segmentation it clearly did so**. (Ex.1005, Figs 6-7.)

1026 Sur-Reply, 6; see *also* 1027 Sur-Reply, 5

Finally, **Petitioner incorrectly relies on functions ascribed to Alden's third embodiment**, depicted in Figures 11-13, contending that Alden provides that "its 'segmented light distribution elements' can perform, including 'directing light to look around corners,' 'concentrat[ing] light to look uphill,' ... and 'downhill.'" (Reply, 3.)

1026 Sur-Reply, 10-11; see *also* 1027 Sur-Reply, 10

Petitioner also points to the **boilerplate in ¶[0061]** as evidence that Figure 5 is able to "direct"/"concentrate" light. (Reply, 18-19.)

1026 Sur-Reply, 11; see *also* 1027 Sur-Reply, 10

Petitioner's expert agrees Alden is not clear

Petitioner's expert indicated that it is “*not clear*” and could not explain how the switch array shown in Figure 3 controls the LED array shown in Figure 5 to create the beam spread illustrated therein:

Q. Okay. So[,] does the figure 3 description affect the total beam spread of the figure 5 embodiment?

A. The figure 3 can inform. But, again, this is a **concept**. So[,] if you look at the number of rows on 77 and 79, it's not clear how many. Assuming that each element controls one LED, it's not clear and I cannot count here.

* * *

A. In figure 3. It's a reference as an array matrix. In other words, there are rows and columns. So here basically the disclosure is that each one of these controls one LED. And this is what the POSITA would understand at that time. So[,] **it doesn't give me any information how many rows, how many columns we have. It's a concept diagram. There are no dimensions, no scale.**

(Ex.2041, 108:11-18; 108:23-109:1-5, emphasis added.)

1026 POR, 19-20; see also 1027 POR, 18-19

Failure of Fig 5 Proofs

Alden lacks “sufficient precision and detail” to “necessarily” require an interpretation of the Figure 5 LED embodiment as a section of a two-dimensional array, per the doctrine of inherent anticipation. *See Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116, 1120 (Fed. Cir. 2002) (anticipation requires that “[a] single reference must describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in the prior art.”) ... Petitioner’s inferential evidence requires speculation (per Petitioner’s own expert) outside the four corners of Alden’s teachings and is thus insufficient to satisfy Petitioner’s anticipation burden. (Ex.2041, 108:14-18.)

1026 Sur-Reply, 7-8; *see also* 1027 Sur-Reply, 7

Were Figure 5 interpreted to include additional rows of LEDs, Alden lacks details regarding how the hypothetical structure would be put together—notably whether the two-dimensional LED structure would form a semi-cylinder, a semi-sphere or a flat plane (among other choices), which informs the control strategy and resultant beam spread. (Ex.2040, ¶¶80-87.)

1026 Sur-Reply, 8; *see also* 1027 Sur-Reply, 7-8

Given the lack of a clear disclosure and key gaps in how the hypothetical structure would be put together and then operate, at best Petitioner identifies ambiguities as to how Figure 5 should be interpreted—which establish that Petitioner has failed to meet its burden of proof. *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1284 (Fed. Cir. 2017).

1026 Sur-Reply, 9; *see also* 1027 Sur-Reply, 8

The Board recognized alternative interpretations

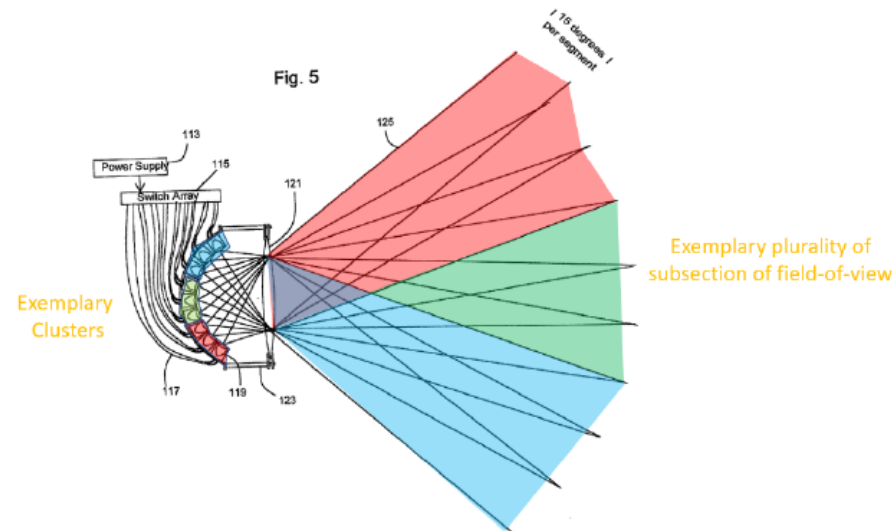
We find this argument unpersuasive because we conclude, on the present record, that one of ordinary skill in the art (see Section II.A), would understand that Figure 5 is a schematic/sectional type of drawing intended to show generally how the system components are connected and how the LEDs would project light through the lens, and that for clarity it omits other LEDs that would be necessary to produce a two-dimensional lighting pattern. We find that the skilled artisan would recognize that a headlamp intended to produce a pattern similar to that reflected in the control circuits of Figure 3 would include additional rows of LEDs passing through the center of the lens at different angles arranged around the center of the lens. Alternatively, we conclude that one of ordinary skill in the art wishing to use a headlamp with just a single line of LEDs would understand that the sensor and/or control circuitry would need to be tailored to such an arrangement.

1026 DI, 10-11; see also 1027 DI, 11-12

Petition - Inoperative 2D Switch Array + 1D LED array combination

1[B]: *a plurality of light clusters, . . . capable of projecting light so as to illuminate a plurality of sub-sections of a field-of-view with different illumination characteristics, . . . ;*

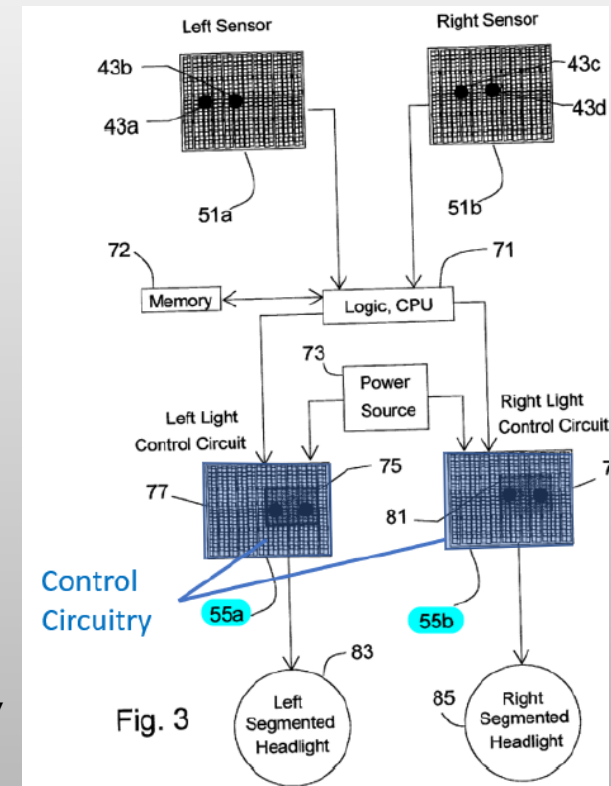
Alden's system includes a "plurality of light clusters" to create a headlight beam, as it includes a plurality of lighting elements (e.g., LEDs) arranged in the headlamps to project light. (Alden, [0027], Fig. 5.) Further, these lighting elements are "on a curve along the focal point of a headlight lens 121," with different groups projecting light into different areas in front of the vehicle, e.g., left, center, right:



1026 Pet., 13-14 (annotated)

1[D]: *electronic control circuitry configured to independently operate the light clusters;*

Alden discloses Claim 1[D]. (Papanikolopoulos Decl., ¶¶59-61.) Alden's system includes a "left light control circuit" (55a) and a "right light control circuit" (55b):

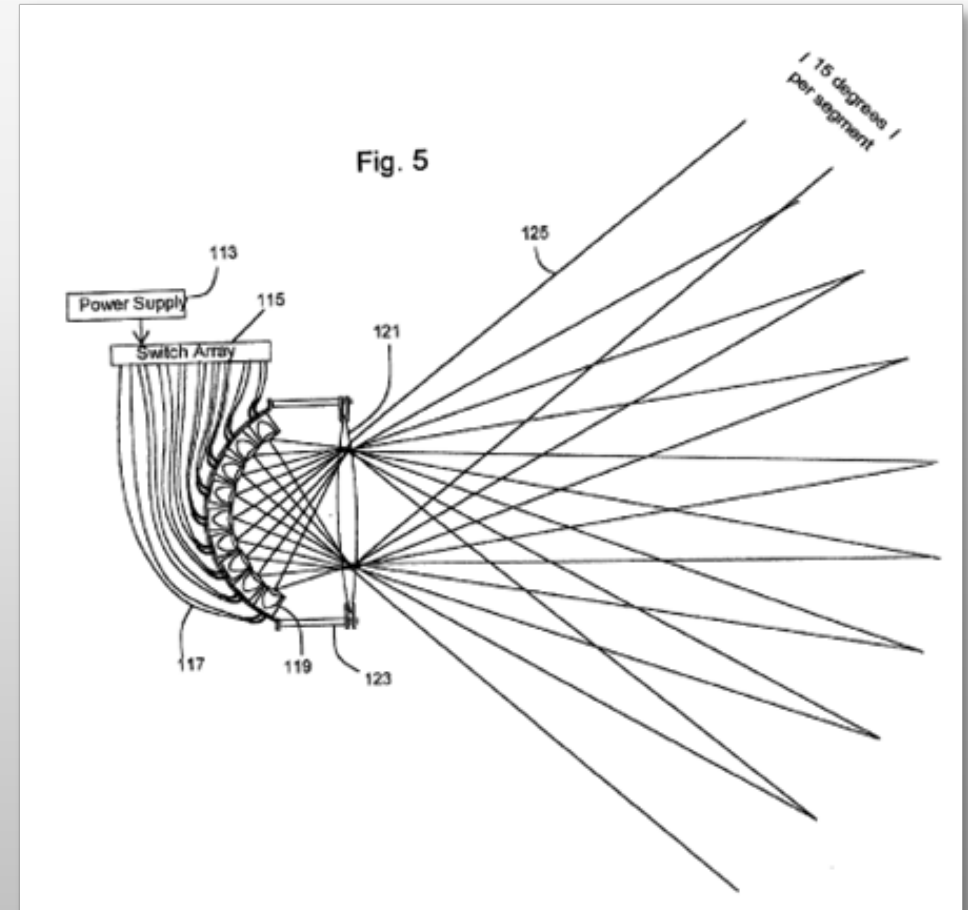


1026 Pet., 18-19, 22 (annotated)

Petition Controls through Trial

Likewise, the Petition unequivocally relies on the Figure 3 two-dimensional switch array to power the one-dimensional LED array from Figure 5. (Pet., 17-20.) Whether there is an alternative, unpresented argument that a POSA would modify the two-dimensional switch array to power the one-dimensional LED array of Figure 5 or modify Figure 5 to utilize a two-dimensional LED array is irrelevant—Petitioner did not present any such modification and must live with the shortcomings of the inoperable combination it proffered. As the Supreme Court explained in *SAS Institute*, a Petition “guide[s] the life of the litigation,” and Petitioner’s contentions “define the scope of the litigation all the way from institution through to conclusion.” *SAS Institute, Inc. v. Iancu*, 138 S. Ct. 1348, 1351, 1356, 1357 (2018).

1026 Sur-Reply, 2; see also 1027 Sur-Reply, 2

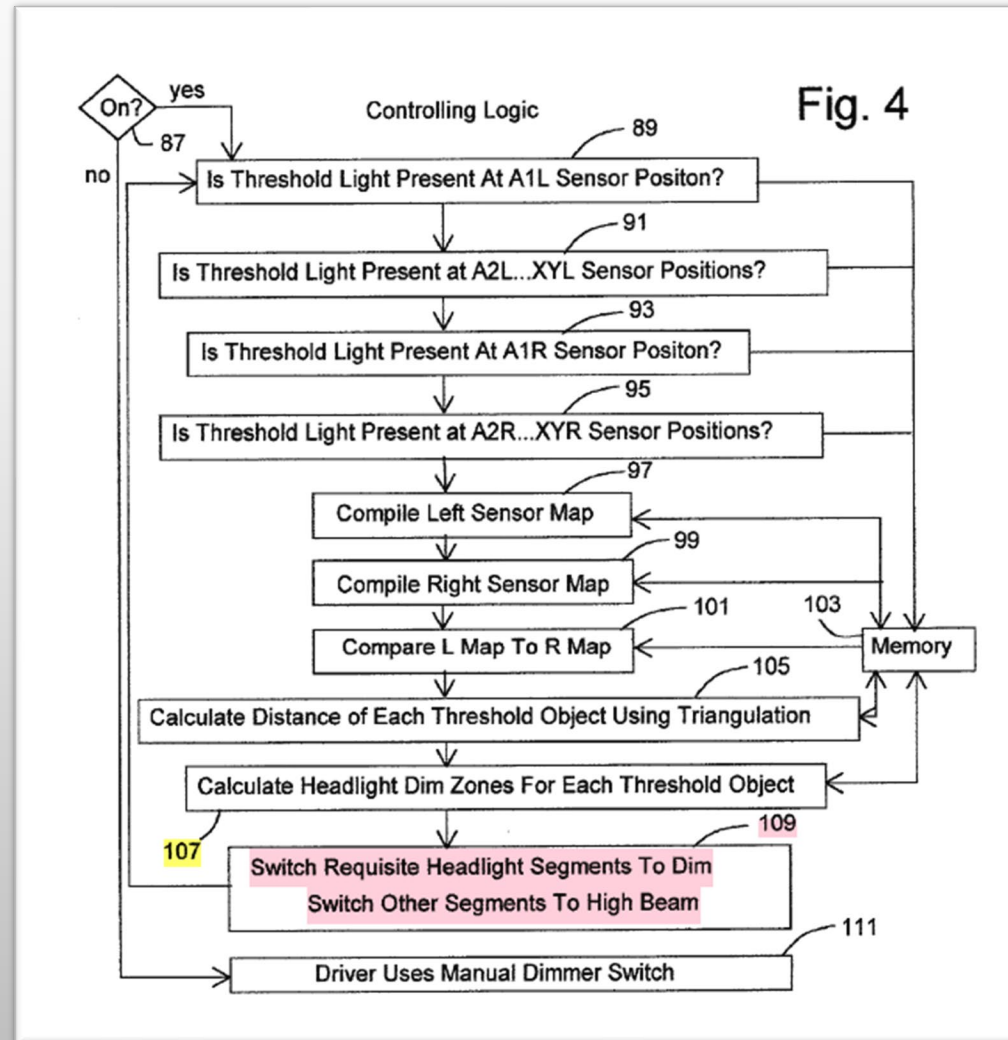


1026 POR, 8; see also 1027 POR, 8

3. Failure of Proof - “Determining” limitations

Claims 1, 20 and 26 Use Different “Determining” Limitations

20[E]: [1] **the processor**, in communication with at least the sensors and the control circuitry, **configured to:** [2] **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, [3] **determine optimal use** of the differently aimed directional light sources to maximize vehicle operator visibility in at least the second subsection, while minimizing a disturbing effect, resulting from the illumination output, on the vision of other traffic in at least the first subsection, and [4] direct the control circuitry to adjust the directional light sources to **achieve the determined optimal use**.



26[A]: utilizing one or more sensors of a vehicle including the adaptive headlight system to obtain and provide data predefined as relevant to a **determination of illumination requirements** for the field-of-view, the data including data indicative of at least one of one or more other vehicles or a pedestrian;

26[B]: **determining illumination requirements** for the field-of-view based on the data sensed by the sensors, including **determining illumination for at least a first subsection** of the field-of-view including the other vehicle or pedestrian, as indicated by the sensor data, and for at least a second subsection of the field-of-view not including the other vehicle or pedestrian;

26[E]: controlling the light clusters via the electronic control circuitry to collectively emit the headlight beam meeting the **determined illumination requirements**.

1026 Pet., 31-32

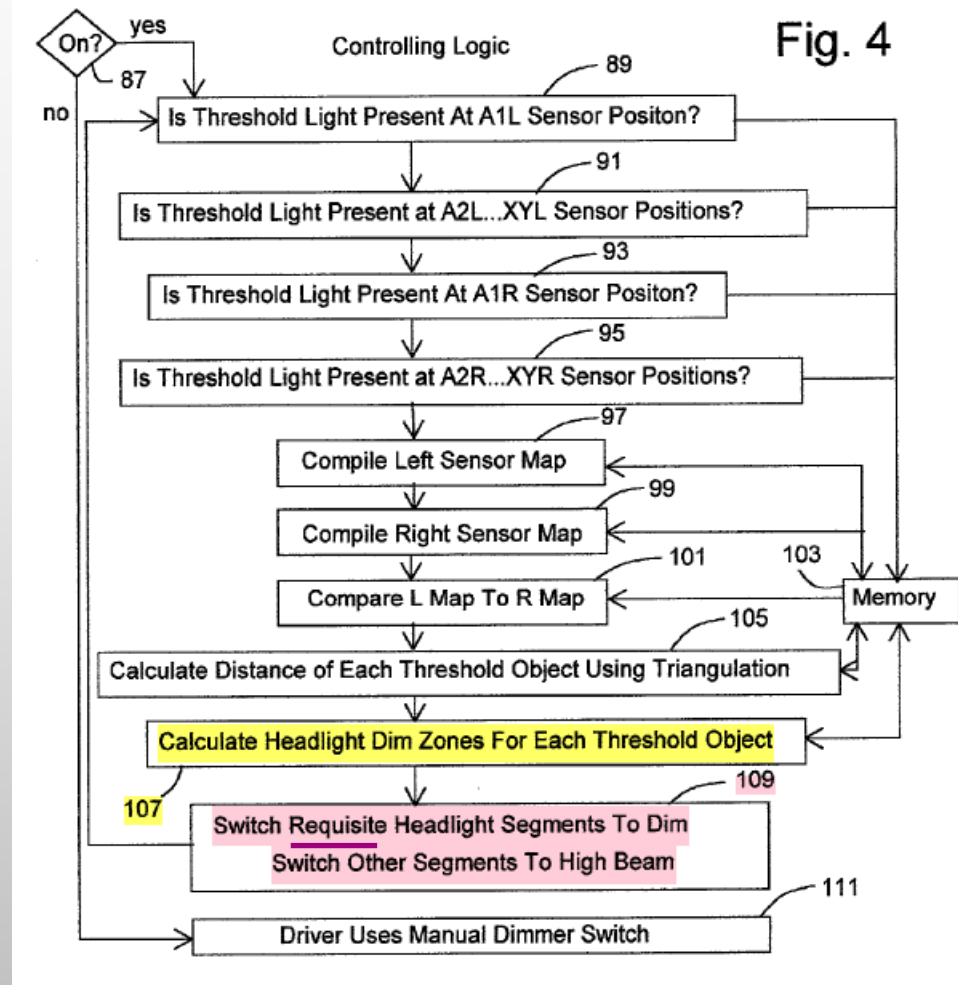
1026 Pet., 32-33, 35-36

Per Petition, Processor Determines Dim Zones (Step 107); Current is Restricted to the Dim Zones (Step 109)

20[E]: [1] **the processor**, in communication with at least the sensors and the control circuitry, **configured to:** [2] **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, [3] **determine optimal use** of the differently aimed directional light sources . . . to achieve the **determined optimal use**.

two subsections”). (Papanikolopoulos Decl., ¶68.) Alden describes that “[t]he location of objects is used to calculate which zones of each headlight need to be dimmed in a calculate headlight dim zones process 107. Signals are sent to each of the headlight control circuit zones that need to be dimmed to restrict the amount of current to the corresponding headlight zones such that they are dimmed in a dimming process 109. Zones which are not dimmed remain on high beam. Thus

1026 Pet., 25-26; see also 1027 Pet., 22-23



Ex. 1005, Fig. 4 (annotated)

Alden and Petition confirm binary low/high modes

Petition:

“Where Alden wants a sector of the headlight beam to be low or high, a determination is made to power the lighting elements for those sectors to produce low or high beam intensity light, as opposed to light at an intensity in the range between low and high.”
(Papanikolopoulos Decl., ¶67.)

1026 Pet., FN 6; *see also* 1027 Pet., FN 6

Claim 26--Alden does not teach “determin[ing] . . . illumination for at least two of the sub-sections”

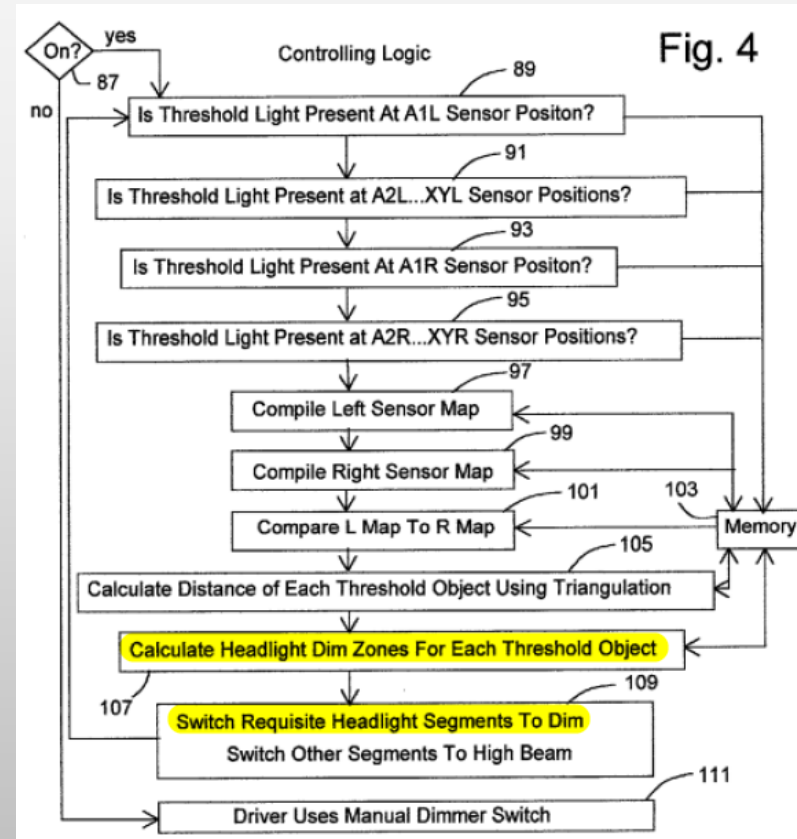
Alden

A triangulation process 105 is used to determine distance of each object. The location of objects is used to calculate which zones of each headlight need to be dimmed in a calculate headlight dim zones process 107. Signals are sent to each of the headlight control circuit zones that need to be dimmed to restrict the amount of current to the corresponding headlight zones such that they are dimmed in a dimming process 109. Zones which are not dimmed remain on high beam. 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.

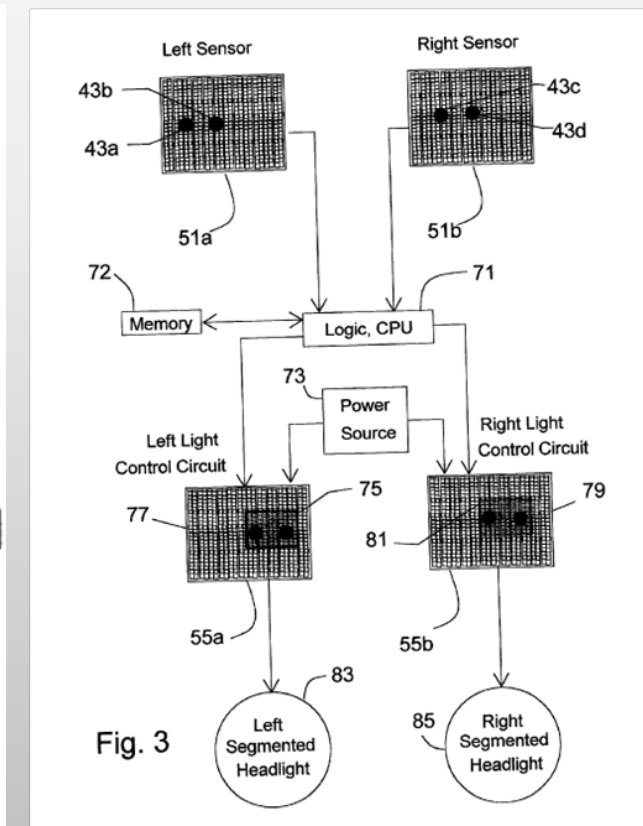
Ex. 1005, ¶[0028]

61 produces a high beam in a first sector 65 while concurrently producing a low beam in a second respective sector 63 (or dim beam) where the 41 is sensed. 61 also being mounted on 47. Thus the driver of 47 can see everything illuminated to the maximum except the area where 41 is. Meanwhile, the driver of 41 sees only a dim or low beam light from 47. Thus the light for both drivers is concurrently optimized by segmented the light distribution into independently controlled sectors.

Ex. 1005, ¶[0026]



Ex. 1005, Fig. 4 (annotated)



Ex. 1005, Fig. 3

Claims 37 and 59 – Different “Determining” Limitations

37[D]: *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,*

37[E]: *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*

1027 Pet., 18-27, 32-33, and 35

59[D]: *wherein the at least one processor is configured to: determine light output for the headlight system that aims illumination at the first subsection, 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; and*

“Determining” Limitation – Claim 65

65[B]: *determining illumination for at least a first subsection including the second vehicle and at least one or more second subsections, to either side of the first subsection, including determining 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;*

Alden discloses and renders obvious (alone or in view of Stam) Claim

65[B]. (Nikos Decl., ¶87.) *See supra* Claims 37[D]-37[E], 59[D].

1027 Pet., 35

Impermissible threshold theory change

Petition:

These intensities in between high beam and low beam (e.g., medium) are a “predefined threshold value” which the low beam would be below and the high beam would be above.
(Nikos Decl., ¶66.)

1027 Pet., 25

Reply:

Second, Petitioner does not define *everything* between high and low beam as the threshold value. (POR, 28.) Instead, because Alden’s headlights can operate at a range between high and low, there is some value within this, such as “medium” intensity, that the low beam is set below and the high beam is set above. (Petition, 25; EX1013, ¶19.)

1027 Reply, 7

Dependent Claims 39 and 40

39: The headlight system of Claim 37, wherein the plurality of light clusters are further capable of illuminating at least two of the sub-sections with different illumination characteristics based on the at least one processor determining specific, different illumination characteristics for each of the at least two sub-sections.

Alden anticipates and renders obvious (alone or in view of Stam) Claims 39. (Nikos Decl., ¶¶95-96.) As discussed, Alden’s “light clusters” **can illuminate different sub-sections of the headlight distribution area with different illumination characteristics**, based on the processor determining different illumination characteristics for each sub-section. See *supra* Claims 37[B], 37[D]-37[E]. In particular, Alden’s light clusters project light into different areas in front of the vehicle (e.g., first and second “sub-sections”) with different illumination characteristics. (Nikos Decl., ¶96.) Again, each individual lighting element is individually-controllable and on a curve along the headlight lens, “such that the light from each lighting element goes into a specified portion (or portions) of a headlight distribution area.” (Alden, [0025], [0029], Figs. 1-2, 5.) And the lighting elements can be controlled so that they illuminate sectors containing a detected other vehicle with low beam light, while illuminating sectors with no detected vehicle with high beam light. (*Id.*, Figs. 1-2, 5, [0026]-[0029]; see also Figs. 11- 13, [0036]-[0038].)

1027 Pet., 37-38 (emphasis added)

40: The headlight system of Claim 37, wherein the light distribution pattern defines illumination for at least the first and the one or more second sub-sections of the field of view.

Alden anticipates and renders obvious (alone or in view of Stam) Claim 40. (Nikos Decl., ¶97.) As discussed, in Alden the “light distribution pattern” is differing illumination levels output from the lighting elements in the headlamps, and that pattern defines the light to be produced in “the first and the one or more second sub-sections,” with light in some sectors where a vehicle is detected being dimmed and light in other sectors being high beam. See *supra* Claims 37[D]-37[E].

1027 Pet., 38-39

PO argues Petitioner fails to map Alden to the claim language because the “light distribution pattern” cannot be “different illumination levels *output* from the lighting elements.” (POR, 41-42.) This mischaracterizes the Petition, which explains that Alden determines which subsections of the field-of-view should be dimmed and which should be high beam—*i.e.*, a pattern of low and high beams across the headlight distribution area. (Petition, 18-24, 38.) This pattern of low and high beams is then output from the headlights. (*Id.*)

1027 Reply, 12

4. Alden does not disclose: “Identifying” Vehicles Claims 11, 50

Claim 11/50: The headlight system of claim 1/37, *further including a computer vision processing unit* configured to use the sensor data and one or more of the algorithms *to 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.

Patent Owner:

The light sensors of claim 1 are at best, a very rudimentary “computer vision processing unit” that is incapable of “identifying” a vehicle (or anything else). (Ex.2040, ¶224.) Per the claim construction principles laid out in *Phillips v. AWH Corp.*, the ordinary meaning of “identify” is to “show to be a certain person or thing; to fix the identity of”. (Ex.2065, 902.) The notion that Alden can “identify” a vehicle is a misstatement of the reference’s teachings. (Petition, 49.) In relevant part, Alden determines an area in which light should be diminished, based on the detection of light within that area. (Ex.2040, ¶224.) At no point does Alden provide an algorithm or any other teaching that allows Alden to “show or fix the identity of” the detected light as a vehicle, as compared to a myriad of other potential light sources. (*Id.*)

1026 POR, 52

Petitioner:

Alden anticipates and renders obvious Claim 11. (Papanikolopoulos Decl., ¶109.) Alden’s headlight system includes a “computer vision processing unit” with its logic CPU 71 and control circuitry 55. (Alden, [0027], Fig. 3; *see also* Figs. 11-13.) The logic CPU 71 and control circuitry 55 receive data from photodiode or CCD detector arrays 51, and use this data with algorithms (such as shown in Figure 4) to identify vehicles in the light distribution area in front of a vehicle. (*Id.*, [0027]-[0028], Figs. 3-4.) Alden further discloses that the logic CPU 71 and control circuitry 55 are configured to modify the output of the segmented headlight beam such that any detected vehicles in the light distribution area are illuminated with dimmed beams. (*Id.*, [0027]-[0028]; *see also* [0025]-[0026], [0029].) *See also supra* Claim 7.

1026 Pet., 49

“Identifying a Vehicle” Construction

Unrefuted construction:

(Ex.2040, ¶224.) Per the claim construction principles laid out in *Phillips v. AWH Corp*, the ordinary meaning of “identify” is to “show to be a certain person or thing; to fix the identity of”. (Ex.2065, 902.) The notion that Alden can “identify” a vehicle is a misstatement of the reference’s teachings. (Petition, 49.) In relevant

1026 POR, 52

Petitioner conflates sensing light with “identifying” a vehicle

PO’s sole argument is that Alden does not disclose “identifying” other vehicles, but rather “determines an area in which light should be diminished, based on the detection of light within that area.” (POR, 21-25.) This is wrong. A key purpose of Alden is to “sense the locations of *other vehicles*” and control the headlights in response to the “sensed vehicle[s].” (Alden, [0006]; *see also* [0008], [0003]-[0005], [0025]-[0029]; EX1003, ¶109.) Alden’s CPU “checks the status of each respective sector 89 of the light sensors,” assesses whether the detected light is “above a *threshold* intensity or distance” such that it indicates “two headlights of [an oncoming vehicle] 41,” and correspondingly determines “which zones need to be dimmed.”⁵ (Alden, [0027]-[0028]; *see also* Petition, 49.)

1026 Reply, 16-17; *see also* 1027 Reply, 16-17

Alden Senses Objects

Ex. 1005, ¶¶[0027]-[0028]

is stored in memory 99. The CPU compares the right map to the left map to determine the distance and intensity of each object sensed in a calculating process 101. A triangulation process 105 is used to determine distance of each object. The location of objects is used to calculate which zones of each headlight need to be dimmed in a calculate headlight dim zones process 107. Signals are sent to each of the headlight control circuit zones that need to be dimmed to restrict the amount of current to the corresponding headlight zones such that they are dimmed in a dimming process 109. Zones

* * *

which will be on high beam. The 81 area is significantly larger than the headlight dots that were initially received by 51a and 51b because, the CPU has made assumptions about the space that may potentially be occupied by the driver of the sensed vehicle. (The shaded areas of 55a and 55b are for illustrative purposes, in practice one can not look at a switch array matrix and tell which areas are in which state.) The 55a 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.

Petitioner's expert confirms- Alden can't "identify" a vehicle

The second one is actually using the same logic, which is described in figures 3, 4, and 5. I detect that, so my dots here in the figure 3 are going to be the reflectors. The reflectors are going to be something that corresponds -- it will have the same appearance on the image like the headlights.

Ex. 2041, 79:25-80:8

5. Alden does not teach/disclose
Control of the Light Modifying Elements
- Claims 2-4, 42-43

Claims 2, 3, 42, and 43 require control of the light modifying elements

42. The headlight system of claim 37, wherein at least one of the light clusters comprises:

one or more light sources, each having a variable light-source light characteristic dependent on power and alterable, at least responsive to instructions from at least one of the at least one processors, via power control; and

one or more light modifying elements provided in a path of light emitted from at least one of the light sources, further controlling at least one light characteristic of the at least one of the light source;

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 direction, intensity, beam spread, spatial light distribution, or spectral light distribution.

43. The headlight system of claim 42, wherein the one or more light modifying elements comprises at least one of reflectors or refractors, and wherein at least one of the at least one processors is configured to instruct control of at least one light modifying element resulting in a change to the light-source light characteristic.

Anticipation - Alden does not disclose “control of the . . . light modifying elements”

'503 Patent claims 2, 42

Dr. Papanikolopoulos:

90. Alden discloses Claim 2[B]. Alden discloses that each “light cluster” has one or more light emitting sources, *e.g.*, individual or groups of lighting elements 119). (Alden, Fig. 5, [0029].) *See also supra* ¶¶88-89 (Claim 2[A]). Alden further discloses that the light elements 119 have a “variable light source characteristic,” “intensity,” that is dependent on power. (Alden, Abstract, [0026]-[0029].) For example, Alden further discloses that the intensity of each light element is alterable, as it can be either a “high” or “low” (dim) beam, depending on the power supplied. (*Id.*)

1026 Ex. 1003, ¶90 (cited in Pet., 38); *see also* 1027 Ex. 1003, ¶¶100-101

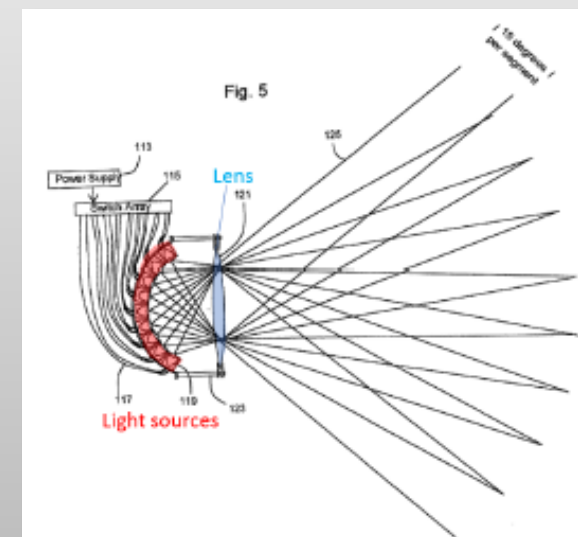
94. Alden discloses such a light modifying element, as it discloses a “lens 121” in the path of light emitted of lighting elements 119. (Alden, Fig. 5, [0029].)

1026 Ex. 1003, ¶94 (cited in Pet., 39); *see also* 1027 Ex. 1003, ¶104

Dr. Turk:

Thus, Alden discloses that the lens 121 adjusts the direction of light emitted by the light element 119, not its intensity. Given the interrelationship between claim elements 2[B] and 2[C], lens 121 does not “control” the intensity characteristic, as required by the claim.

1026 Ex. 2040, ¶204



Ex. 1005, Fig. 5 (annotated in 1026 Ex. 1003, ¶94)

Petitioner's anticipation arguments fail

'503 Patent claims 2, 42

Petitioner argues:

"The lens further controls intensity of these light sources in particular areas of the headlight distribution area."

1026 Reply, 14

42. The headlight system of claim 37, wherein at least one of the light clusters comprises:

* * *

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.

43. The headlight system of claim 42, wherein the one or more light modifying elements comprises at least one of reflectors or refractors, and wherein at least one of the at least one processors is **configured to instruct control of at least one light modifying element resulting in a change to the light-source light characteristic.**

Obviousness – Petitioner does not explain how a POSA would have combined Alden’s embodiments

'503 Patent claims 2, 42

Petitioner argues:

1. Alden’s Fig. 5 system “**can** include other ‘light modifying elements,’ including a ‘variable refractive element’[.]”

1026 Pet., 40

Alden:

The segmented distribution light can be used for many applications other than motor vehicles.

Ex. 1005, ¶[0061]

Obviousness – The Petition does not explain how a POSA would have combined Alden's embodiments

'503 Patent claims 2, 42

Petitioner argues:

A "POSITA would have readily understood how to implement the variable refractive elements in such system."

1026 Pet., 42

Dr. Papanikolopoulos:

we can put a refractor,
which is basically it's quite small, we can put it as
close to the LED as possible, among other options.

Ex. 2066, 79:13-16

A. A POSITA will have the option, depending on the particular task, but in this case in this scenario that I mention in the context I mention before, we can keep the lens.

Ex. 2066, 80:14-17

Petitioner's proposed combination would not work without collimated light

Dr. Turk:

'503 Patent claims 2, 42

Petitioner argues:

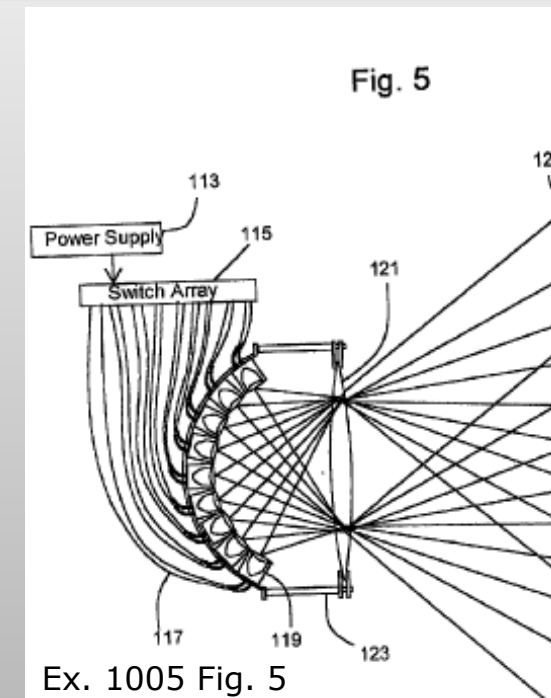
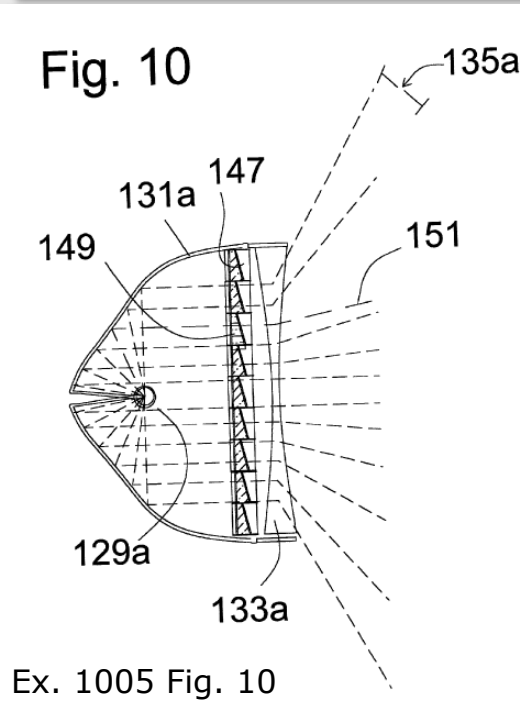
1. A "POSITA **would have had a reasonable expectation of success, as the refractor would perform its same function** of allowing light to pass straight through when a circuit is open and bending light when the circuit is closed."

1026 Pet., 42 (emphasis added)

However, LEDs do not provide collimated light.

208. Use of an electro-optic refractor in the lamp of Figure 5 would result in most light striking the refractor at non-perpendicular angles. Such birefringent crystal would effectively scatter such light and would not work with the embodiment of Figure 5.

Ex. 2040, ¶208



Petitioner's Improper New "refractive element at either end" Argument Fails to solve the collimation problem

'503 Patent claims 2, 42

Petitioner's Reply Argument:

Regarding why a POSITA would implement such a variable refractor, as the Petition explains, the variable 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 Dr. Papanikolopoulos explained, Alden is concerned not only with dimming light when other vehicles are detected, but also illuminating curves in the road. (EX2041, 79:18-80:24.) 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.*)

1026 Reply, 14-15; see also
1027 Reply, 14

6. Alden does not disclose the Predictive Curve Limitations

Claims 15, 21, 54, 60 require *“determin[ing] ... a road curvature . . . ahead of the vehicle”*

15. The system of claim 1, wherein the logical controller is further configured to determine at least a road curvature, indicated by the sensor data, ahead of the vehicle and wherein the required illumination includes increasing illumination in a direction of the road curvature.

54. The headlight system of claim 37, wherein at least one of the at least one processors is further configured to determine at least a road curvature, indicated by the sensor data, ahead of the first vehicle and to determine a second illumination pattern defining increased illumination in a direction of the road curvature.

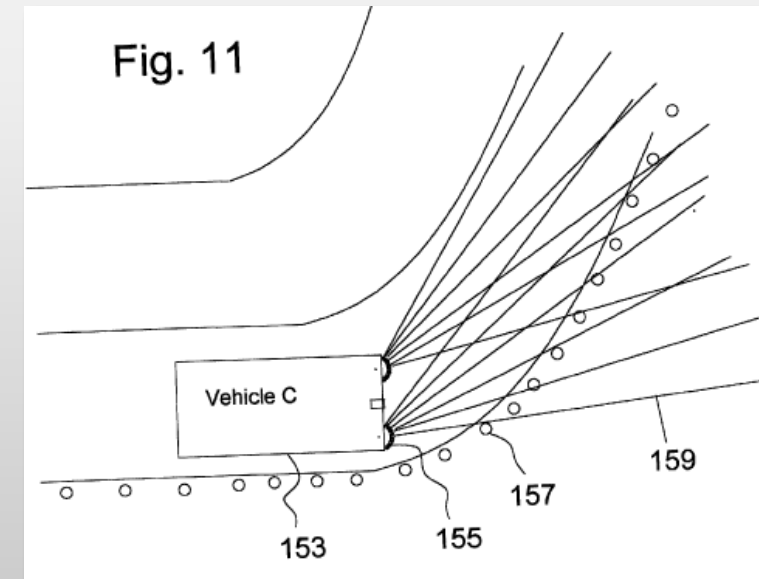
Alden does not disclose “determin[ing] ... a road curvature . . . ahead of the vehicle.”

'503 Patent claims 15, 21, 54, 60

Alden:

[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.

Ex. 1005, ¶[0036]



Ex. 1005, Fig. 11

Petitioner's New Adjustable Threshold Argument

'503 Patent claims 15, 21, 54, 60

Petitioner Argues:

"To distinguish between different objects, . . . the threshold intensity or distance . . . may, for example, simply be **adjusted** based on the object type."

1026 Reply, 17 (emphasis added);
see also 1027 Reply, 17-18

Dr. Papanikolopoulos:

The second one is actually using the **same logic**, which is described in figures 3, 4, and 5. I detect that, so my dots here in the figure 3 are going to be the reflectors. The reflectors are going to be something that corresponds -- it will have the **same appearance on the image like the headlights.**

Ex. 2041, 80:3-8

Alden does not disclose “determin[ing] ... a road curvature . . . ahead of the vehicle.”

'503 Patent claims 15, 21, 54, 60

Petitioner Argues:

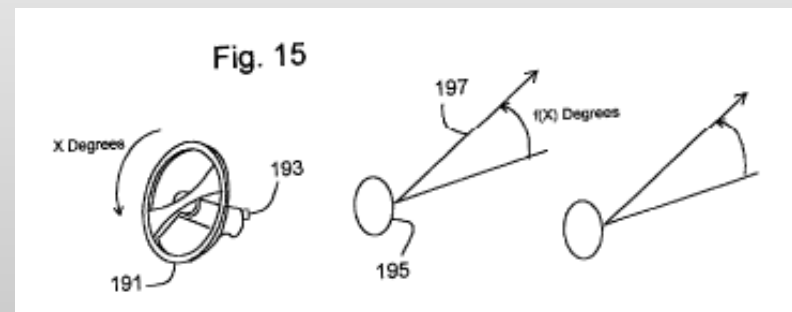
Alden's “rotation sensor” . . . can further detect when a vehicle is planning to turn. . . . when a driver turns her steering wheel before moving, in anticipation of an upcoming turn...”

1026 Pet., 55; see also 1027 Pet., 51-52

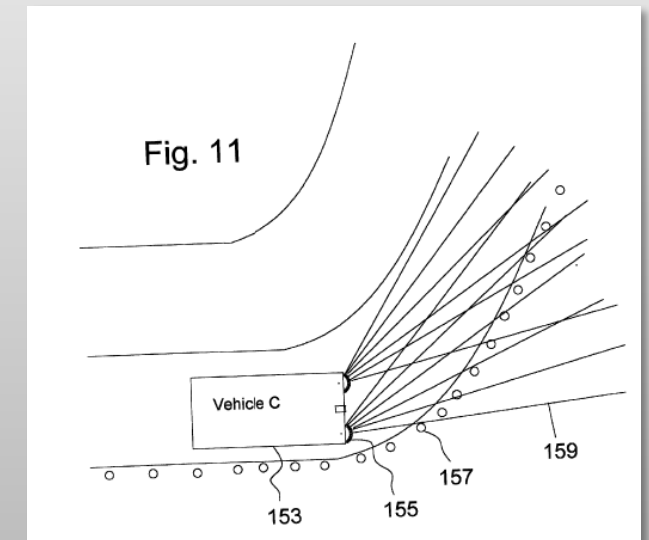
Alden:

The system calculates the new direction of the vehicle and changes the direction of the headlight output 197 a corresponding $f(x)$ degrees.

Ex. 1005, ¶[0058]



Ex. 1005, Fig. 15



Ex. 1005, Fig. 11

Claims 15, 21, 54, 60 also require “*increas[ing] illumination in a direction of the road curvature*”

15. The system of claim 1, wherein the logical controller is further configured to determine at least a road curvature, indicated by the sensor data, ahead of the vehicle and wherein the required illumination includes **increasing illumination in a direction of the road curvature.**

54. The headlight system of claim 37, wherein at least one of the at least one processors is further configured to determine at least a road curvature, indicated by the sensor data, ahead of the first vehicle and to **determine a second illumination pattern defining increased illumination in a direction of the road curvature.**

Alden does not disclose “increas[ing] illumination in a direction of the road curvature” because all beam segments remain at high intensity

'503 Patent claims 15, 21, 54, 60

Alden:

61 produces a high beam in a first sector 65 while concurrently producing a low beam in a second respective sector 63 (or dim beam) where the 41 is sensed. 61 also being mounted on 47. Thus the driver of 47 can see everything illuminated to the maximum except the area where 41 is. Meanwhile, the driver of 41 sees only a dim or low beam light from 47.

Ex. 1005, ¶[0026]

automated control of the headlight intensity and or direction is provided at the sector level. The result is that the present headlight can stay on high beam in all sectors which do not contain a motor vehicle and concurrently go on low beam only in those sectors which do contain a motor vehicle. This maximizes the ability of all drivers to see at all times.

Ex. 1005, ¶[0006]

Signals are sent to each of the headlight control circuit zones that need to be dimmed to restrict the amount of current to the corresponding headlight zones such that they are dimmed in a dimming process 109. Zones which are not dimmed remain on high beam. Thus (assum-

Ex. 1005, ¶[0028]

All beam segments are at high intensity unless specifically dimmed

'503 Patent claims 15, 21, 54, 60

Petitioner Argues:

“Alden’s system does not default to emitting high beams everywhere there is not glare reduction. Rather, Alden’s system can be used for ‘many applications,’ and Figure 11 details an additional functionality of its segmented headlight....”

1026 Reply, 18; *see also* 1027 Reply, 18

Petition (re base claim 37):

Alden alone discloses and renders obvious Claim 37[E].

* * *

Zones which are not dimmed remain on high beam. Thus the light sent to the sensed vehicle location is dimmer than the light sent to all other areas of the headlight distribution area.” (*Id.*, [0028], Fig. 4; *see also* [0026]-[0027], [0029], Fig. 5.)

1027 Pet., 23; *see also* 1026 Pet., 26

Alden:

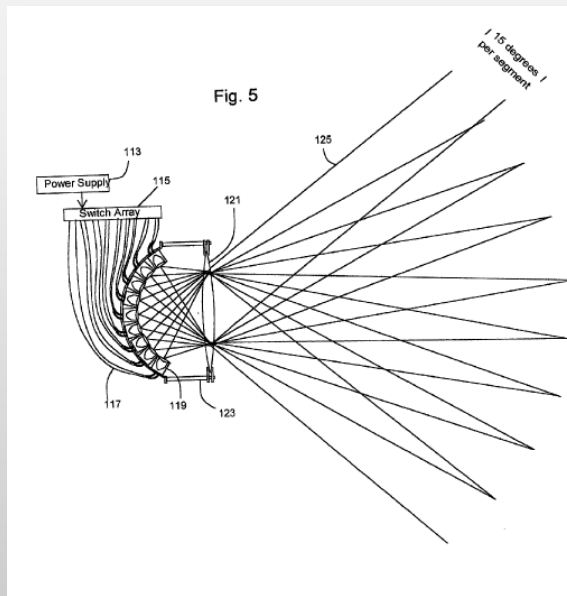
The segmented distribution light can be used for many applications other than motor vehicles.

Ex. 1005, ¶[0061]

Alden's Figure 5 Embodiment illuminates the full light pattern therefore it does not teach “*increasing illumination*”

'503 Patent claims 15, 21, 54, 60

Alden:



Ex. 1005, Fig. 5

Dr. Papanikolopoulos:

Q. Okay. But, in normal driving conditions when there's no oncoming traffic and no curves, the Figure 5 embodiment would illuminate the full pattern shown in Figure 5; is that correct?

A. Yes.

Ex. 2067, 17:21-25

Q. Are you proposing adding additional LEDs to what's shown in Figure 5 or you're saying that's what is shown in Figure 5?

A. I say such as shown in Figure 5.

Ex. 2066, 112:2-5

Alden does not disclose “increasing illumination in a direction of the road curvature” because 1st Embodiment lacks optical steering capability

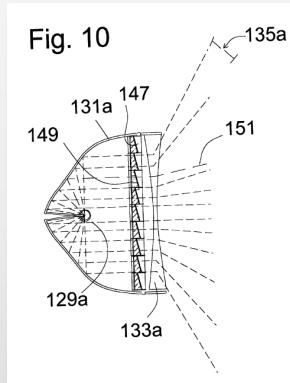
'503 Patent claims 15, 21, 54, 60

Petitioner Argues:

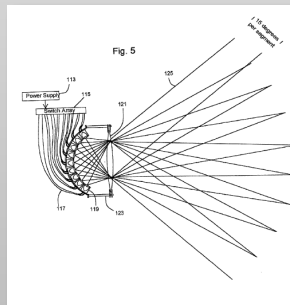
“As the steering wheel ‘rotates ‘x’ degrees,’ the system calculates the new planned direction of the vehicle and **‘changes the direction’** of the headlight output 197 a corresponding ‘f(x)’ degrees.”

1026 Pet., 53-54; see also 1027 Pet., 51

Alden:



Ex. 1005, Fig. 10



Ex. 1005, Fig. 5

Dr. Turk:

72. A third embodiment is shown in Figures 8-10, in which the headlight system employs a single light source 129, a collimating reflector 131, and electro-optic refractive elements 147, 149 to produce multiple light beam segments. (*Id.*, ¶¶[0032-0040].) The CPU 71 can control the electro-optic refractive elements 147, 149 to change the direction of the beam segments passing through respective elements. (*Id.*)

1026 Ex. 2040, ¶72; see also 1027 Ex. 2040, ¶72

239. It is not clear that the headlight of Figure 5 can “change direction.” (Petition, 53.) The lamp already emits high beams everywhere there is not glare reduction and it lacks any optical or mechanical steering. (Ex. 1005, Fig. 5, ¶¶[0006], [0026]-[0027].)

1026 Ex. 2040, ¶239; see also 1027 Ex. 2040, ¶¶222

7. Failure of Proof – Curve vs Turn

Claims 32 and 33

32. The method of claim 26, wherein the determining illumination requirements further includes **determining illumination for an upcoming curve** indicated by the sensor data, wherein the determining the control strategy further comprises determining the control strategy for controlling the directional light clusters to create an output headlight beam that illuminates around the curve.

33. The method of **claim 32**, wherein the determining illumination requirements further includes **determining illumination for an upcoming turn** indicated by the sensor data, wherein the determining the control strategy further comprises determining the control strategy for controlling the directional light clusters to create an output headlight beam that illuminates the turn.

8. Insufficient Rationale to Combine Alden and Harbers

Claims 5 and 69

5. The headlight system of claim 1, wherein at least one of the light-clusters includes:

a plurality of light sources, wherein one or more of the plurality of light sources comprises at least one of multiple light-emitting-diodes (LEDs) or organic light-emitting-diodes, each light source having a spectral power distribution characteristic and wherein the control circuitry is configured to alter the overall light-cluster spectral power distribution to illuminate at least one of the at least two sub-sections of the field-of-view with a **different color of light** from another of the at least two sub-sections.

69. The method of claim 65, wherein the **data includes data indicating fog or snow** environmental conditions and the determining illumination includes determining a shift of at least a portion of the light output from the headlight system towards yellow.

Petitioner does not explain how a POSA would have combined Alden & Harbers

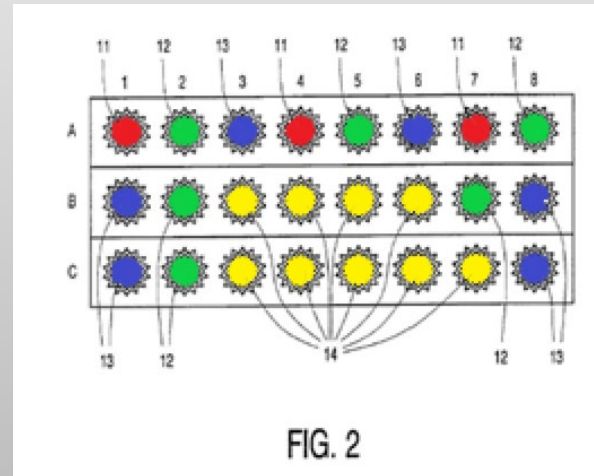
Petitioner argues that Alden and Harbers could be combined “by including particular color LEDs, as taught by Harbers, at particular locations along the curve in Alden’s Figure 5 headlight”

1026 Pet., 64-65

Harbers:

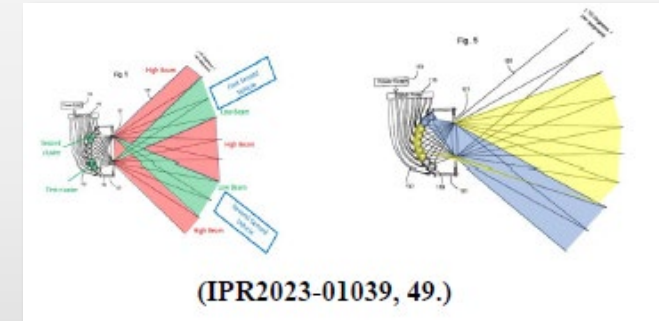
In the example shown in Fig. 2, red LEDs are indicated by reference numeral 11, green LEDs by reference numeral 12, blue LEDs by reference numeral 13, and yellow or white LEDs by reference numeral 14. By ordering the LEDs in the manner indicated in Fig. 2, a substantial reduction of possible color effects is achieved for an observer looking into the light emitted by the vehicle headlamp (for example an oncoming car).

Ex. 1006, 8:30-34



Ex. 1006, Fig. 2 (annotated)

Dr. Turk:



(IPR2023-01039, 49.)

1026 IPR, Ex. 2040, ¶272

272. Harbers discloses a system with each beam segment having a defined function (e.g., high, low, fog, etc.), not a portion of the field of view. However, as shown in some of Petitioner’s examples reproduced below, oncoming vehicles may be traveling towards the emitting vehicle at angles. Since, in those examples, the whole beam of a one or two LEDs encompasses that vehicle, that vehicle would see red, or yellow, or blue, etc., or at least light half comprised of that color. Also, in the example shown below in Petitioner’s annotated figure from another Petition, the driver’s face would be squarely in the “blue” beam proposed for the annotated figure in this argument.

1026 IPR, Ex. 2040, ¶272