

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

**MERCEDES-BENZ USA, LLC,
Petitioner,**

V.

**YECHEZKAL EVAN SPERO,
Patent Owner.**

**U.S. Patent No. 11,208,209 to Spero
Case IPR2023-01034**

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16 Case IPR2023-01034

- - -
DEPOSITION OF DR. NIKOLAOS PAPANIKOLOPOULOS
WEDNESDAY, MARCH 27, 2024
9:35 A.M.
Washington, DC

REPORTED BY:
VIOLA K. NEWMAN, CERTIFIED REALTIME REPORTER
JOB NO. 29409

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1 Washington, DC,

2 Wednesday, March 27, 2024

3 9:35 a.m.

4 THE COURT REPORTER: My name is Viola
5 Newman, and I am a certified realtime reporter, notary
6 public, and stenographer in the state of Michigan.

7 We're conducting this deposition via Zoom
8 and all parties are present via Zoom.

9 I am here for Fortz Legal Support, and the
10 parties have agreed that the witness will be sworn in
11 via Zoom.

12 (Court Reporter asking for clarification.)

13 THE COURT REPORTER: Okay. So I'm in
14 Franklin, Michigan, and the witness is located in
15 Washington D.C., so, therefore, he will be sworn in
16 remotely.

17 NIKOLAOS PAPANIKOLOPOULOS
18 was thereupon called as a witness herein and, after
19 having first been duly sworn to testify to the truth,
20 the whole truth, and nothing but the truth, was
21 examined and testified as follows:

22 THE COURT REPORTER: Okay. If you can give
23 your appearance, Mr. Turner, and then we'll move to
24 Mr. Hughes.

25 MR. TURNER: Okay. I'm Andrew Turner with

1 Brooks Kushman, and I'm here on behalf of patent
2 owner, Y. Evan Spero.

3 MR. HUGHES: Scott Hughes with Hogan
4 Lovells, and I'm here on behalf of Petitioner
5 Mercedes-Benz USA, LLC.

6 EXAMINATION

7 BY MR. TURNER:

8 Q. All right. So, good morning, Dr. Papanikolopoulos.

9 A. Morning.

10 Q. How are you?

11 A. Good.

12 And you?

13 Q. Good.

14 So do you understand why you're here today?

15 A. I do.

16 Q. You understand you're here for your deposition in
17 IPR2023-01034 concerning U.S. Patent Number
18 11,208,029?

19 A. Yes, I do.

20 Q. Okay. How did you prepare for your deposition today?

21 A. I studied my declaration and the prior art, and I had
22 a couple of phone calls, and, also, I came for one day
23 to meet with Scott and Joe.

24 (Court Reporter clarification.)

1 BY MR. TURNER:

2 Q. All right. And so the one day, was that this week
3 that you met with Scott and Joe?

4 A. Yes.

5 Q. Which day did you meet with them?

6 A. It was Monday.

7 Q. Okay. Did you meet with anyone outside of the Hogan
8 law firm?

9 A. No.

10 Q. Okay. And about how much time did you spend preparing
11 for your deposition?

12 A. Just to clarify, prepare for the deposition or
13 preparing the declaration?

14 Q. Just for the deposition, for the deposition.

15 A. Maybe 15 hours, 20 hours.

16 Q. Okay. Is that just for this IPR, or is that including
17 your time spent preparing for the depositions
18 yesterday?

19 A. Well, mixed.

20 So I would say, for this particular
21 deposition, it was around 15 hours.

22 Q. All right. And what documents did you review in
23 preparing for this deposition?

24 A. I looked at my declaration, the patent, and the prior
25 art that I reference in my declaration.

1 Q. Okay. Did you review any documents that are not cited
2 in your declaration?

3 A. Nope.

4 Q. All right. And do you have a copy of the declaration,
5 Exhibit 1003, for this IPR?

6 A. Yes, I have.

7 Q. All right.

8 Can you turn to the second-to-the-last page
9 of your declaration?

10 A. Do you mean the certification page?

11 Q. Yes, the certification page.

12 A. Yes.

13 Q. Okay. Is that your signature under paragraph 153?

14 A. Yes.

15 Q. Okay. And it's dated June 8, 2023.

16 Is that when you completed this
17 declaration?

18 A. Yes.

19 Q. Okay. Who drafted your declaration?

20 A. I was in full control of the text and I wrote myself
21 certain technical parts, and I rely on the advice of
22 lawyers for the legal segments contained in my
23 declaration.

24 Q. So by being in full control of the text, do you agree
25 with all the opinions stated in your declaration?

1 A. Yes.

2 Q. Okay. And about how much time did you spend preparing
3 this declaration, Exhibit 1003?

4 A. So my memory's a little bit -- so maybe 30 to 40
5 hours.

6 Q. And do you remember when you first started working on
7 this declaration?

8 A. It was towards the end of May, I believe.

9 Q. May 2023?

10 A. Yes.

11 Q. Do you remember when you were first contacted to start
12 working on this declaration by the Hogan Lovells law
13 firm?

14 MR. HUGHES: I'll just caution the witness.
15 You can answer the question, but don't
16 reveal anything about any of the contents of
17 conversations with the attorneys.

18 THE WITNESS: I believe I was contacted, I
19 visited the office of Hogan, and we finalized the
20 agreement May 2023. I was here for a conference, and
21 I visited the office.

22 BY MR. TURNER:

23 Q. Okay.

24 A. But, again, it has been several months. I don't
25 recall the exact dates.

1 Q. So you finalized the agreement in May of 2023, but do
2 you remember when they first contacted you?

3 A. I don't recall this answer.

4 Q. Have you done any work with the Hogan Lovells law firm
5 prior to this work on these patents, on this patent,
6 the '029 patent, or the related patents?

7 A. What do you mean by related patents?

8 Q. So the patent that we discussed yesterday. So the
9 IPRs there are by Mr. Spero. So the other depositions
10 that we've had, one yesterday and one a month ago.

11 Have you done work for the law firm Hogan
12 Lovells prior to this engagement?

13 A. To the best of my knowledge, no.

14 Q. Okay. Have you done any work with Mercedes prior to
15 these IPRs?

16 A. I think one of my declarations was used years back. A
17 declaration I did for Toyota, if I'm right, was used
18 by Mercedes in a proceeding, but this has been more
19 than five years, I believe.

20 Q. Okay.

21 A. But I need to go to my records to be absolutely sure.

22 Q. Okay. Do you remember the name? Was that a lawsuit
23 or was it an IPR or a litigation?

24 A. Most likely, it was an IPR, and I believe it was a
25 Toyota IPR that I did early 2010. But my declaration

1 was used as part of the public record in order to make
2 the argument that Mercedes wanted to make as a
3 supporting element, I believe.

4 Q. Okay.

5 A. Someone else brought this to my attention. I was
6 never contacted.

7 Q. Okay. So you were not retained by Mercedes or you
8 weren't working directly with Mercedes for that?

9 A. No.

10 Q. Okay. All right.

11 And who did you work with in preparing your
12 declaration?

13 A. Scott and Sally Yi Zhang.

14 Q. Okay. Did you work with anyone outside of the Hogan
15 Lovells law firm?

16 A. No.

17 Q. And what did you rely on in preparing your
18 declaration?

19 A. I rely on the patent itself, and the prior art, and
20 also my own experience as a POSITA that I am.

21 Q. All right. Do you have a copy of the Alden reference,
22 which is U.S. Patent Application Publication
23 2003-0137849?

24 A. Give me a minute.

25 You said Alden; am I right?

1 Q. Yes, Alden.

2 A. Yes.

3 Q. So this references a marked Exhibit 1005 on the bottom
4 right corner?

5 A. Yes.

6 Q. Okay. And you're okay if we refer to this as the
7 Alden reference?

8 A. Yes.

9 Q. Okay. Can you turn to Figure 5 of the Alden
10 reference?

11 A. Yes.

12 Q. What is shown in Figure 5?

13 MR. HUGHES: Objection. Vague.

14 THE WITNESS: Let me go to my declaration.

15 BY MR. TURNER:

16 Q. Maybe I can be more specific.

17 How would you describe the beam pattern
18 illustrated in Figure 5?

19 A. So do you refer to one particular beam or a collection
20 of beams?

21 Because Figure 5, in a disclosure of Alden,
22 if we go to paragraph 14 from Alden, it says Figure 5
23 illustrates the segmented headlight beams and
24 controlling streets array in a first embodiment, and
25 there's a further discussion in paragraph 29 of Alden.

(Discussion off the record at 9:52 a.m.)

(Back on the record at 9:55 a.m.)

BY MR. TURNER:

Q. Okay. Dr. Papanikolopoulos, I think you asked me to clarify the question, am I referring to a particular beam or a collection of beams.

I'm referring to both. So if you describe the beams shown in Figure 3 -- or Figure 5 -- excuse me.

A. So if we go to paragraph 75 of my declaration, I say, when one is driving an equipped vehicle, the controlled first plurality of LEDs would be those LEDs that are directing light to sectors in the area where the road curves.

This can be seen with reference to Figure 5, for example, where the controlled first plurality of LEDs could be those shaded in green following the curve of the road as it turns left, and I have annotated the Figure 5, and I use also the paragraph 29 from Alden.

As can be seen from the annotated figure, the three LEDs at the bottom of the array direct light in the sector towards the left side of the headlight distribution area, and, thus, can be controlled to produce illumination pattern illuminating the curb.

1 Q. Okay. So this portion that you annotated in green,
2 that is a light pattern that's provided when the road
3 curves; is that correct?

4 A. I'm examining a scenario, which is basically the
5 system -- if we go to paragraph --

6 Q. So in your annotated figure, are you saying that the
7 Alden reference would turn off those other LEDs during
8 a curve?

9 A. What I'm saying is, actually -- so Alden has two
10 applications mainly described here, among other
11 things.

12 One is actually maximize visibility for the
13 driver and reduce glare for drivers of oncoming
14 vehicles. The second one is basically described in
15 paragraph 36 and Figure 11 where it says -- Figure 11
16 illustrates the art of the present invention being
17 used to concentrate light to look around corners in
18 response to road conditions. An equipped vehicle 153
19 senses that the road turns by receiving the light from
20 reflector's sensor, a reflector 157.

21 So what I'm referring to here in
22 paragraph 75 of my declaration is actually the system
23 has detected these reflectors, and by following the
24 logic described in Figures 3 and 4 and the text
25 described in paragraphs 27, 28, and 29 of Alden, it

1 basically directs from 36, we say, the responding
2 headlights 155 direct light into the corner to
3 maximize the driver's ability to see there.

4 The directing of light can be achieved with
5 segmented sensing elements and segmented light
6 distribution elements described herein.

7 So this is exactly what I'm highlighting
8 here. The system has detected these reflectors.

9 (Court Reporter clarification.)

10 Has detected these reflectors 157, and,
11 basically, the responding headlights 155 direct the
12 light into the current to maximize the driver's
13 ability to see there. This is what I'm highlighting
14 here.

15 And the notation says, first plurality of
16 LEDs directing light --

17 (Court reporter clarification.)

18 So in the scenario that we have, a road
19 curves left, this is the annotation of Figure 5 in
20 paragraph 75.

21 The first plurality of LEDs directing light
22 into road curving left are highlighted, both the LEDs
23 and the associated shape of light, the lighting
24 pattern, shown in this annotated Figure 5.

25 Q. So you're saying the light pattern is, in your

1 annotated Figure 5 at paragraph 75 of your declaration
2 corresponds to Alden's Figure 11 beam pattern; is that
3 correct?

4 A. Give me one minute.

5 Figure 11 shows a vehicle, the headlight
6 155, the reflector's 157, and the pattern's 159. So
7 one should note there are two headlights. So,
8 basically, I'm illustrating the operation of one of
9 the headlights, of the segmented headlights described
10 by Alden when a left curve is basically coming or the
11 vehicle C approaches this left curve.

12 Q. Figure 11 of Alden illustrates a vehicle approaching a
13 left turn -- or a left curve?

14 A. Yes, among other things.

15 You can see, for example, that the element
16 155 and the other headlight are already having this
17 directed segmented light annotated in this
18 illustrative, demonstrative Figure 11.

19 Q. So, in your annotated Figure 5, are -- the LEDs that
20 are not colored, are those turned off during this
21 curve scenario?

22 A. You need to -- it's one possibility. The other
23 possibility is actually you have them at low beam,
24 depending on the scenario.

25 Again, the priority in this application is

1 maximize the visibility and increase the situational
2 awareness of the driver with respect to the curve.

3 Q. Okay. So in Alden's Figure 5 embodiment, when it's
4 driving down a straight road, so when it's not
5 approaching a curve, does it use all of the LEDs shown
6 or the light elements 119 to illuminate the full light
7 pattern that's illustrated in Figure 5?

8 A. Can you repeat the question?

9 Q. So in Alden's Figure 5 embodiment, when the vehicle is
10 driving down a straight road and there's no upcoming
11 curve, does the Figure 5 embodiment use all of the
12 LEDs shown in Figure 5 to illuminate the full pattern
13 that's depicted in Figure 5?

14 A. Yes. This is one possibility, but depends on the
15 existence -- for example, if we look at Figure 2 --
16 sorry -- Figure 2 and Figure 1, and we have other
17 vehicles, then we fall under the first application of
18 Alden, described in Alden, which is, basically, let's
19 maximize the visibility for the driver and reduce the
20 glare for other drivers.

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

25 A. Yes.

1 Q. Okay.

2 A. Or, for a POSITA, this will have been -- reading
3 Alden, would have been the first application described
4 in Alden.

5 Q. All right.

6 Can you turn to Figure 6 of Alden?

7 A. Yes. I'm there.

8 Q. Okay. Now, in paragraph 48 of the Alden reference, it
9 describes collimating light.

10 So the sentence, a headlight with
11 electro-chromatic dimming means 131 consists of a
12 light element 129, which emits light which is
13 reflected off a collimated surface resulting in
14 collimated light.

15 Do you see that? Figure 48.

16 A. Paragraph 48, you mean?

17 Q. Paragraph 48, correct.

18 A. Yes. Just let me read the overall context.

19 Yes. I read the respective paragraph.

20 Q. So what does the term collimating light mean to you?

21 A. For a POSITA at that time, collimated light would be a
22 light where there is -- basically, there is a
23 parallel. There's no spread or minimal spread.

24 Q. All right. Is there collimated light shown in Figure
25 6?

1 A. On the right part, the one that has the elements 129,
2 131, 127, 133, and the segment 135.

3 Q. It's on the right part? So it's -- so where in this
4 figure would you describe the light as collimated
5 light?

6 A. If you -- let me see how I can -- if we follow the 129
7 element --

8 Q. So what is 129? Is that a light source?

9 A. It's a light source.

10 So 129, according to Alden, is a light
11 element 129, emits the light, which is basically all
12 the rays that we see coming off element 129, which is
13 reflective of a collimating surface resulting in
14 collimated light. So if you see the horizontal lines
15 are basically the collimated light.

16 The collimated light passes through a
17 segmented array 127, which is highlighted in the right
18 subfigure of Figure 6, and then basically
19 electro-chromatic cells, using a switch array similar
20 to 115 and the processes previously described herein,
21 the light intensity flowing through each individual
22 segment is controlled such that the distribution of
23 light is dimmed where the car is sensed and on high
24 beam elsewhere.

25 Q. So why does this headlamp assembly provide collimated

1 light to the segment array 127?

2 MR. HUGHES: Objection. Vague.

3 THE WITNESS: In some applications,
4 collimated light may be desirable. In some others,
5 for example, you can do without collimated light.

6 BY MR. TURNER:

7 Q. All right. So in this Figure 6 design, the light
8 source 129 -- so that's providing light leftward,
9 right? Leftward in this figure; is that correct?

10 A. Yeah.

11 Q. And then it reflects off of the collimated surface,
12 which I think you said was 131?

13 A. Yes.

14 Q. To provide the parallel collimated light beams; is
15 that correct?

16 A. Yes.

17 Q. Okay. So if this light source 129 was turned around
18 and it provided the light directly to the -- this
19 array 127, would this headlamp still function the
20 same?

21 A. There are many scenarios. I mean, it is not only the
22 turning around, but the distance of this 129 element
23 to the 133 element, I believe, and, also, we're
24 talking about the properties of the electro-chromatic
25 dimming means.

1 So there are a few other things that are
2 important here. So I'm just looking at the particular
3 embodiment that is referred to as basically second
4 embodiment in Figure 6 in paragraph 48.

5 Q. All right. So what does this segmented array 127 do
6 to the collimated light that passes through it?

7 A. Let me go back to the spec.

8 So paragraph 48 of Alden states:
9 Discloses, fixes. The collimated light passes through
10 a segmented array 127 of electro chromatic cells,
11 using a switch array similar to 115, and the process
12 as previously described herein.

13 The light intensity flow in through each
14 individual segment is controlled such that the
15 distribution of light is dim where the car is sensed
16 and on high beam elsewhere.

17 So this array of electro chromatic cells,
18 the 127, controls basically the light intensity that
19 flows through each individual segment in order to
20 accomplish the goal of having dim light -- avoiding
21 glare where a car, an oncoming car, is detected and a
22 high beam elsewhere.

23 Q. So is the light that's shown here in reference -- by
24 reference numeral 135, is that this dimmed light, or
25 reflected light, or is that normal light passing

1 through?

2 A. Let me look again at the spec.

3 It states, after the light from 129
4 passes -- this is Alden in paragraph 48 -- after the
5 light passes -- after the light from 129 passes
6 through a respective, it is directed by a headlight
7 optic 135 such that it travels to a specific sector of
8 the headlight distribution. Sample light sector 135
9 being one such example.

10 So it can be either.

11 Q. Okay. So reference numeral 135 can be normal light or
12 the deflecting light?

13 A. No. That's not what I --

14 MR. HUGHES: Objection. Mischaracterizes.

15 THE WITNESS: What I'm saying is --
16 actually, what it says before -- in paragraph 45 --
17 paragraph 48, using a switch array similar to 115, and
18 the process previously described herein, the light
19 intensity flowing through each individual segment is
20 controlled such that the distribution of light is
21 dim -- which is what I was referring to -- where a car
22 is sensed, and on high beam elsewhere.

23 So 48, by referring to all the methods --
24 if we look at the bottom, it says using individual
25 controlled electro chromatic cells in an array is a

1 means of selectively controlling which areas of the
2 headlight distribution will receive light beam -- high
3 beam and which will receive low beam. Means for
4 controlling, they say, have been previously discussed
5 in that respect to avoid the redundancies.

6 BY MR. TURNER:

7 Q. All right. Can you turn to Figure 8 of Alden, please.

8 A. Yes.

9 Q. All right. So what is shown in Figure 8 of Alden?

10 MR. HUGHES: Objection. Vague.

11 THE WITNESS: I'm going to paragraph 32.

12 It says, Figure 8 illustrates the elements
13 of an individual electro-optic cell in a first state.
14 A first transparent substrate, such as glass 137, has
15 deposited on it a first transparent electrode 139.

16 A second transparent substrate 145, such as
17 glass, has a second transparent electrode 143
18 deposited thereon.

19 In the embodiment of Figure 6 and 7, the
20 electro-optic material 141 is an electro chromatic
21 material which allows greater light to pass through it
22 in a first state, such as when the circuit is open,
23 and a lesser amount of light to pass through when in a
24 second state, such as when the circuit is closed.

25 The elements of Figure 8 comprising a

1 individually controlled segment of 127 or 127a,
2 segmented electro chromatic array. In the electro
3 chromatic embodiment, generally, the 143 surfaces are
4 parallel to 139 surfaces, though not depicted as such
5 in Figure 8.

6 BY MR. TURNER:

7 Q. All right. So is Figure 8 an enlarged view of an
8 element or a cell of the Figure 6 embodiment?

9 A. A POSITA may say that. It just tries to -- discloses
10 more about how -- if you look -- it starts with your
11 Figure 6. Then Figure 7 is identical to Figure 6,
12 except that they're altering a segmented electro
13 chromatic element 127A is incorporated into the optic.
14 Because these were separated in Figure 6. This is
15 describing paragraph 31.

16 And Figure 8 illustrates the element of an
17 individual cell in the first state.

18 Q. So does Alden describe the Figure 8, the element shown
19 in Figure 8, as a standalone component or as part of
20 an array, such as is shown in Figure 6?

21 A. The disclosure -- a POSITA would read the disclosure
22 as Figure 8 illustrating the elements of an individual
23 electro-optic cell in a first state.

24 So I think the more -- the interest here of
25 Alden is to disclose how this electro-optic cell may

1 work in the states.

2 And the first state is when the circuit is
3 open, and, basically, this is -- in this case, allows
4 greater light to pass through it in the first state --
5 again, I'm still in paragraph 32 -- such as when the
6 circuit is open, and a lesser amount of light to pass
7 through when in a second stage, such as when the
8 circuit is closed.

9 Q. All right. Now, if we could turn back to the Figure 5
10 embodiment of Alden.

11 So how would you describe the light
12 provided by the LEDs before it gets to the lens 12?

13 How would you describe that beam pattern?

14 A. The beam has -- basically, it's three-dimensional.
15 What we see here is just LEDs, a slice of these LEDs.
16 The role of LEDs. Heats the element, the optical
17 element, which is the headlamp lens 121.

18 Q. Yeah. But how would you describe the shape of the
19 beam pattern --

20 MR. HUGHES: Objection.

21 BY MR. TURNER:

22 Q. -- or beam spread from an individual LED?

23 A. Can you clarify with respect to what characteristics,
24 because, again, this is a demonstrative figure that
25 shows the LED, a row of LEDs, a slice of LEDs, placed

1 on a curve along the focal point.

2 Q. Okay. Just, in general, an LED -- how would you
3 describe the light beam provided by an LED?

4 A. With respect to what characteristics?

5 Q. Like, the shape of it. Like, does it provide light at
6 a certain angle? A certain beam spread? Does it
7 provide light in all directions?

8 A. Yeah --

9 MR. HUGHES: Objection. Compound.

10 THE WITNESS: It's just a light source that
11 basically uses --

12 What's the LED? The LED is basically a UV
13 or a blue dye that heats at a forceful level and emits
14 light.

15 (Court reporter clarification.)

16 BY MR. TURNER:

17 Q. So would a single LED provide collimated light?

18 A. It depends if you are close or further away. If you
19 are very close to the LED, the light can be viewed
20 almost as collimated -- or collimated. If you are
21 further away, there is a spread.

22 But this can be easily -- depending on the
23 needs that you have, by using an LED collimator, you
24 can get any beam characteristics you may want.

25 Q. An LED collimator, is this something that is part of

1 the LED housing as part of the primary optic, or is
2 this a separate lens that's mounted and spaced apart
3 from the LED?

4 A. It's something very small. In fact, at that time, a
5 POSITA would have looked at something quite small
6 that's basically like a filter you put in front.

7 Q. So this is a filter you'd put right in front of an LED
8 to act as a collimator?

9 A. Yeah. And sometimes they come integrated as part of
10 the LED. Depending on the needs.

11 Q. So integrated within the LED itself, the LED
12 package --

13 A. Yep.

14 Q. -- did it have a collimator?

15 A. It's one of the options.

16 Q. Does Alden disclose any collimators integrated with
17 the LEDs?

18 MR. HUGHES: Do we need clarification on
19 some of the previous answers?

20 (Discussion off the record at 10:33 a.m.)

21 (Back on the record at 10:35 a.m.)

22 BY MR. TURNER:

23 Q. So I think my last question was: Does Alden disclose
24 any collimators there are integrated with the LEDs?

25 A. Let me check.

1 No. But for a POSITA, in the context of a
2 POSITA in 2002, this would have been well-known. It
3 will be basically using the collimator, the LED
4 collimator, as the same way you use a filter.

5 Q. Did you describe in your declaration how a collimator
6 could be integrated with an LED?

7 A. Are you referring to an LED collimator or --

8 Q. Yes. A collimator integrated with an LED. If that's
9 called an LED collimator, then yes.

10 A. Are you speaking -- in which declaration, the 29, or
11 other declarations?

12 Q. Just the declaration that we're discussing today, the
13 '029 declaration.

14 A. I don't believe -- because for the issues raised in
15 this particular pattern, I thought the POSITA would
16 have been well aware at that time.

17 Q. Can you turn to Figure 3 of the Alden reference.

18 A. Let me go also in my declaration.

19 Yes. I'm there.

20 Q. So do you see the left and right light control
21 circuits in Figure 3?

22 A. Yes, I do.

23 Q. Now, these are used to control the left segmented
24 headlight and right segmented headlight; is that
25 correct?

1 A. Yes. According to the Alden disclosure.

2 Q. Now, does Alden describe using this same circuit to
3 control all of the embodiments? For example, the
4 Figure 5 embodiment that has the LEDs on the curve and
5 the Figure 6 embodiment which has these refractive
6 type elements?

7 MR. HUGHES: Objection. Vague and
8 compound.

9 THE WITNESS: Alden discloses -- so, for
10 example, in my analysis of Figure 5, I use basically
11 the statements in paragraph 29, which says it's a
12 lighting element being independently controlled by a
13 corresponding switch in an array of switches 115.
14 Each switch is controlled by the CPU and logic
15 previously described.

16 So a POSITA will read this, that the logic
17 and the CPU previously described are the ones which
18 are described in Figure 3 and paragraph 27 of Alden.

19 And if we go to, for example, 36, it says,
20 at the end, the directing of light can be achieved
21 with segmented sensing elements.

22 So, to me, this is basically Figure 3 and
23 paragraph 27, Figure 4 and paragraph 28, and segmented
24 light distribution elements described herein.

25 And a POSITA will understand that basically

1 refers to Figure 5 and the paragraph 29.

2 And, also, we should not forget that there
3 are important disclosures and teachings in paragraph
4 61, where it says the following:

5 While the above description describes many
6 specifications, these should not be construed as
7 limitations on the scope of the invention, but,
8 rather, as an exemplification of a preferred
9 embodiment thereof.

10 Many other variations are possible. For
11 example, light sensors -- light sectors may overlap
12 that one light distribution sector is covered by more
13 than one illumination emitting, filtering -- and this
14 goes back to my earlier comment about the collimator
15 -- and/or diverting sectors.

16 One or more methods employed herein may be
17 used in combination to vary illumination in a
18 segmented system.

19 So, in other words, what is the objective
20 of Alden? First application is maximize visibility
21 and minimize glare. Second application, looking
22 around the corner and directing the light towards this
23 corner described in 36.

24 BY MR. TURNER:

25 Q. Okay. So does Alden describe using the circuit as

1 shown in Figure 3 for controlling both the LEDs of the
2 Figure 5 embodiment and the elements of the Figure 6
3 embodiment?

4 A. If we go to paragraph 30 at the bottom, it says, means
5 for assessing and controlling electrical flow to
6 controlling the electro chromatic filter array has
7 been previously discussed and not restated to avoid
8 redundancy.

9 So the sensing of the control, of the
10 electrical flow, basically are omitted in order to
11 avoid the redundancy what's disclosed in paragraph 30.

12 Q. So you're saying the sentence at the end of paragraph
13 30 means for sensing and controlling electrical flow
14 to, parenthetical, controlling the electro chromatic
15 filter array having been previously discussed and not
16 restated to avoid redundancy, that sentence at the end
17 of paragraph 30 indicates that he's using the same
18 controls in Figure 3 to control Figure 6; is that
19 correct?

20 A. I think it discloses that basically the same sensing
21 and controlling electrical flow means can be used.

22 Q. Okay. For the control of an LED, what does that
23 signal look like? Is that a -- like, a constant
24 voltage, constant current type signal, or is that a
25 PWM signal?

1 A. There are different ways.

2 Q. So which way is used in Alden?

3 A. A POSITA will have had many options. PWM, at that
4 time, it was basically one of the techniques used.
5 PWM stands for pulse width modulations.

6 Q. Okay. So pulse width modulation.

7 Why would a POSITA have used pulse width
8 modulation to control the Alden embodiment or would
9 have understood Alden to disclose that?

10 A. I mean, we need to go back to the definition of a
11 POSITA that I have in my declaration. So, I think,
12 based on the background and the experience, something
13 like this would have been one of the choices.

14 Q. Okay. So would --

15 A. Sorry.

16 One of the choices can be something even
17 simpler than that, applying a voltage and using a
18 resistor to change this.

19 So depending on the budget and
20 implementation you want to do, a POSITA could have
21 thought of different ways, and I think that's why he
22 describes and discloses these control circuits --

23 Q. All right. So you said by --

24 A. -- like 77 and 79 as demonstrated in Figure 3.

25 Q. So when you said applying a voltage, you're referring

1 to applying a constant voltage to control the LEDs,
2 like the LED embodiments of Figure 5; is that correct?

3 A. No.

4 What I'm saying is, actually, you have --
5 you have basically -- depends on how these are
6 configured, and then you have a power source, and then
7 you can have a resistor there that changes the
8 current.

9 You see the power supply 113 in Figure 5.

10 Q. Okay. So where is the resistor illustrated in
11 Figure 5?

12 A. A POSITA will understand this as part of the switch
13 array.

14 Q. You said -- sorry. Go ahead.

15 A. And part, also, of the left -- in Figure 3, part of
16 the left light control circuit and the right light
17 control circuit of Figure 3.

18 Based on the disclosure in 29, in paragraph
19 29 of Alden, each switch is controlled by the CPU and
20 logic previously described.

21 This is paragraph 29.

22 Q. All right. So, again, what type of signal is provided
23 by the switch array to control each LED in the
24 Figure 5 embodiment?

25 A. So, if we look at the -- by changing the intensity of

1 current that goes through the LED, you have --
2 basically, electrons transform into photons.

3 And depending on the intensity, you can
4 have more photons or less photons, which correspond to
5 high beam or low beam. Or, basically, according to
6 Alden, if you go to 61, it says, at the end of
7 paragraph 61, it was understood that the present
8 invention can also be used to operate a segmented
9 light distribution system to provide illumination to
10 independently controlled segments, each operable
11 within a range of intensities between the high beam
12 and the low beam state.

13 Q. So you're saying that sentence in paragraph 61 is
14 describing operating the segment and light
15 distribution system of Figure 5 within a range of
16 intensities; is that correct?

17 A. Also, I think for the particular pattern that we have,
18 this is applicable, also, to the Figure 11, the
19 Figure 12, and the Figure 13, among other things.

20 Q. All right. So is the signal that's provided that
21 controlled the LEDs of the Figure 5 embodiment
22 different than the signal that's provided to control
23 the refractive elements of the, say, Figure 6
24 embodiment?

25 A. Different in what respects? In magnitude? In --

1 basically, in units? In what?

2 Q. How is it different?

3 A. Are you talking about Figure 6, the electro chromatic,
4 or are you talking about Figure --

5 Q. Well, let's start with Figure 6. If that's different
6 than other figures, we can discuss that too.

7 A. Let me go and -- because I think, in my declaration, I
8 have some --

9 So if you go to paragraph 129 --

10 Q. Sorry. That was 129?

11 A. 129.

12 This is the first one I found. I believe I
13 mention, in addition, Alden system can include other
14 optical control elements, including a variable
15 refractive element.

16 This is in response to, basically, that
17 Alden, in view of Kobayashi, renders all these claims
18 10 to 11, 21 to 22, and 32 to 33.

19 So I say, in addition, Alden system can
20 include other optical control elements, including a
21 variable refractive element in the form of a liquid
22 crystal, and I'm referencing paragraphs 33, 34, 35, 61
23 and Figures 8 to 10.

24 This retractor enables light from a visual
25 headlight distribution sector to be directed in

1 response to environmental conditions when used in
2 conjunction with the elements and processes previously
3 described herein.

4 And I have the Figure 10 annotated where I
5 highlight with red the diverted light and with blue
6 the variable refractive element.

7 The liquid crystal -- this is paragraph
8 130.

9 The liquid crystal has a first refractive
10 state when its circuit is open such that light passes
11 straight through without bending. Figure 8.

12 The liquid crystal then has a secondly
13 refractive state when the circuit is closed, causing
14 the light to bend due to refracture and after passing
15 through.

16 Figure 9 -- paragraph 33.

17 Thus, by selectively closing the circuit,
18 light for a particular distribution sector can be bent
19 to redirect the light to a different area.

20 Q. Okay.

21 A. At 131, it has, quote, Alden discloses that its use of
22 refractive elements to bend light, and also Alden
23 expressly discloses that one or more methods employed
24 herein may be used in combinations to vary
25 illumination.

1 And I'm saying, in paragraph 132, the
2 inclusion of other defractor -- refraction elements in
3 the path of different beam segments allows for greater
4 control.

5 And, basically, a POSITA will have
6 understand that you apply current to an anisotropic
7 material, and then you don't apply current.

8 So I think this is pretty obvious to a
9 POSITA at that time.

10 Q. Okay. So you're saying there's two states, as Alden
11 describes with reference to Figure 8, and you switched
12 between the states by applying current or not applying
13 current; is that correct?

14 A. According to Alden disclosure, yes.

15 Q. Okay. So that's the signal that's provided to the
16 refractive type elements or the liquid crystals for
17 controlling them.

18 Now, is that how Alden describes the LEDs,
19 providing current to turn them on and turning off
20 currents -- or not providing current to turn them off?

21 A. (No verbal response.)

22 MR. HUGHES: Counsel, we've been going
23 about an hour and a half or so. So whenever you get
24 to a good stop for a break, please.

25 MR. TURNER: Okay.

1 THE WITNESS: Alden discloses in Figure 3,
2 in paragraph 27, this -- and Figure 4 and Figure 5,
3 with a power supply, basically, how really these
4 basically are changing.

5 But, again, this has to do with the
6 variation by changing the current.

7 BY MR. TURNER:

8 Q. Okay. So when controlling the LEDs of the Figure 5
9 embodiment, do they have two states, current on or
10 current off, or...

11 A. There are many possibilities here.

12 Again, you may have zero current, so you
13 have no light. It has basically stated in 61, you can
14 have all the different intensities between high and
15 low beam, and a POSITA will understand that this --
16 the low beam may be zero.

17 Q. And to achieve the different intensities between the
18 high and low beam or high and zero, would the
19 controller provide a different current value than high
20 or zero?

21 MR. HUGHES: Objection. Vague.

22 THE WITNESS: Can you repeat the question?

23 BY MR. TURNER:

24 Q. To achieve the different intensities between high and
25 low beam, would the controller provide a different

1 current value than high or zero?

2 MR. HUGHES: Same objection.

3 THE WITNESS: This depends on the type of
4 LED you have, and its operational characteristics.

5 MR. TURNER: All right. Why don't we take
6 a break.

7 (Off the record at 11:06 a.m.)

8 (Back on the record at 11:18 a.m.)

9 MR. TURNER: All right. Well, welcome
10 back.

11 BY MR. TURNER:

12 Q. Dr. Papanikolopoulos, can you turn to paragraph 54 of
13 your declaration, please?

14 A. Yes.

15 Q. Okay. So do you see in this section this is your
16 ground one analysis and your combination is Alden in
17 view of Kobayashi; is that correct?

18 A. Indeed.

19 Q. Okay. What are you relying on the Kobayashi reference
20 for teaching?

21 MR. HUGHES: Objection. Vague.

22 THE WITNESS: So let me go to my
23 declaration.

24 So if we go to paragraph 68, I'm starting
25 explaining the elements of Kobayashi and I'm using, in

1 the analysis, first of all, Kobayashi is in the same
2 field as Alden.

3 Discloses performing similar control of
4 headlight systems to illuminate the road curves based
5 on the road map data.

6 Similar to Alden, Kobayashi's headlamp
7 system includes various inputs, the controller, and
8 the headlamp. And I'm having -- reference Kobayashi,
9 Figure Number 1, column 3 from 9 to column 5, row 28,
10 and also the Figures 12 and the text in paragraph --
11 in column 17, rows 3 to 67.

12 In particular, Kobayashi discloses that
13 each controller (irradiation control means) receives
14 road map information from road profile calculating
15 means along with other sensor data, and use these
16 inputs to automatically adjust the illumination of
17 headlamp 5.

18 And I have some references from Kobayashi.
19 The road profile calculating means can also be
20 included as part of a GPS sensor that outputs map
21 information.

22 And I continue with Kobayashi.

23 I'm using it also for the Figure 10, and,
24 also, it's interesting to look at paragraph 72.
25

1 BY MR. TURNER:

2 Q. Yep. I'm there.

3 A. Kobayashi -- in addition, as noted above, Kobayashi
4 similarly includes a controller that it determines a
5 changed shape of light when map indicates an upcoming
6 curve or change in the road shape.

7 For example, where a map data indicates
8 that the road curves left and then right, Kobayashi's
9 controller can use this to concentrate or direct
10 lighting in advance of the curves to the left and then
11 to the right.

12 Again, as I discuss above, it will have
13 been obvious to modify Alden in view of Kobayashi to
14 determine the required changed shaping of light to
15 accommodate the common road turns based on map data.

16 Alden -- let me -- because there is two
17 other points I want to say.

18 Alden will continue to perform the same
19 determination of changed light patterns to accommodate
20 upcoming curves so change is road safe, only now it
21 will make the determination based on the additional or
22 substituted received map data.

23 THE COURT REPORTER: Please, please slow
24 down again.

25 THE WITNESS: I'm sorry.

1 Alden will continue to perform the same
2 determination of changed light patterns to accommodate
3 upcoming curves or changes in road shape, only now it
4 will make determination based on the additional or
5 substituted received map data indicating the road
6 curvature.

7 And the final thing I want to say, if we go
8 to paragraph -- just a minute -- 92, I'm saying,
9 additionally, from the perspective of a POSITA, Alden,
10 in view of Kobayashi, discloses claims 3, 14, and 25.
11 Kobayashi, like Alden, discloses continuously
12 adjusting that is reshaping light as a vehicle
13 proceeds along the road using a --

14 THE COURT REPORTER: Hold on for a second.

15 (Discussion off the record at 11:25 a.m.)

16 THE WITNESS: So Alden, in view of
17 Kobayashi, discloses claims 3, 14, and 25.

18 Kobayashi, like Alden, discloses
19 continuously adjusting, that is, reshaping light as a
20 vehicle proceeds along the road using road map data.
21 Kobayashi.

22 Kobayashi discloses that each controller,
23 irradiation control means 4, receives road map
24 information from road profile calculated means, along
25 with other sensor data, and uses this input to

1 automatically adjust the illumination of headlamp 5,
2 and I'm having the references that I'm using from
3 Kobayashi.

4 Kobayashi further discloses that, as a
5 vehicle moves along the road, the irradiation control
6 means 4 can conduct irradiation control of the
7 lighting device in accordance with the road profile.

8 As a result, when the vehicle turns to the
9 left -- to left, the left shoulder is irradiated, and
10 when the vehicle turns to right, the right shoulder is
11 irradiated, and I'm including Figure 10 that
12 demonstrates what the previous text described.

13 In particular --

14 BY MR. TURNER:

15 Q. Thank you.

16 A. And it continues also and says, why I combined
17 purchaser motivation, and so on and so forth, and
18 these are in my declaration.

19 Q. Okay. So can you turn back to paragraph 69, please.

20 A. I'm there.

21 Q. Okay. So your first sentence, you see where it says
22 it would have been obvious to a POSITA to apply these
23 materials to Alden to additionally or through simple
24 substitution use map data to identify road curvature
25 when adapting the LEDs of Alden to direct light into

1 the corner?

2 Do you see that?

3 A. Yes.

4 Q. So are you proposing this using map data, you're
5 saying, additionally or through simple substitution?
6 So what would you be substituting this map data for?

7 A. So let me -- I think I'm saying -- I'm discussing
8 this -- give me a minute.

9 So if we go to paragraph 70, I'm saying in
10 the middle of -- around the middle of page 41 of
11 Exhibit 1003, a POSITA will have thus been motivated
12 to combine the techniques of detecting the road
13 curvature to maximize successful detection in
14 different environments, for example, where a road
15 lacks the reflectors contemplated in Alden, and
16 referring to the elements 157 in Figure 11.

17 Relying on map data will be preferred.
18 Installing such road reflectors along all the roads
19 will be expensive and could be impractical in some
20 areas, like urban environments, where there may not be
21 a place for certain reflectors to be installed, such
22 that they could be recognized. And in an environment
23 where map data may be less reliable, light or steering
24 wheel sensors may be preferred.

25 Alden suggests that combining multiple

1 sources of information about road curvature is
2 beneficial.

3 My comment here is that I'm discussing also
4 the wheel sensor. So a POSITA will naturally be
5 motivated to incorporate additional sources of road
6 curvature information such as Kobayashi's
7 functionality of using map data to determine road
8 curvature.

9 Q. All right. So if this combination includes map data
10 and other input such as that described in Alden, if
11 both inputs are present, how would your combination
12 prioritize the inputs?

13 A. A POSITA will have other -- a couple of options.
14 There is a whole area in intelligent transportation
15 systems and intelligent vehicles that is called
16 multisensor fusion.

17 Sorry. I'll repeat that. It's called
18 multiple sensor fusion.

19 So you need -- a POSITA will know, based on
20 the needs and the environment, for example, if you are
21 in an urban area with a lot of high-rise buildings,
22 you may not want -- you may not have access
23 continuously to GPS.

24 So this whole area of sensor fusion is part
25 of an intelligent vehicle. In fact, at that time,

1 there was even a workshop symposium talking about
2 this. So a POSITA would have been well informed on
3 how to fuse to blend the data.

4 Q. Okay. So you're saying, in an urban area, if you
5 didn't have access to GPS, so that's the map data from
6 Kobayashi, then you would use the information from
7 Alden, such as the reflectors; is that correct, for
8 detecting an upcoming curve?

9 MR. HUGHES: Objection. Mischaracterizes.

10 THE WITNESS: What I'm saying, Kobayashi --
11 let me go -- let me go to Kobayashi. Just give me one
12 minute.

13 If we go to Figure 12 of Kobayashi --

14 BY MR. TURNER:

15 Q. So Kobayashi, that's Exhibit 1006; is that correct?

16 A. I have that it's a part of the other proceedings. So,
17 yeah. That's correct then.

18 So if you go to Figure 12 of Kobayashi,
19 there are elements 14, 13, 15, 16. 14 has the title,
20 vehicle speed sensor. Element 13 has steering sensor.
21 Element 32, it has the GPS receiving section. Element
22 33 is a gyro sensor. And all of them, through the use
23 of the calculating section, along with the ACU which
24 is denoted by number 10, are integrated and are
25 informing the drive section, which informs the

1 lighting element 30L and 30R.

2 So, to answer your question, the GPS data
3 is only part of the sensory data which are basically
4 considered by Kobayashi.

5 Q. So are you saying for your proposed combination you're
6 adding all of these inputs to the Alden reference?

7 A. I'm just saying what is disclosed, and the part that I
8 think it will be interesting, and in addition to
9 Alden, because Alden discloses a steering sensor, as
10 well, and using the steering data. I think if the GPS
11 receiving -- the GPS data, it will be deemed useful by
12 the POSITA at that time. That's all I'm saying.

13 Q. So are you proposing adding the steering sensor from
14 Kobayashi to the Alden reference?

15 MR. HUGHES: Objection. Vague.

16 THE WITNESS: I would not propose this. A
17 POSITA wouldn't -- because already there is a steering
18 sensor involved -- disclosed by Alden.

19 BY MR. TURNER:

20 Q. Can you turn to paragraph 71 of your declaration?

21 A. Yes.

22 Q. Okay. So here you're analyzing claim limitation 1D,
23 and in your heading, you see where it says determine a
24 light change, the change adapting a light pattern of
25 the headlamps in at least one of color intensity or

1 spacial distribution?

2 A. Yes.

3 Q. What is your understanding of the term spacial
4 distribution?

5 A. Distribution means space. Not my understanding, but
6 the understanding of a POSITA at that time.

7 Q. Okay. Then how is that different from the term
8 intensity?

9 A. We go back to luminance, luminous flux. So my
10 understanding here is actually with respect to
11 luminance, how bright the light is.

12 Q. So you're saying intensity refers to how bright the
13 light is?

14 A. As perceived by a driver or, basically, by square
15 foot, for example, is the unit.

16 Q. All right. Can you turn to page 75 of your
17 declaration?

18 A. Yes.

19 Q. If you scroll up -- maybe we'll start with paragraph
20 73.

21 A. Okay.

22 Q. So this -- the heading here, the claim limitation,
23 you're controlling at least a first plurality of LED
24 light sources to provide light, based, at least in
25 part, on the determined light change and prior to the

1 motor vehicle reaching the road curvature.

2 Do you see that?

3 A. Yes.

4 Q. Okay. So now you -- if you scroll down to 75, you
5 annotated Figure 5 of the Alden reference, correct?

6 A. Yes.

7 Q. Okay. And what you have annotated in green, this is
8 showing the illumination as the road curves left; is
9 that correct?

10 A. Yes.

11 Q. Are you proposing adding any LEDs or adjusting the
12 position of this array of LEDs to provide this
13 green-lighted segment?

14 A. I'm not sure of the question.

15 What are you referring to?

16 Q. (Cross talk.)

17 A. Sorry. I just annotated the figure to illustrate how
18 the detection of reflectors described in paragraph --
19 shown in Figure 11 and described in paragraph 36 of
20 Alden, I'm saying an equipped vehicle 153 senses that
21 the road turns by receiving light from a refractor
22 such as a refractor 157, and I'm saying that
23 responding headlights 155 direct light into the corner
24 to maximize the driver's ability to see there. The
25 directing of light can be achieved with a segmented

1 sensing elements and segmented light distribution
2 elements described herein.

3 So if we go to Figure 11, it's a top view
4 of a vehicle. It has the headlights -- one of the
5 headlights with the lighting elements 155 noted. The
6 vehicle is noted by 153 and we have the reflectors and
7 shows basically the 159 beam.

8 And this is what I'm trying to provide an
9 annotated illustration of how -- basically, which
10 part -- the first -- I'm trying to show the first
11 plurality of LEDs directing light into the road
12 curving left.

13 Q. So are you proposing any modifications to the
14 structure of Alden for this claim limitation?

15 A. No. It's just an annotation.

16 Q. All right. Can you turn to paragraph 91 of your
17 declaration, please.

18 A. Yes.

19 Q. Actually, let's skip that.

20 Can you go to -- just a second. All right.
21 Can you go to paragraph 117, please.

22 A. Yeah.

23 Q. Okay. So you see, 117, the header above this you're
24 analyzing claims 8A, 19A, and 30A?

25 A. Yes.

1 Q. Limitation is determine a position associated with at
2 least one other vehicle based at least in part on
3 second data indicating the at least one vehicle and
4 captured by the at least one or more cameras?

5 A. I do.

6 Q. Okay. So now, if you could scroll down to paragraph
7 119.

8 Now, you've annotated Figure 3 to reference
9 to the horizontal and vertical position of sensed
10 vehicles.

11 Do you see that?

12 A. Yes.

13 Q. So what do you mean by the horizontal and vertical
14 position of sensed vehicles?

15 A. So I'm using the POSITA knowledge, and mainly I'm
16 using the whole description that these -- Kobayashi
17 senses the left and the right, basically provide
18 two-dimensional information, as is indicated by the
19 element 77 in Figure 3, and element 79.

20 So we want to position -- and also, if we
21 go to Figure 4 --

22 Q. Figure 4 of Alden?

23 A. -- of Alden --

24 Q. Okay.

25 A. I'm informed by the elements 89, 91, 93, and 95.

1 Element 89, it says, is threshold light present at A1L
2 sensor position? Is threshold light present at A2L
3 XYL sensor positions?

4 In other words, in a role major -- role
5 major scanway (phonetic), which is basically the way
6 that we look at things like this, we try to find
7 light, which -- the Circum light in the case of the
8 headlights.

9 Similarly, the element 93 says, is
10 threshold light present at position of the right
11 sensor A1R? This is element 93.

12 And then element 95 it says, is threshold
13 light present at A2 RXY? Again, we need the
14 coordinates in order to perform this -- the passing of
15 the Kobayashi data, Kobayashi sensor data.

16 So then, element 97, we compile the left
17 sensor map; in element 99, we compile the right sensor
18 map; and in the element 101, we compare the left map,
19 the right map. All these are two-dimensional arrays.

20 So, basically, here, what I'm saying is
21 that we need a system as disclosed in the controlling
22 logic of Figure 4, says where are we with respect to
23 this two-dimensional structure the vehicle may be.

24 And this is important information because
25 that is used in order -- and there is module that is

1 feeding to this component 105, calculate distance of
2 fixed threshold object using triangulation.
3 Triangulation wouldn't work without this horizontal or
4 vertical position of the sensed vehicle.

5 And then is the segmented automatic
6 headlight system because says calculate headlight dim
7 zones for each threshold object.

8 Q. All right. So, now, if you go back to paragraph 120
9 of your declaration --

10 A. Yep.

11 Q. -- so now you're referring to a first subsection and a
12 second subsection.

13 Do you see that?

14 A. Yes.

15 Q. Are these subsections illustrated in Figure 3?

16 A. Can you repeat your question?

17 Q. Are these subsections illustrated in your Figure 3
18 that you annotated above paragraph 120?

19 A. What I have annotated with yellow are basically the
20 location of the vehicle, and with respect to the left
21 light control sequence and the right light control
22 sequence.

23 And if we go to Alden, in paragraph -- in
24 paragraph 27, it says, likewise, a right shaded
25 circuit area 81 indicates the areas of a segmented

1 headlight control switch array switches which will
2 cause portions of the right headlight to be dim while
3 a non-shaded right circuit area 79 represents the
4 portions of the right segmented headlight which will
5 be on high beam.

6 The 81 area is significantly larger than
7 the headlight dots that were initially received by 51a
8 and 51b because the CPU has made assumptions about the
9 space that may potentially be occupied by the driver
10 of the sensed vehicle.

11 Q. Okay. So in Figure 3, are you saying that the area
12 that you have highlighted in orange would be --
13 correspond to the dimmed area and the remaining area
14 would have been the high beam area?

15 A. Yep.

16 Q. Okay. So, now, does that correspond to -- how does
17 that correspond to the Figure 5 embodiment of Alden?

18 MR. HUGHES: Objection. Vague.

19 THE WITNESS: So this particular figure
20 here, the annotated figure is used in order to
21 address -- let me make sure that I'm right.

22 In order to address the 8A, 19A, 30A,
23 determine -- determine in a position associated with
24 at least one other vehicle based at least in part on
25 second data, indicating the at least one other vehicle

1 and captured by the at least one of the one or more
2 cameras.

3 So a POSITA will understand this, that --
4 how another vehicle, other than the one where we are
5 doing the segmented headlight system, can be detected.
6 This is called -- these are notation it refers to.

7 BY MR. TURNER:

8 Q. So your annotations of Figure 3, does this represent
9 that the headlamp would project high beam light above
10 the vehicle, below the vehicle, all around the
11 vehicle, except for in that orange square or
12 rectangle?

13 A. Yes. And, again, this is in the context of me
14 addressing by Alden, in view of Kobayashi, reviews the
15 claims 8A, 19A, and 30A.

16 Q. Okay. All right. So, now, if you scroll down to
17 paragraph 126 -- or flip. I think you have paper, so
18 if you flip the page.

19 A. Yep.

20 Yes, I'm there.

21 Q. Okay. So you have annotated this figure to indicate a
22 sensed vehicle in the center, correct?

23 A. Yes.

24 Q. So does this beam pattern shown in Figure 5 correspond
25 to the annotated Figure 3 embodiment that we were just

1 discussing?

2 A. This annotation addresses my view, which is the view
3 of the POSITA, that Alden, in view of Kobayashi,
4 renders all these claims 8B, 19B, and 30B.

5 And do you want me to read this or...

6 Q. No. That's not necessary.

7 I mean, does this Figure 5 correspond to
8 your annotated Figure 3 embodiment?

9 A. I'm using the same, basically whatever Alden teaches,
10 but I'm trying to address, basically, that -- a second
11 plurality of LED light sources providing light
12 directly towards an area, including at least a portion
13 of the other vehicle, to diminish glare to a driver of
14 the other vehicle by a decrease to intensity of light
15 directed toward and illuminating the area; and, number
16 two, the light that's directed towards and
17 illuminating the area having lower intensity compared
18 to light directed towards points laterally adjacent of
19 the area to either side.

20 So I'm saying -- I'm sensing a -- Alden
21 senses a vehicle, Alden system, that has low beam and
22 the areas adjacent to this are on high beam. That's
23 basically the objective of using this particular
24 annotation as disclosed by Alden.

25 Q. Now, is this Figure 5 embodiment, is this a top view

1 or a side view?

2 A. Figure 5, as annotated, or Figure 5 in general?

3 Q. As you have annotated in paragraph 126 of your
4 declaration.

5 A. All my annotations of Figure 5 basically are based on
6 the disclosures in Figure 3 -- Figures 3, 4, and 5,
7 and on 4 -- by the paragraphs, 27, 28, and 29, which
8 is -- basically create this.

9 Q. All right. So on the bottom of page 87, you refer to
10 areas as being laterally adjacent to the sensed
11 vehicle.

12 So based on your terminology of being
13 laterally adjacent, does that help explain? Is this a
14 top view or a side view?

15 A. As I mentioned, this is a top view. I mean, before
16 even the annotation, a POSITA will have looked at this
17 and said top view.

18 Q. Okay. So in your Figure 3 embodiment, you describe
19 that as having high beams above the vehicle.

20 So which LEDs, as shown in Figure 5, would
21 generate the high beams that are located above the
22 vehicle?

23 A. Can you repeat the question?

24 Q. In your Figure 3 embodiment, you showed an orange
25 block or rectangle around the vehicle that represented

1 the area that was dimmed; is that correct?

2 A. I have a blue --

3 Sorry. You mean about --

4 Q. This was in Figure 3 that you had in paragraph 119 of
5 your declaration.

6 A. Yeah.

7 Q. So, if you see in Figure 3, which is in paragraph 119
8 of your declaration, you have high beams all around
9 the vehicle, correct?

10 A. Yes.

11 Q. Okay. So, now, if we go back to your Figure 5
12 embodiment, which shows the top view, which LEDs would
13 be used to generate the high beams above the sensed
14 vehicle?

15 A. You see, as Alden discloses, Figures 3 and 4 are used
16 for Figure 5, and, basically, Figure 5 -- the
17 paragraph 29, says the following:

18 That these LEDs -- let me --

19 Paragraph 29 from Alden, Figure 5
20 illustrates the segmented headlight means -- the
21 segmented headlight means a controlling switch array
22 if the first embodiment, and, also, it says, its
23 lighting element being independently controlled by a
24 corresponding switch in an array of switches 115.
25 Each switch is controlled by the CPU and logic

1 previously described.

2 So, as I have said previously, a POSITA
3 will have read this to mean that Figure 5 demonstrates
4 a slice of the LEDs on a curve.

5 Q. So --

6 A. Let me -- because this is an important point.

7 The 119 and other lighting elements only
8 care about the focal point, overhead light lens 121,
9 such that the light from its lighting element goes
10 into specified portion or portions.

11 So the combination of the placement of
12 these directed LEDs, along with the focal point of the
13 headlight lens 121 -- this is from paragraph 29 --
14 will allow, for example, to answer your particular
15 question, an LED from rows below cover the area above
16 the highlighted-in-yellow box.

17 Q. So you're saying there would be a row of LEDs below
18 those illustrated in Figure 5 that would provide the
19 light above the vehicle -- the yellow box in the
20 Figure 3 embodiment; is that correct?

21 A. A row placed vertically.

22 As I have discussed earlier, this is a
23 slice. Because, basically, again, it says, each
24 switch is controlled by the CPU and logic, Figure 4,
25 and Figure 4 has this two-dimensional images provided

1 by the camera sensors and refer to logic that is
2 described in Figure 4.

3 Q. When you use the term slice, you're referring to,
4 like, a row of LEDs, and there'd be adjacent rows?
5 There'd be multiple rows of LEDs?

6 A. Yes, a POSITA would have viewed it that way.

7 Q. All right. Can you turn to paragraph 127 of your
8 declaration?

9 A. Yes.

10 Q. All right. So do you see in this section you're
11 analyzing dependent claims 10 through 11, 21 through
12 22, and 32 through 33?

13 A. Yes.

14 Q. And these claims include limitations direct to optical
15 control elements?

16 A. Yes.

17 Q. So are you relying on Alden's headlight lens 121 and
18 variable refractive elements for satisfying these
19 optical elements, limitations -- these optical control
20 elements?

21 MR. HUGHES: Objection. Compound.

22 THE WITNESS: Let me review my declaration
23 here.

24 So the claim 10 requires one or more
25 optical control limits for controlling light from one

1 or more of the LED light sources.

2 And 11, it says the system of claim 10
3 wherein the optical control elements include at least
4 one of one or more reflectors -- refractors or lenses.

5 So I'm saying that the Alden system
6 provides a headlamp -- headlight lens 121 such that
7 the light from its lighting element goes into a
8 specified portion or portions of the headlight
9 distribution area, from 29.

10 And I'm continuing with the analysis of the
11 less -- of the lens.

12 In paragraph 129, I'm saying, in addition,
13 as Alden has stated in 61, paragraph 61, Alden system
14 can include other optical control elements, including
15 invariably a refractive element in the form of a
16 liquid crystal.

17 BY MR. TURNER:

18 Q. Okay. So which one of these elements are you relying
19 on for satisfying the one or more optical control
20 elements?

21 A. I'm starting with the lens, and I'm saying it's not
22 only the lens, but a POSITA will have been -- reviewed
23 the refractive element as another embodiment.

24 Let me make sure I have my --

25 If you go to paragraph 35, it says,

Figure 10 depicts a segmented headlight with individual control sectors of distribution of the third embodiment -- as the third embodiment.

Q. All right. Are you back -- are you referring to paragraph 35 of Alden, or of your declaration?

A. 35 of Alden.

Q. Okay. So the refractive element you said is another embodiment, and that's what Alden refers to as the third embodiment; is that correct?

A. Yes.

Q. Okay. And in Figure 5, the lens 121, that's in a different embodiment of Alden?

A. If we go to paragraph 29 of Alden, it says, Figure 5 illustrates the segmented -- the desegmented headlight means a controlling switch array in the first embodiment.

Q. So Figure 5 is a first embodiment; Figure 10 depicts a third embodiment; is that correct?

A. Yes.

Q. Okay.

A. But it could be viewed in conjunction with 61 and other statements that he has throughout that. Basically, I'm reading from paragraph 61, many other variations are possible.

Sorry, 61 starts, while the above

1 description describes many specifications, these
2 should not be construed as limitations on the scope of
3 the invention, but, rather, as an exemplification of
4 the preferred embodiment thereof.

5 Many other variations are possible. For
6 example, light sectors may overlap such that one light
7 distribution sector is covered by more than one
8 illumination emitting, filtering, and/or diverting
9 sectors. One or more methods employed herein may be
10 used in combination to vary illumination in a
11 segmented system.

12 Q. Okay. So in your opinion, that disclosure or those
13 statements in Alden's paragraph 61 supports combining
14 the Figure 5, Figure 10 embodiments?

15 A. In the context of the particular description -- are
16 you asking me in the context of claims 10 and 11 or in
17 general?

18 Q. In general. Would that -- would a person of ordinary
19 skill in the art reading that understand that the
20 Figure 5 embodiment and the Figure 10 embodiment could
21 be combined?

22 A. I think in the context of the '029 patent we're
23 considering today, I think this is a whole teaching
24 disclosure.

25 Q. Okay. So how would a person of ordinary skill in the

1 art combine these two embodiments?

2 A. I have expressed opinions about how the particular --
3 I mean, I think, basically, I highlight it, how,
4 basically, Alden, in view of Kobayashi, reviews all
5 the claims that we are discussing in this particular
6 patent.

7 And I have expressed my opinion in other
8 depositions on how this combination is helping the
9 other patents.

10 Q. Okay. Can you turn to paragraph 131 of your
11 declaration.

12 A. Yes.

13 Q. Okay. Do you see the -- about the third sentence
14 where you have it in bold where you're quoting Alden?

15 Okay. Maybe -- in fact, Alden expressly
16 discloses that one or more methods employed herein may
17 be used in combination to vary illumination in a
18 segmented system.

19 Do you see that sentence?

20 A. Yes.

21 Q. Okay. So then after that, you're talking about the
22 use of a known optical element, a liquid crystal, in
23 the system.

24 So can you explain how you would combine
25 these to add this known optical element to the Figure

1 5 embodiment?

2 MR. HUGHES: Objection. Vague.

3 THE WITNESS: A POSITA, among other
4 options, could have used the system described in the
5 third embodiment in Figure 10, along with the logic
6 described in Figures 3 and 4, in order to have this
7 bedding of the light, or this segmented headlamp.

8 And as I'm saying, the POSITA will have a
9 reasonable expectation of the success as the liquid
10 crystal illuminance will perform the same function of
11 allowing light to pass straight through when a circuit
12 is open and bending light when a circuit is closed,
13 and a POSITA will have been motivated, as Alden
14 expressly provides above in 61, to add these
15 refraction element to each headlight system, such as
16 to the system depicted in Figure 5.

17 BY MR. TURNER:

18 Q. Okay. So does Alden describe an array of refractive
19 elements with reference to Figure 10, or a single
20 element?

21 A. Let me go to the description.

22 Figure 10 depicts a segmented headlight
23 with a division controlled sectors of distribution of
24 the third embodiment. A single light element 129A
25 produces collimated light due to collimating surface

1 131A.

2 The light then passes through an array of
3 variable reflection elements described in Figure 9.
4 So describes an array of refraction elements. This
5 allowed architecture enables light from an individual
6 headlight distribution sector to be redirected in
7 response to the sensed environmental conditions when
8 used in conjunction with the elements and processes
9 previously described -- discussed herein.

10 Thus, light from one section has been
11 diverted to become diverted light 151 in low beam
12 where a vehicle not shown has been sensed by the light
13 from other segments are not diverted, are on high
14 beam, where no vehicle is sensed.

15 Q. Do you agree Alden describes an array of refractive
16 elements in Figure 10?

17 A. Based on the disclosure I just read, yes.

18 Q. Okay. How would a person of ordinary skill in the art
19 combine this array of elements with the Figure 5
20 embodiment?

21 MR. HUGHES: Objection. Vague. Calls for
22 speculation.

23 THE WITNESS: The first option that will
24 have come to a POSITA is basically to take the
25 Figure 5 and use basically the Figure 10 as a

1 substitution of the multiple LEDs, among other
2 options.

3 BY MR. TURNER:

4 Q. So are you saying you would replace the LEDs of the
5 Figure 5 embodiment with the array of refractive
6 elements of Figure 10?

7 A. One possibility.

8 Q. So for this combination, what would the light source
9 be?

10 A. The one indicated in 129A.

11 Q. Okay. So you'd have the -- so, for your combination,
12 you would have the single light source, 129A?

13 Would you have this surface, this 131A
14 surface also?

15 A. A POSITA will have started from there as a first
16 option, among other options.

17 Q. So what else of Figure 5 embodiment would remain in
18 combination?

19 A. There are many options. Again, I can think of an
20 example where, for example, you are going to use the
21 Figure 10 -- so you can use Figure 5, the LEDs, just
22 for the central portion, and having the structure
23 described in Figure -- in Figure 10 to substitute the
24 LEDs on the side or in addition to the LEDs on the
25 side.

1 I think there are many options, depending
2 on the needs, especially since the refracting element
3 gives you some interesting properties with respect to
4 bending and directing the light. There are different
5 combinations that the POSITA could have had, including
6 just substituting a percentage of the LEDs we see here
7 in this 3D space that the headlight covers.

8 MR. HUGHES: Counsel, we're at about 12:30
9 our time here. So just whenever you get a chance to
10 break for lunch, just let us know.

11 MR. TURNER: Okay. Yeah. A few more
12 minutes.

13 MR. HUGHES: Yep.

14 BY MR. TURNER:

15 Q. All right. Can you turn back to your declaration
16 paragraph 131?

17 A. Yes.

18 Q. So the first sentence here, it says Alden discloses
19 that its use of refractive elements to bend light can
20 be included in its headlight system, such as that of
21 Figure 5, and a POSITA would have readily understood
22 how to implement the variable refractive elements in
23 the system.

24 So based on our discussion here, you
25 mentioned there's a lot of different options. So

1 based on your analysis here in your statement, if a
2 POSITA would have readily understood how to implement
3 these, which of your options would a POSITA have
4 implemented?

5 A. I said not many. I said there are several options and
6 I mentioned some, and this depends on the task at
7 hand. For example, are we talking about a headlight
8 system that is going to be in road atlas or basically
9 the whole discussion we had about lack of GPS, other
10 sensor information, and so on and so forth.

11 So a POSITA at that time will need to look
12 at the application -- for example, the application
13 here for this particular patent in consideration is
14 looking -- directing light to the corner and
15 increasing visibility on a curve. And I use the term
16 can be included in its headlight system. And this
17 emphasizes that this is one of the options.

18 Q. Okay. So based on your analysis that you did for
19 claims 10 through 11, 21 through 22, and 32 through
20 33, based on those applications for the '029 patent,
21 which one of these combinations would a person of
22 ordinary skill in the art choose as far as the
23 combination of the Figure 10 embodiment and the
24 Figure 5 embodiment?

25 A. Basically, what I was asked to do, again, I was asked

1 to look if Alden, in view of Kobayashi, referenced all
2 these claims, and this particular segment that we're
3 discussing now, the claims 10 to 11, 21, 22, and 32
4 and 33.

5 So this analysis here is focusing on this
6 particular why I believe that, as a POSITA, Alden, in
7 view of Kobayashi, renders obvious these claims.

8 Q. Can you explain how a person of ordinary skill in the
9 art would have implemented the variable refractive
10 elements in the system described in Figure 5?

11 A. First of all, I'm starting, the first element I
12 mentioned is actually the lens, satisfies the claim
13 limitations for 10 and 11. And I'm saying, in
14 addition, Alden discloses this refractive element.

15 Q. You understand that claims 10 and 11 include all the
16 limitations of claims they're depending from?

17 Sorry. Strike that.

18 Are you analyzing claims 10 and 11 in
19 isolation?

20 A. I'm analyzing, in their totality of the language which
21 is contained. For example, the system of claim 1, and
22 I analyze claim 1 -- I'm starting at page 24 of my
23 declaration.

24 Further, including one or more optical
25 control elements for controlling light from one or

1 more of the LED light sources.

2 So, for me, this was the thing I was trying
3 to answer. I addressed this. As I mentioned,
4 starting page 24 till page 47, I address why the
5 claim 1 is obvious of Alden in view of Kobayashi.

6 Then I'm analyzing, including the
7 difference -- claim 10 says, the system of claim 1,
8 further including one or more optical control image
9 from controlling light from one or more of the LED
10 light sources.

11 In the analysis I have, 127 -- paragraph
12 127, 128, and 129 and 130 and 131 answers this, but I
13 start with a use of the lens 121, and this is
14 described in paragraphs 127, 128, and then, in 129,
15 I'm saying, in addition, Alden systems can include
16 other optical control elements.

17 Q. Okay. So for your combination, are you adding these
18 to the Figure 5 embodiment?

19 A. The adding is in addition, other ways -- other
20 elements which can be used, other optical control
21 elements that can be used.

22 Q. And you're saying, in addition, this would be an
23 alternate embodiment?

24 A. It's additional information that I'm including that
25 will inform a POSITA about why claim 10 -- Alden, in

view of Kobayashi, renders obvious claim 10.

Q. Okay. So how would a person of ordinary skill in the art add a variable refractive element to the Figure 5 embodiment?

MR. HUGHES: Objection. Vague. Asked and answered.

THE WITNESS: I think my paragraph 129 explains that.

BY MR. TURNER:

Q. Okay. So if that explains it, would you mount this to the Figure 5 embodiment between LEDs and the lens 121?

A. I said there are other few options among -- and I will start with partial substitution. Because I have to consider this as part of the particular content in patent '029.

Q. Okay. So what elements are you substituting?

A. One option, as I mentioned earlier, is just substituting or adding on the side of the LEDs.

Q. Are you adding the full array of refractive elements or a single one?

A. It can be a single one.

Q. Okay. So if you're adding those to the side of the LEDs, is the LEDs in -- illustrated in Figure 5; is that correct?

MR. HUGHES: Objection. Mischaracterizes.

1 THE WITNESS: I'm saying, in the case of --
2 basically, where we want to bend the light in a
3 certain direction, and if, basically, we have lack of
4 additional sensory signals, one of the things you can
5 do is actually adding them on the side so, basically,
6 you can have more control along the curve, as a
7 POSITA.

8 BY MR. TURNER:

9 Q. So when you're saying adding these to the side of the
10 LED, by adding a refractive element to the side of the
11 LED, that's within the beam path between the LED and
12 the lens 121 --

13 MR. HUGHES: Objection.

14 BY MR. TURNER:

15 Q. -- is that correct?

16 MR. HUGHES: Mischaracterizes.

17 THE WITNESS: I'm saying on the side. So
18 the bending will happen -- it will not interfere.

19 BY MR. TURNER:

20 Q. So can you be more specific what you mean by at the
21 side with reference to Figure 5? Where exactly would
22 this refractive element be located?

23 A. So it can be a structure, as denoted in Figure 10,
24 that goes, for example, where 119 is next to it.

25 Q. By next to it, do you mean within the light path

1 between the LED and the lens 121?

2 A. No. I mean, if we want to have something as a first
3 option next to it.

4 Q. What do you mean by next to it?

5 A. Do you see where we have 119 and a pointer?

6 Q. Yes.

7 A. So there is some space next to this LED. Or the other
8 one is to take this LED 119 out, leave the rest, take
9 the one out which is on the other symmetrical position
10 of this top view, and have this refractive element
11 there.

12 Q. So you're saying -- you're describing two options.
13 One would have the refractive element within the
14 housing between a light element 119 and the lens 121;
15 is that correct? That's one option?

16 A. And there are other options.

17 Q. And the other option you mentioned was moving the
18 element 119 outside of this housing?

19 A. Yeah.

20 Q. And then just --

21 A. Just removing this. Just removing this element
22 completely.

23 Q. Just one single light element out of the series or the
24 array?

25 A. You may have to remove more, depending on how these

1 are located along the focal point of the headlamps and
2 a number of -- the total number of LEDs we have.

3 Q. All right. So this LED, would it be used only for
4 curve illumination or would it also be used for
5 forward illumination?

6 A. In the context of the patent '029, I will see the need
7 or the motivation to do for the curve, or a POSITA
8 would have examined these as an option.

9 MR. HUGHES: Counsel, we're about 12:45
10 now. So if we can just get to a place for lunch soon,
11 please.

12 MR. TURNER: Yeah. We can break. Why
13 don't we break.

14 (Recess taken at 12:45 p.m.)

15 (Back on the record at 1:30 p.m.)

16 MR. TURNER: So I have no further
17 questions.

18 MR. HUGHES: And we have no questions
19 either.

20 THE COURT REPORTER: Great. Okay.

21 Mr. Turner, would you like to order the
22 transcript?

23 MR. TURNER: Yes. I'd like a rough, and
24 then I'd like the final, you know, within a week, if
25 you can do that.

1 THE COURT REPORTER: Okay. So rough, you
2 know, today, like, in a few hours.

3 And final -- what did you say, seven
4 business days?

5 MR. TURNER: Seven -- so calendar days. So
6 if we target April 3rd.

7 THE COURT REPORTER: You want it April 3rd.
8 No problem.

9 And then, Mr. Hughes, do you want a copy of
10 the rough draft?

11 MR. HUGHES: Yes. If we could get the
12 rough today, and then final just whenever normal
13 delivery is.

14 THE COURT REPORTER: Okay. Thank you.
15 (Deposition concluded at 1:34 p.m.
16 Signature of the witness was requested.)
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CHANGES AND SIGNATURE

WITNESS NAME: Nikolaos Papanikolopoulos, March 27, 2024

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1 I, having read the foregoing deposition consisting of my
2 testimony at the aforementioned time and place, do hereby
3 attest to the correctness and truthfulness of the
4 transcript, except as noted above.

5
6 _____
7 Nikolaos Papanikolopoulos

8 Dated:
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CERTIFICATE OF NOTARY

STATE OF MICHIGAN)

) SS

COUNTY OF OAKLAND)

I, VIOLA KAY NEWMAN, a Notary Public in and for the above county and state, do hereby certify that the above deposition was taken before me at the time and place hereinbefore set forth; that the witness was by me first duly sworn to testify to the truth and nothing but the truth; that the foregoing questions asked and answers made by the witness were duly recorded by me stenographically and reduced to computer transcription; that this is a true, full, and correct transcript of my stenographic notes so taken; and that I am not related to nor of counsel to either party nor interested in the event of this cause.

Viola Newman

VIOLA KAY NEWMAN, CSR-4320, RPR, CRR
Notary Public,
Oakland County, Michigan

My commission expires: December 4, 2025

Exhibits		
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