

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALEO NORTH AMERICA, INC.; VALEO S.A.;
VALEO GmbH; VALEO SCHALTER UND SENSOREN GmbH;
and CONNAUGHT ELECTRONICS LTD.,
Petitioner,

v.

MAGNA ELECTRONICS, INC.,
Patent Owner.

Case IPR2014-01208
Patent 7,991,522 B2

Before JAMESON LEE, PHILLIP J. KAUFFMAN, and
MATTHEW R. CLEMENTS, *Administrative Patent Judges*.

KAUFFMAN, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. PROCEDURAL HISTORY

Valeo, North America, Inc., Valeo S.A., Valeo GmbH, Valeo Schalter und Sensoren GmbH, and Connaught Electronics Ltd. (collectively, “Petitioner”) filed a Petition (Paper 1, “Pet.”) to institute an *inter partes* review of claims 2–5, 7, 11, 12, 16–26, 28, 32–35, 37, 40, and 44–46 of U.S. Patent No. 7,991,522 B2 (Ex. 1001, “the ’522 patent”). Patent Owner, Magna Electronics, Inc., filed a timely Preliminary Response (Paper 6, “Prelim. Resp.”).

In the December 23, 2014, Decision to Institute (Paper 13, “Dec.”), we instituted trial on claims 2, 3, 5, 7, 11, 12, 18, 19, 21–26, 28, 32–35, 37, 40, and 44–46 on the following grounds:

(1) claims 2, 3, 5, 7, 11, 12, 28, 32–35, 37, 40, and 44–46 as unpatentable under 35 U.S.C. § 103(a) over Nissan¹ and Hitachi²;

(2) claims 18, 21, 22,³ 25, and 26 as unpatentable under 35 U.S.C. § 103(a) over Nissan, Hitachi, and Gutta⁴; and

(3) claims 19, 23, and 24 as unpatentable under 35 U.S.C. § 103(a) over Nissan, Hitachi, and Broggi.⁵

¹ Ex. 1002, JP 2004-1658 (pub. Jan. 8, 2004). We refer to the English translation at Exhibit 1003 throughout.

² Ex. 1013, JP 2002-74339 (pub. Mar. 15, 2002).

³ Petitioner proposed a ground of unpatentability against claim 22 based on Nissan, Hitachi, and either Gutta or Breed. *See* Pet. 56–59. We instituted on the alternative based on Gutta. *See* Dec. 27–29. Here, we list each of the claims subject to Nissan, Hitachi, and Gutta together.

⁴ Ex. 1005, U.S. 6,424,273 B1 (iss. July 23, 2002).

⁵ Ex. 1006, Alberto Broggi et al., *Multi-Resolution Vehicle Detection Using Artificial Vision*, 2004 IEEE INTELLIGENT VEHICLES SYMP. 310–314.

Subsequently, Patent Owner filed a Patent Owner Response (Paper 31, “PO Resp.”), and Petitioner filed a Reply (Paper 33, “Pet. Reply”).

Patent Owner did not file a motion to amend.

Patent Owner filed a motion to exclude certain evidence which is discussed in section III below.

Oral hearing was held on Thursday, October 1, 2015, and a transcript of the oral hearing is included in the record.⁶ Paper 48 (“Tr.”).

For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 2, 3, 5, 7, 11, 12, 18, 19, 21–26, 28, 32–35, 37, 40, and 44–46 of the ’522 patent are unpatentable.

B. RELATED PROCEEDINGS

The parties indicate that Patent Owner asserted the ’522 patent against Petitioner in *Magna Electronics Inc. v. Valeo, Inc.*, No. 2:13-cv-11376-DRG (filed on Mar. 28, 2013) (E.D. Mich.). Pet. 3; Paper 5, 2.

The ’522 patent was the subject of IPR2014-00221. In a Final Written Decision dated May 28, 2015, we determined that claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 are unpatentable as obvious over Nissan and Hitachi. *Valeo North America, Inc., et al. v. Magna Electronics, Inc.* (PTAB May 28, 2015) (Paper 58). On July 30, 2015, Patent Owner filed a notice of appeal. *Id.* at Paper 59.

⁶ The hearing was held with the hearing for IPR2014-01204.

C. THE '522 PATENT

The '522 patent relates generally to vision or imaging systems for vehicles and, more particularly, to imaging systems that are operable to determine if a vehicle or object of interest is adjacent to, forward of, or rearward of the subject vehicle to assist the driver in changing lanes or parking the vehicle. Ex. 1001, col. 1, ll. 18–23. The prior art included many lane change aid/side object detection/lane departure warning devices or systems, and the like, that are operable to detect a vehicle, or other object, that is present next to, ahead of, or rearward of the equipped vehicle or in a lane adjacent to the equipped vehicle. *Id.* at col. 1, ll. 29–33. Such known systems statistically analyze all of the pixels in a pixelated image. *Id.* at col. 1, ll. 48–51. However, because such systems continuously analyze every pixel for every frame captured, they require expensive processing controls and computationally expensive software to continuously handle and process substantially all of the data. *Id.* at col. 1, ll. 60–67. In addition, prior art warning systems may result in a warning for many intended maneuvers. *Id.* at col. 2, ll. 19–24. As a result, the driver may begin to ignore the warnings. *Id.* at col. 2, ll. 25–27.

To address these issues, the '522 patent discloses an object detection system operable to detect and/or identify a vehicle or other object of interest at the side, front, or rear of the vehicle equipped with the object detection system. *Id.* at ll. 35–44. The system uses an edge detection algorithm to detect edges of objects in the captured images. *Id.* at ll. 44–51. The system processes a subset of image data that is representative of a target zone or area of interest within the field of view where a vehicle or object is likely to be present. *Id.* at ll. 51–55. The system processes the detected edges within the subset of image data to determine whether they are part of a vehicle. *Id.*

at ll. 55–59. The system utilizes various filtering mechanisms to substantially eliminate or substantially ignore edges or pixels that are not or cannot be indicative of a vehicle or significant object to reduce the processing requirements and to reduce the possibility of false positive signals. *Id.* at ll. 60–65.

Figure 1 is reproduced below.

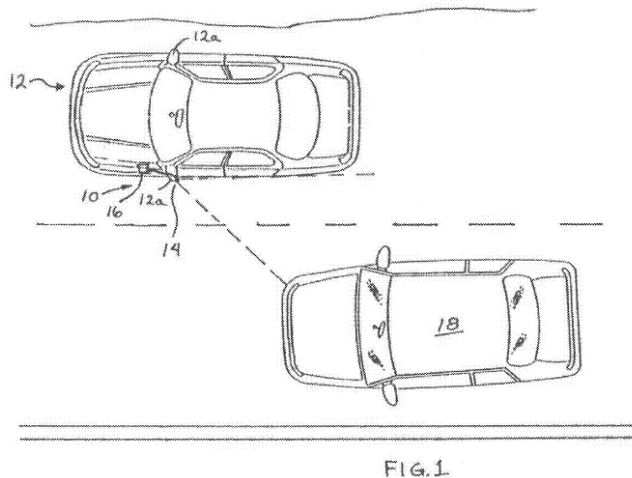


Figure 1 depicts an overhead view of a vehicle incorporating the object detection system of the present invention. *Id.* at col. 4, ll. 7–8. Lane change assist or aid system 10 is positioned at vehicle 12 (such as at exterior rearview mirror 12a) and is operable to capture an image of a scene occurring sidewardly and rearwardly at or along one or both sides of vehicle 12. *Id.* at ll. 47–51. Lane change assist system 10 comprises image capture device or sensor or camera 14, which captures an image of the scene occurring toward a respective side of the vehicle 12, and control 16, which processes the captured image to determine whether another vehicle 18 is present at the side of vehicle 12. *Id.* at ll. 51–57. Control 16 may be further operable to activate a warning indicator or display or signal device to alert the driver of vehicle 12 that another vehicle is present at the side of vehicle 12. *Id.* at ll. 57–60.

Figure 2 is reproduced below.

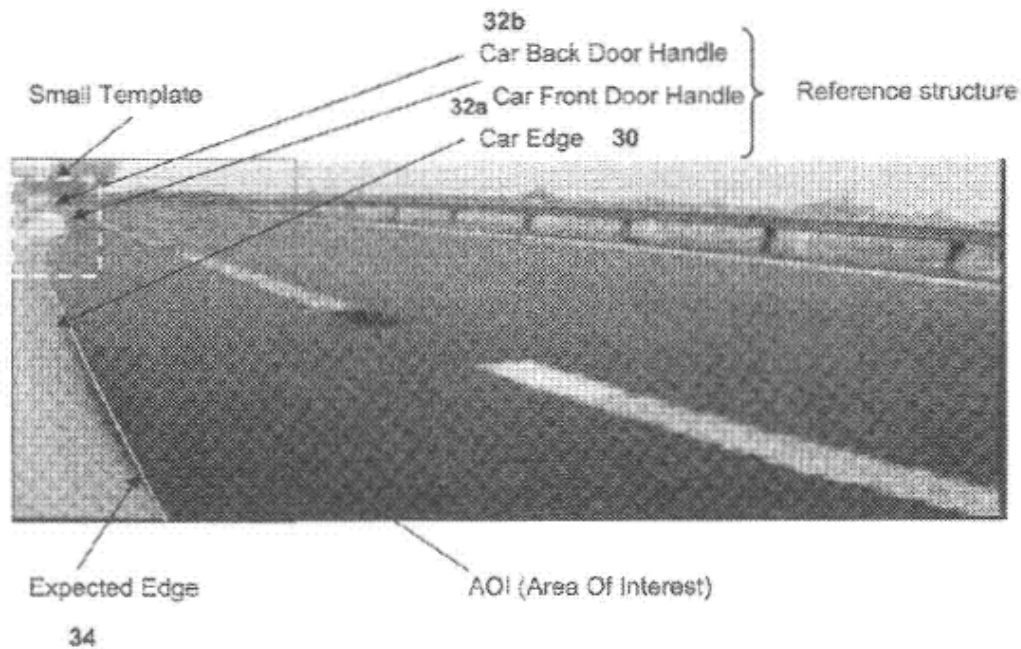
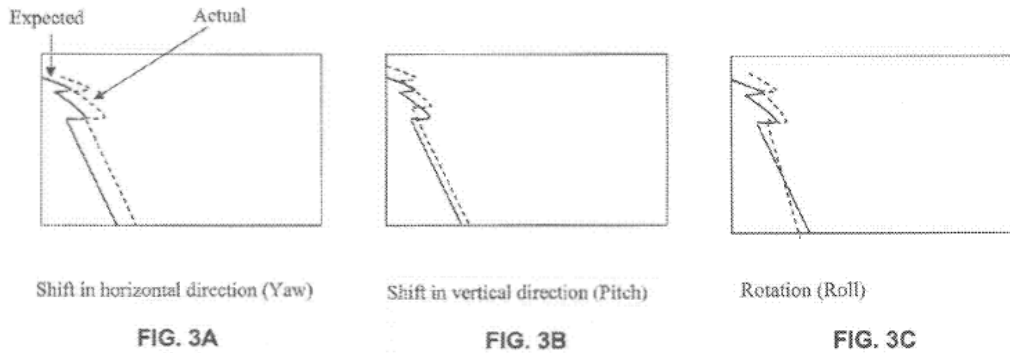


FIG. 2

Figure 2 is a representation of a captured image of a side area of a vehicle, as captured by an imaging sensor. *Id.* at col. 4, ll. 9–11. In order to verify that the camera or imaging sensor is mounted at the vehicle (such as at an exterior portion of the vehicle) within a desired tolerance limit so as to provide the desired field of view, the camera may detect the side of vehicle (30) and/or front door handle (32a) or rear door handle (32b) of the vehicle, and the control may confirm that they are in the expected location in the captured images. *Id.* at col. 6, ll. 11–19. If the control determines that the camera is not aligned or aimed at the desired location (such as by determining that the vehicle edge and/or door handle/handles are not at the expected location), the control may adjust the image and/or image processing to account for any such misalignment of the camera. *Id.* at ll. 19–24. For example, the degree of misalignment may be calculated, and the image processing may be adjusted or shifted and/or rotated to position the

reference structure at the appropriate location in the captured images. *Id.* at ll. 24–28.

Figures 3A–C are reproduced below:



Figures 3A–C are schematics of the captured image of Figure 2, showing adjustments that may be made to the image processing to account for misalignment of the image sensor. *Id.* at col. 4, ll. 12–14. As shown in Figures 3A–C, the actual or detected vehicle edges may be misaligned or separated from the expected vehicle edges, such that the image processing may be adjusted to shift the captured image data accordingly to accommodate such misalignment of the camera. *Id.* at col. 6, ll. 42–47.

Based on the results of the image processing techniques, data or information of the yaw, pitch, and roll may be used to set the polygon coordinates and H depression pixel calibration parameters, so that the expected vehicle edges are substantially aligned with the actual or detected vehicle edges. *Id.* at ll. 47–52.

II. THE CHALLENGED CLAIMS

A. ILLUSTRATIVE CLAIMS

Independent Claim 1 (not challenged) and its dependent claim 2 are illustrative and are reproduced below:

1. An imaging system for a vehicle, said imaging system comprising:

an imaging array sensor comprising a plurality of photo-sensing pixels, wherein said imaging array sensor is disposed at an exterior rearview mirror assembly at a side of a vehicle equipped with said imaging system;

wherein, when said imaging array sensor is disposed at the exterior rearview mirror assembly, said imaging array sensor has a field of view exterior of the equipped vehicle, and wherein said imaging array sensor is operable to capture an image exterior of the equipped vehicle;

a control for processing said captured image;

wherein said control is operable to determine that said imaging array sensor is misaligned when said imaging array sensor is disposed at the exterior rearview mirror assembly at the side of the equipped vehicle; and

wherein said control, responsive to a determination of misalignment of said imaging array sensor, is operable to at least partially compensate for the determined misalignment of said imaging array sensor.

2. The imaging system of claim 1, wherein said imaging array sensor is disposed at least partially within the exterior rearview mirror assembly at the side of the equipped vehicle.

B. CLAIM CONSTRUCTION

In the Decision to Institute we did not explicitly construe any claim term. Dec. 10. Neither party provides explicit claim constructions. All claim terms are given the broadest reasonable construction. *See* 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1275–79 (Fed. Cir. 2015). Our analysis necessitates construction of certain terms in claims 19 and 24, and our construction is discussed in the patentability analysis below.

III. MOTION TO EXCLUDE

A. INTRODUCTION

As mentioned above, Patent Owner filed a Motion to Exclude certain exhibits. Paper 35 (“Mot.”). Petitioner filed an Opposition to the Motion (Paper 43, “Opp.”), and Patent Owner filed a Reply to the Opposition (Paper 45, “Opp. Reply”).⁷ For the following reasons, Patent Owner’s motion is *denied*.⁸

⁷ Petitioner’s Opposition to Patent Owner’s Motion to Exclude (Paper 39) was expunged as late and was subsequently re-filed. *See* Paper 40 (expunging Paper 39); Paper 42 (permitting re-filing).

⁸ As detailed below, we expunge Exhibit 1033 as Patent Owner requests; however, because we expunge rather than exclude this evidence, we do not consider the Motion to Exclude to be granted in part.

Patent Owner's Motion to Exclude Evidence addresses the following exhibits:

Title	Exhibit Number
Broggi	Ex. 1006
First Frahm Declaration	Ex. 1010
First Grenier Declaration ¹⁰	Ex. 1024
Second Grenier Declaration ¹¹	Ex. 1028
Butler Declaration	Ex. 1029
Second Frahm Declaration	Ex. 1034
Broggi Declaration	Ex. 1033

Before addressing the admissibility of each exhibit, we detail the four sets of objections involved as well as a related Motion to Submit Supplemental Information. The exhibits at issue were submitted with papers, as supplemental evidence, and as supplemental information as detailed below.

1. First Set of Objections

The Decision to Institute was entered on December 23, 2014, and Patent Owner's first set of objections was timely served on January 8, 2015. *See* Dec. 1; Ex. 2018, 6. Patent Owner objected to Exhibit 1006 and to paragraph 115 of the first Frahm Declaration (Ex. 1010). *See* Ex. 2018, 1,

⁹ Prior to May 19, 2015, objections were required to be served, and after this date objections are required to be filed. *See* Amendments to the Rules of Practice for Trial Before the Patent Trial and Appeal Board, 80 Fed. Reg. 28,561–28566 (May 19, 2015); 37 C.F.R. § 42.64.

¹⁰ Dated June 30, 2014.

¹¹ Dated July 25, 2014.

4–5. Each of these exhibits was submitted with the Petition. Original Exhibit 1006 included both “Broggi”¹² and the first Grenier Declaration.

In response, Petitioner timely served as supplemental evidence the Butler Declaration and the second Grenier Declaration.¹³ See Ex. 1035, 3.

Subsequently, Petitioner filed Broggi as corrected Exhibit 1006, and filed the first Grenier Declaration as Exhibit 1024.¹⁴ See Paper 15 (order permitting re-filing), Paper 16 (Petitioner’s notice).

Consequently, Patent Owner’s first set of objections covers: Broggi (corrected Ex. 1006¹⁵), the first Frahm Declaration (Ex.1010), and the first Grenier Declaration (Ex. 1024).

2. *Second Set of Objections*

On January 27, 2015, Patent Owner objected to the second Grenier Declaration and the Butler Declaration. See Ex. 2019; Mot. 1–2. At this time, these Declarations were supplemental evidence, not evidence. Our rules permit objection to evidence, but not to supplemental evidence. See 37 C.F.R. § 42.64. Consequently, Patent Owner did not make an effective objection to the second Grenier Declaration or the Butler Declaration.

¹² By “Broggi” we mean the article titled *Multi-Resolution Vehicle Detection Using Artificial Vision* identified above.

¹³ Petitioner’s response to Patent Owner’s objections refers to the Declaration of Mr. Butler and the Declaration of Mr. Grenier as Exhibits 1024 and 1025, respectively. See Ex. 1035, 3. However, at that point the Declarations were served, but not filed. As will be explained later, these Declarations eventually became Exhibits 1029 and 1028, respectively. See *e.g.*, Mot. 1.

¹⁴ The file contains both the original (filed July 25, 2014) and corrected version (filed Feb. 2, 2015) of Exhibit 1006.

¹⁵ From this point forward, reference to Exhibit 1006 means the corrected version unless stated otherwise.

In response, Petitioner took three actions.

a) Served Documents

Petitioner served a response to Patent Owner's objections which included documents labeled as Exhibits 1030–1033.¹⁶ See Ex. 1036, 2 (Petitioner's response); Ex. 2015 (e-mail from Petitioner to Patent Owner serving supplemental evidence). These documents were intended to be supplemental evidence; however, because Patent Owner's objections were not effective, these documents are not supplemental evidence.

b) Filed Broggi Declaration

After serving the Broggi Declaration as described above, Petitioner also filed it as Exhibit 1033. See Paper 20 (Petitioner's notice of filing Ex. 1033). This Declaration was not filed with one of Petitioner's papers. 37 C.F.R. § 42.6(c) (requiring that exhibits be filed with the first document in which it is cited). Consequently, although the Broggi Declaration was filed, it is not evidence.

c) Sought to File Supplemental Information

Petitioner also filed a Motion to File Supplemental Information under 37 C.F.R. § 123(a)(1), seeking to file Exhibits 1028–1032. Paper 18. Patent Owner filed an opposition and Petitioner filed a reply. Papers 21, 22, respectively.

¹⁶ At this time, despite being labeled as exhibits, these documents were served, but not filed. The documents were filed as explained in the following two paragraphs. The Broggi Declaration was one of these documents.

(1) Exhibits 1028 and 1029

We granted Petitioner’s motion to submit supplemental information with regard to the second Grenier Declaration (Ex. 1028) and the Butler Declaration (Ex. 1029).¹⁷ Paper 23, 4–6.

(2) Exhibits 1030–1032

We expunged Exhibits 1030–1032 because these exhibits were not authorized to be submitted with the Motion to Submit Supplemental Information. *Id.* at 2–3.¹⁸

3. Third Set of Objections

Patent Owner objected to Exhibits 1030–1032. *See* Ex. 2020. As Patent Owner recognizes, this set of objections is no longer relevant because we expunged Exhibits 1030–1032. *See* Mot. 2.

4. Fourth Set of Objections

Patent Owner timely objected to paragraphs 3 and 4 of the second Frahm Declaration (Ex. 1034).¹⁹ *See* Paper 34. Petitioner did not submit

¹⁷ At this point these Declarations became evidence.

¹⁸ Our Decision also addressed the Broggi Declaration (Ex. 1033), but explicitly took “no action” with regard to it. *Id.* at 3. As guidance to the parties, and not as a determination of any kind, we stated that “supplemental evidence, as opposed to supplemental information, may be relied on only to support the admissibility of evidence, and not to support any argument on the merits.” *Id.* (citing a sample Board case for guidance). It remains true that supplemental evidence may be relied upon to support admissibility arguments but not arguments on the merits. As explained above, though, Exhibit 1033 is not supplemental evidence because the objection to which it was served in response was not proper.

¹⁹ The second Frahm Declaration was filed with Petitioner’s Reply on July 23, 2015, and the fourth set of objections was filed on July 30, 2015. *See* Papers 33, 34. Patent Owner objected to other evidence as well, but that

supplemental evidence in response to this set of objections. *See* Mot. 2; *see generally* Opp. (making no mention of any evidence served in response to these objections).

5. *Summary*

In the first and fourth sets of objections, Patent Owner effectively objected to: Broggi (corrected Ex. 1006), the first Frahm Declaration (Ex.1010), the first Grenier Declaration (Ex. 1024), and paragraphs 3 and 4 of the second Frahm Declaration (Ex. 1034).

Patent Owner's second set of objections, regarding what became the second Grenier Declaration (Ex. 1028) and the Butler Declaration (Ex. 1029), was not effective because, at the time Patent Owner objected, those documents were supplemental evidence, not evidence, and our rules provide for objections only to evidence. Because Patent Owner did not timely object to these Declarations after they became evidence,²⁰ Patent Owner did not preserve its right to move to exclude these Declarations. We, therefore, deny Patent Owner's Motion to Exclude as to these Declarations.

Finally, with respect to Patent Owner's third set of objections, it is no longer relevant as explained above.

C. ANALYSIS

Patent Owner preserved the first and fourth sets of objections by filing its Motion to Exclude Exhibits 1006, 1010, 1024 and 1034. *See* Mot. 1–2; 37 C.F.R. § 42.64(c). With the exceptions noted below, Patent Owner's

other evidence is not the subject of this Motion to Exclude and need not be addressed here.

²⁰ These documents became evidence on March 18, 2015. Paper 23.

motion identifies and explains the objections. Mot. 1–13; 37 C.F.R. § 42.64(c). Patent Owner seeks to expunge (vice exclude) the Broggi Declaration (Ex. 1033) because it was not timely served in response to Patent Owner’s first set of objections. *See id.* at 12; Opp. Reply 1–2.; Ex. 1036, 2; Ex. 2015; 37 C.F.R. § 42.64(b)(2). As the moving party, Patent Owner bears the burden of proof. *See* 37 C.F.R. § 42.20(c). We address first Exhibit 1033 and then the remaining exhibits in reverse chronological order of their filing.

1. Broggi Declaration (Ex. 1033)

As explained above, the Broggi Declaration is not supplemental evidence because the objection to which it was served in response was not proper. Because the Broggi Declaration is not evidence, supplemental evidence, or supplemental information, we expunge it.

2. Second Frahm Declaration (Ex. 1034)

As explained above, the second Frahm Declaration was submitted with Petitioner’s Reply, and was effectively objected to in Patent Owner’s fourth set of objections.

a) Admissibility

Patent Owner seeks to exclude paragraphs 3 and 4 of the second Frahm Declaration. Mot. 11. Specifically, Petitioner contends that these paragraphs are irrelevant under Federal Rule of Evidence (FRE) 402 because Dr. Frahm did not attend the June 2004 symposium.²¹ *Id.*; Opp. Reply 5; *see also* Paper 34 (Patent Owner’s fourth set of objections based in part on FRE 402).

²¹ Here, and throughout, we take this as an assertion that the evidence at issue is not relevant as defined by FRE 401 and are therefore is inadmissible under FRE 402.

The premise of Patent Owner's argument is that evidence that is not based on personal knowledge is not relevant. Personal knowledge is not a necessary condition of relevance. Rather, evidence is relevant if it has any tendency to make a fact more or less probable than it would be without the evidence and the fact is of consequence in determining this case. See FRE 401 (emphasis added).

Further, Patent Owner contends that Dr. Frahm's testimony is not based on personal knowledge in that he did not attend the symposium in question. However, Dr. Frahm's testimony does not allege attendance at the symposium. In the paragraphs at issue, Dr. Frahm testifies that he has: regularly attended Institute of Electrical and Electronics Engineers (IEEE) conferences, chaired a conference having IEEE published proceedings, and observed IEEE publication practices. Ex. 1034 ¶ 3; *see also* Ex. 1024 ¶ 1 (IEEE abbreviation). Dr. Frahm's observation is that IEEE's practice is that the date of the conference is the publication date of the article or paper involved. *Id.* In light of this, Dr. Frahm concludes that Broggi was published and publically accessible at the June 2004 Symposium as is indicated on the face of the document. Ex. 1034. ¶ 4; Ex. 1006. In light of this, Patent Owner's contention that Dr. Frahm's testimony should be excluded because it lacks personal knowledge is not persuasive.

The second Frahm Declaration is relevant in that it makes publication of Broggi (Ex. 1006) at the Symposium, a fact of consequence in this proceeding, more probable than without this evidence.

Consequently, Patent Owner has not persuaded us that paragraphs 3 and 4 of the second Frahm Declaration are inadmissible under FRE 402.

b) Limitation on Use

Although we do not exclude the second Frahm Declaration, for the reasons that follow, it may not be considered with regard to the admissibility of Broggi (Ex. 1006).

Patent Owner's first set of objections objected to Broggi (Ex. 1006), and that was Petitioner's opportunity to submit evidence in support of the admissibility of Broggi. Petitioner's Reply may respond only to arguments raised in Patent Owner's Response. 37 C.F.R. § 42.23(a). Patent Owner's Response may not properly argue the admissibility of Broggi (Ex. 1006) because such an argument may be raised only in a motion to exclude. *See* 37 C.F.R. § 42.64. For that reason, arguments and evidence supporting the admissibility of Broggi (Ex. 1006) are not proper in Petitioner's Reply.

Despite this, paragraphs 3 and 4 of the second Frahm Declaration properly respond to the argument in Patent Owner's Response regarding the sufficiency of proof that Broggi is prior art under 35 U.S.C. § 102(a). Whether Broggi is a "printed publication" is a separate issue from its admissibility under the Federal Rules of Evidence. *See* Opp. 10–11; PO Resp. 14.

c) Conclusion

Accordingly, we deny Patent Owner's Motion to Exclude paragraphs 3 and 4 of the second Declaration of Dr. Frahm (Ex. 1034).

We consider the Declaration of Dr. Frahm regarding the determination of whether Broggi is prior art under 35 U.S.C. § 102(a), but not regarding the determination of whether Broggi (Ex. 1006) should be excluded.

3. *First Grenier Declaration (Ex. 1024)*

As explained above, the first Grenier Declaration was submitted with the Petition, and was effectively objected to in Patent Owner's first set of objections.

Patent Owner contends that the first Grenier Declaration is irrelevant under Federal Rule of Evidence ("FRE") 401, and is inadmissible hearsay under FRE 802. Mot. 6–7; Opp. Reply 4–5; *see also* Ex. 2016, 4–5 (objecting based on FREs 401 and 802).

a) *Relevance*

Patent Owner contends that the first Grenier Declaration provides "no evidence of publication whatsoever." Mot. 6. Rather, according to Patent Owner, presentation at the June 2004 symposium is not a publication and likewise, registration with the U.S. Copyright Office is not a publication. *Id.* Similarly, Patent Owner contends that the Declaration only provides that: "(1) Broggi was published in 'Intelligent Vehicles Symposium, 2004 IEEE'; and (2) the date of the conference was 14-17 June 2004." Opp. Reply at 4.

The premise of Patent Owner's argument is that evidence must establish a fact sufficiently in order to be relevant. Such argument is not proper in a motion to exclude, which is for challenging the admissibility of evidence, not for challenging its sufficiency. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,767 (August 14, 2012) (stating that a motion to exclude may not be used to challenge the sufficiency of the evidence to prove a particular fact).

Further, we disagree with Patent Owner's characterization that the Declaration provides "no evidence whatsoever" of publication. *See* Mot. 6. To the contrary, for example, Mr. Grenier states that "[c]opies of the conference proceedings were made available to attendees of the conference."

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Ex. 1024 ¶ 6. This evidence is relevant in that it tends to make publication of Broggi at the conference more probable than if this evidence was not considered.

Patent Owner has not persuaded us that the first Greneier Declaration is inadmissible under FRE 402.

b) Hearsay

Patent Owner contends that the first Grenier Declaration fails to establish a publication date based on the IEEE records. Mot. 6–7. This argument, like the prior argument, is unpersuasive because it is directed to the sufficiency of the evidence rather than to its admissibility. Further, contrary to Patent Owner’s contention, the records attached to the first Grenier Declaration indicate that the article titled “Multi-resolution vehicle detection using artificial vision” by Broggi, et al. was:

Published in:

Intelligent Vehicles Symposium, 2004 IEEE

Date of Conference:

14-17 June 2004

Ex. 1024, 3.

Patent Owner has not persuaded us that the first Grenier Declaration is inadmissible under FRE 802.

c) Conclusion

Accordingly, we deny Patent Owner’s Motion to Exclude the first Grenier Declaration (Ex. 1024).

We consider the first Grenier Declaration on the merits and with regard to the admissibility of Broggi (Ex. 1006).

4. *First Frahm Declaration (Ex. 1010)*

As explained above, the first Frahm Declaration was submitted with the Petition.

Patent Owner argues that paragraph 115 of the first Frahm Declaration is irrelevant under FRE 402 and should be excluded. Mot. 5; Opp. Reply 3–4; *see also* Ex. 2018, 3–4 (objecting based on FRE 402).²² Specifically, Patent Owner asserts that this paragraph is irrelevant because Dr. Frahm did not attend the symposium and therefore cannot know that an actual publication took place. *Id.*; Opp. Reply 3–4.

The paragraph at issue follows:

115. Broggi (Pet. Ex. 1006) is a publication that dates back to June 14-17, 2004 and was presented at the 2004 IEEE Intelligent Vehicles Symposium. I understand that Broggi is prior art to the '522 patent at least under § 102(a) because it published within one year before the earliest filing date of the '522 patent.

Ex. 1010 ¶ 115. Our analysis here parallels that of the second Frahm Declaration above.

Specifically, we agree with Petitioner that Dr. Frahm need not have personal knowledge in order for this evidence to be relevant.²³ Opp. 5–6. Personal knowledge is not a necessary condition of relevance. The proper inquiry is whether the evidence has any tendency to make a fact more or less

²² Patent Owner also objected under FRE 901, but did not preserve that objection by including it in the Motion to Exclude. *See* Ex. 2016, 3–4; 37 C.F.R. § 42.64(c).

²³ Petitioner's citation to *EMC Corp., et al. v. PersonalWeb Tech., LLC*, IPR2013-00082, slip op. at 60 (P.T.A.B., May 15, 2014) (Paper 83) is not helpful to our determination here because there the Board dealt with authentication while here we deal with relevance. *See* Opp. Reply 3–4 (pointing out this distinction).

probable than it would be without the evidence and the fact is of consequence in determining this case. See FRE 401.

Further, Patent Owner contends that Dr. Frahm's testimony is not based on personal knowledge in that he did not attend the symposium in question. However, Dr. Frahm's testimony does not allege attendance at the symposium.

Dr. Frahm's statement that Broggi was presented at the June 2014 conference tends to make it more probable that Broggi was presented at the conference. This is true even though Dr. Frahm was not in attendance at the symposium.

Patent Owner has not persuaded us that the first Frahm Declaration is inadmissible under FRE 402. Accordingly, we deny Patent Owner's Motion to Exclude paragraph 115 of the first Declaration of Dr. Frahm (Ex. 1010).

We consider paragraph 115 of the first Frahm Declaration on the merits and with regard to the admissibility of Broggi (Ex. 1006).

5. Broggi (Ex. 1006)

As explained above, Broggi (Ex. 1006) was submitted with the Petition.

Patent Owner contends that Broggi is irrelevant under Federal Rule of Evidence ("FRE") 402, and not authenticated under FRE 901. Mot. 3; Opp. Reply 2–3; Ex. 2018 (objecting under FREs 402 and 901).

a) Relevance

Regarding relevance, Petitioner contends that Petitioner has failed to establish that Broggi was published or made publically accessible prior to the December 23, 2004, priority date of the '522 patent. Mot. 3. Patent Owner elaborates that because Broggi has not been shown to be prior art, it is not relevant to the proceeding. *Id.* at 4. According to Patent Owner,

consideration of Broggi would severely prejudice Patent Owner. *Id.*; Opp. Reply 2.

As an initial matter, Patent Owner’s contention that consideration of Broggi would “severely prejudice” Patent Owner, implies that Broggi should be excluded under FRE 403. To the extent that Patent Owner is making such an assertion, it is unpersuasive. Patent Owner did not object to Broggi based on FRE 403, and consequently cannot properly make a motion on that basis. *See* Ex. 2018, 2–3. Further, Patent Owner does not explain cogently how the probative value of Broggi is outweighed by one of the enumerated dangers of FRE 403.

Here, as with other exhibits, Patent Owner’s argument is unpersuasive in that it challenges the sufficiency of the evidence rather than the admissibility.

Turning to the exhibit in question, the upper left hand corner of the first page states: “2004 IEEE Intelligent Vehicles Symposium, University of Parma, Parma, Italy, June 14–17, 2004,” and the lower left hand corner indicates “© 2004 IEEE.” Ex. 1006, 1.

Broggi tends to make Petitioner’s contention that Broggi is prior art more probably than it would be without this evidence. *See* Pet. 8.

Patent Owner has not persuaded us that Broggi is inadmissible under FRE 402.

b) Authentication

Patent Owner’s objection regarding authentication follows:

Magna further objects to the totality of Exhibit 1006 under FRE 901. This exhibit is referred to by Valeo as “Broggi,” but includes the attached Declaration of Gerard P. Grenier which is **not** part of the Broggi article. Valeo’s exhibit list does not address this issue, and confuses the record by implying that the

Grenier Declaration is somehow part and parcel of Broggi, when it is demonstrably not.

Ex. 2018, 3.

Patent Owner objects to the Broggi article and the first Grenier Declaration being filed as a single exhibit. As explained above, this objection has been resolved because corrected Exhibit 1006 does not include the first Grenier Declaration (now Exhibit 1024).

In the Motion to Exclude Evidence, Patent Owner asserts that Broggi (Ex. 1006) is not properly authenticated under FRE 901 because Dr. Frahm's statement is insufficient to authenticate Broggi. Mot. 4–5. Patent Owner did not object to Broggi (Ex. 1006) on this basis, and therefore we do not consider such an argument in Patent Owner's Motion to Exclude Evidence.

c) Other Exhibits

As stated above, the first and second Frahm Declarations (Exs. 1010, 1034) and the first Grenier Declaration (Ex. 1024) may be considered regarding the admissibility of Broggi (Ex. 1006). To the extent that Patent Owner challenges the authenticity of Broggi (Ex. 1006), each of these exhibits contains information consistent with Broggi, and consequently these exhibits tend to show that Broggi is what Petitioner contends it to be. See Ex. 1010 ¶ 115; Ex. 1034 ¶¶ 3, 4; Ex. 1024 ¶¶ 1–9, page 3.

d) Conclusion

Accordingly, we deny Patent Owner's Motion to Exclude Broggi (Ex. 1006).

IV. PRELIMINARY ISSUES

A. BROGGI (EX. 1006) AS PRIOR ART

1. Introduction

In an *inter partes* review, a ground of unpatentability cannot be based upon a public use or a sale; rather, the ground must be based upon prior art in the form of a patent or a printed publication. 35 U.S.C. § 311(b); 35 U.S.C. § 102. The determination of whether a particular reference qualifies as a prior art printed publication “involves a case-by-case inquiry into the facts and circumstances surrounding the reference’s disclosure to members of the public.” *In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004). Neither distribution nor indexing is a necessary condition for being a “printed publication;” rather, the key inquiry is whether or not a reference has been made “publically accessible.” *Id.* at 1348.

The parties do not dispute that the critical date of the ’522 patent is December 23, 2004. Ex. 1001, 1.

2. Petitioner’s Evidence

Petitioner argues that Broggi is prior art under 35 U.S.C. § 102(a) because it was published at the IEEE Intelligent Vehicles Symposium at the University of Parma, in Parma Italy, on June 14–17, 2004. Pet. 8; Ex. 1006.

As explained above, Broggi (Ex. 1006) is an article²⁴ by Alberto Broggi et al., titled “Multi-Resolution Vehicle Detection using Artificial Vision.” Ex. 1006, 1. The top of the first page of the Article includes the following information:

²⁴ We sometimes refer to Broggi (Ex. 1006) as “the Article.”

IPR2014-01208
Patent 7,991,522

2004 IEEE Intelligent Vehicles Symposium
University of Parma
Parma, Italy June 14–17, 2004

Ex. 1006, 1. This information suggests that the Article was available at the Symposium.

The first page of Broggi includes the annotation “© 2004 IEEE.” We acknowledge that a copyright date alone is not sufficient to establish public accessibility. *See In re Lister*, 583 F.3d 1307. We also acknowledge that this copyright was not registered until January 4, 2005, after the critical date of the ’522 patent. *See* Ex. 1028 ¶ 9b. Despite this, the copyright date of 2004 is consistent with the contention that Broggi was presented at the Symposium.

Notably, Broggi is not marked with any limitations regarding dissemination.

In his first Declaration, Dr. Frahm states, “Broggi (Pet. Ex. 1006) is a publication that dates back to June 14-17, 2004 and was presented at the 2004 IEEE Intelligent Vehicles Symposium.” Ex. 1010 ¶ 115.

Dr. Frahm elaborates in his second Declaration, stating:

3. As a person who regularly reviews scholarly articles, including IEEE publications such as the Broggi article, and as someone who regularly attends IEEE conferences, I believe that Broggi published when the document indicates on its face that it was published (i.e., in June 14-17, 2004). Having chaired a conference with IEEE published proceedings, I have firsthand knowledge of IEEE’s general publication practices. Further, all IEEE conferences that I have attended, the papers presented were made publicly available at the conference. The common practice of IEEE is that the date of the conference is the publication date of the articles/papers presented. Dr. Turk has failed to provide any evidence that this is not the case in the instant proceeding, where the Broggi article was presented at an IEEE symposium on June 14-17, 2004. I have organized IEEE

based proceedings, and as a general practice, IEEE sets deadlines for the specific purpose of making articles publicly available at the time of the conference.

Ex. 1034 ¶ 3.

In light of this, Dr. Frahm's opinion that IEEE articles, such as Broggi, are published as indicated on the face of the article is supported by an underlying factual basis. *See* Pet. Resp. 4–5; Ex. 1034 ¶ 3.

In his second Declaration, Mr. Grenier states that he is the Senior Director of Publishing Technologies for IEEE. Ex. 1024 ¶ 1. Mr. Grenier, as a neutral and uncompensated third party, confirms certain information regarding Broggi. *Id.* ¶¶ 2, 4–5. In particular, Mr. Grenier provides the following information:

6. The Article was published by IEEE as part of the conference proceedings on the date of the conference. Copies of the conference proceedings were made available to attendees of the conference. The Article is currently available for public download from the IEEE digital library, IEEE Xplore (www.ieeexplore.ieee.org).

9. IEEE's records confirm the following:

a) "Multi-Resolution Vehicle Detection using Artificial Vision" was published and presented at the 2004 IEEE Intelligent Vehicles Symposium which occurred June 14–17, 2004.

Ex. 1028 ¶¶ 6, 9 (emphasis added).²⁵

Attached to the second Grenier Declaration are true and correct copies of the Article, and an Abstract of the Article. Ex. 1028, ¶¶ 3, 4–8 (respectively). The attached Article is the same as Exhibit 1006. As noted above, the Abstract includes the following annotations

²⁵ Portions of the second Grenier Declaration not included in the first Grenier Declaration are underlined. *Cf.* Ex. 1024 to Ex. 1028.

Published in:
Intelligent Vehicles Symposium, 2004 IEEE
Date of Conference:
14-17 June 2004

Id. at 3.

Mr. Butler explains that he is the Office Manager of the Internet Archive. Ex. 1029 ¶ 1. Mr. Butler explains that the Internet Archive’s “Wayback Machine” archives files by URL (website address) at various dates, and visitors may recall these archived files by available dates. *Id.* ¶ 3. If visitors click on a link on an archived page, the Wayback Machine will serve the archived file with the closest available date to the page upon which the link appeared and was clicked. *Id.*

Attached to the Butler Declaration²⁶ is a download of the website “<http://www.ce.unipr.it/people/broggi/publications/>” archived on April 10, 2004.²⁷ No entry corresponding to the Broggi Article was available at that time. A download of the same website archived on October 12, 2004, includes the following entry:

- [Alberto Broggi](#), [Pietro Cerri](#), and Pier Claudio Antonello, **Multi-Resolution Vehicle Detection using Artificial Vision**, In *Procs. IEEE Intelligent Vehicles Symposium 2004*, pages 310-314, Parma, Italy, June 2004.

Download the paper in  [PDF format](#).

See Ex. 1029, 16 (Broggi annotation is the first entry), 16–28 (entire download). This abstract shows an article title, authors, Symposium name,

²⁶ Mr. Butler certifies that the attached printouts are true and accurate copies of Internet Archive records. Ex. 1029 ¶ 6.

²⁷ See Ex. 1029 ¶ 5 (explaining download date format and that the URL footer is the web page downloaded from), 3–15 (copy of downloaded information).

page numbers, date, and location all consistent with Broggi (Ex. 1006). *Id.* at 16.

The Butler Declaration and attached records indicate that the Broggi Article referenced was posted to a public website between April 10, 2004, and October 12, 2004, and may be accessed by selecting the link at the bottom of the entry. *Id.*

3. Patent Owner Arguments

Patent Owner argues that Petitioner has failed to satisfy its burden that Broggi is prior art. PO Resp. 11–20. In support of this argument, Patent Owner cites a case for the proposition that a party seeking to invalidate a patent must do so by clear and convincing evidence. PO Resp. 12–13 (citing *Norian Corp. v. Stryker Corp.*, 363 F.3d 1321, 1326 (Fed. Cir. 2004)). In an *inter partes* review a Petitioner must prove unpatentability by a preponderance of the evidence, not by clear and convincing evidence. *See* 35 U.S.C. §316(e).

We further analyze Patent Owner’s arguments by exhibit.

a) Broggi (Ex. 1006)

Patent Owner contends that Broggi provides “no definitive evidence to support that the paper was published at or prior to the conference.” PO Resp. 13 (Citing the Turk Declaration (Ex. 2016) ¶¶ 30–31). Dr. Turk echoes this contention. Ex. 2016 ¶¶ 30–31. Dr. Turk elaborates that academic conferences sometimes provide the manuscripts of presented papers months after the actual conference dates, or sometimes drafts are made available with an indication that the finished paper will be provided in the future. *Id.* ¶ 31.

At best, Patent Owner’s argument presents no contradictory evidence and makes the conclusory assertion that the information on the first page of

Broggi is not definitive. Patent Owner argues as if Broggi (Ex. 1006) itself must definitively establish that it is prior art as a printed publication. Such is not the case. Petitioner relies upon other evidence as well, and Patent Owner's contention here does not address the evidence as a whole. Further, Dr. Turk mentions that there are possibilities other than publication at the conference, such as, subsequent publication or publication of a draft, but Dr. Turk does not provide the facts or data underlying that opinion. *See* 42 C.F.R. § 42.65(a). For example, Dr. Turk does not state that he frequently attends such conferences or has otherwise obtained experience or knowledge supporting his assertion.

b) First and Second Frahm Declarations (Exs. 1010, 1034)

To a degree, Patent Owner argues admissibility rather than addressing the sufficiency of the evidence. *See, e.g.*, PO Resp. 14 (contending that Petitioner "attempts to authenticate" Broggi's publication, and that Dr. Frahm lacks personal knowledge). As explained above, admissibility is properly challenged in a Motion to Exclude Evidence and the Patent Owner's response is the proper vehicle to challenge the sufficiency of evidence.

Although the first Frahm Declaration does not establish the basis of Dr. Frahm's opinion that Broggi was published as Petitioner contends, Dr. Frahm's second Declaration does so. *See* Ex. 1010 ¶ 115; Ex. 1034 ¶¶ 3–4. Specifically, as explained above, Dr. Frahm's second Declaration establishes that Dr. Frahm has personal knowledge of IEEE publication procedures. Based upon this knowledge, Dr. Frahm opines that Broggi was published as indicated.

c) First and Second Grenier Declarations (Exs. 1024, 1028)

Regarding the first Grenier Declaration, Patent Owner contends that it does not provide “any evidence” that the Article was published as Petitioner contends. PO Resp. 15–16. Patent Owner highlights that Mr. Grenier did not attend the Symposium and therefore did not personally observe such things as: how many people attended, the qualifications of attendees, whether the Article was available, or when it was first available for public download. *Id.* (citing various portions of the Deposition of Mr. Grenier at Ex. 2017). Patent Owner adds that “presentation” is not synonymous with “publication” and that the first Grenier Declaration does not provide evidence of “publication.”²⁸ PO Resp. 15 (citing Ex. 2017, 11:17–19).

Regarding the second Grenier Declaration, Patent Owner contends that the second Grenier Declaration does not remedy the shortcomings of the first, similarly stating that the attached printout provides “no evidence whatsoever.” PO Resp. 17. Patent Owner adds that Mr. Grenier’s statement is “unsupported by any IEEE record,” and has “no tendency” to make the publication date of Broggi more probably. *Id.* at 17–18.

Patent Owner’s arguments are not persuasive for several reasons. First, Patent Owner again argues admissibility rather than addressing the sufficiency of the evidence. *See, e.g.*, PO Resp. 17–18 (arguing that Mr. Grenier’s statement is “unsupported by any IEEE record,” (suggestive of hearsay) and has “no tendency” to make the publication date of Broggi more probably (suggestive of relevance)). Second, Patent Owner’s

²⁸ Patent Owner also argues that the copyright registration date of January 4, 2005, is after the critical date of the ’522 patent. *Id.* at 16. Petitioner does not rely upon the copyright registration as proof of public accessibility, and for that reason this argument is inapposite. *See* Pet. 8.

characterization of the Declarations as not providing “any evidence” and “no evidence whatsoever” are contradicted by our analysis above that the Declarations are relevant. *See id.* at 15–17. Such an extreme characterization is both inaccurate and does persuasively address the merits of the evidence.

Third, Patent Owner’s assertion that Mr. Grenier’s Declarations are not based on personal observation are not persuasive because Mr. Grenier does not profess to have knowledge based on personal attendance at the Symposium. Rather, Mr. Grenier provides information as an IEEE representative familiar with IEEE records. *See* Ex. 1024 ¶¶ 1–2; Ex. 1028 ¶¶ 1–2. Mr. Grenier’s lack of personal attendance at the Symposium does not cast any doubt on the veracity of Mr. Grenier’s Declarations.

Fourth, Patent Owner’s contention that presentation is not synonymous with publication and that the first Grenier Declaration does not provide evidence of publication is unpersuasive. PO Resp. 15 (citing Ex. 2017, 11:17–19). The cited portion of the Deposition of Mr. Grenier indicates only that Mr. Grenier did not personally attend the symposium. This contention is unconvincing for the reasons given above. Further, contrary to Patent Owner’s contention, the Declarations do provide evidence of publication. Specifically, the first Grenier Declaration explicitly states that the Article was “published by IEEE,” and the second Declaration goes on to add that it was published “as part of the conference proceedings on the date of the conference.” *See* Ex. 1024 ¶ 6; Ex. 1028 ¶ 6.

Fifth, we disagree with Patent Owner’s characterization that Mr. Grenier does not know if copies of the Broggi Article were available at the Symposium. PO Resp. 15 (citing Ex. 2017, 12:3–7). This evidence must be considered in the context of the Deposition, and the Declarations.

In Mr. Grenier's Deposition, Patent Owner asks a series of questions regarding Mr. Grenier's personal attendance at, and observation of, the Symposium. *See* Ex. 2017, 11:17–12:11. In this context, Mr. Grenier's reply that he does not know if copies were available at the Symposium means that he did not view such an event. Mr. Grenier's first Declaration supports this interpretation, stating that copies of the conference proceedings were made available to attendees of the conference. Ex. 1024 ¶ 6. In his second Declaration, Mr. Grenier clarifies by adding that the Article was published as part of the conference proceedings *on the date of the conference*. Ex. 1028 ¶ 6. In light of this, we determine that although Mr. Grenier did not observe that copies of the Article were available to attendees at the conference, he knows that such availability is indicated by IEEE records.

d) Butler Declaration

Patent Owner makes numerous arguments regarding the Butler Declaration.

Two of Patent Owner's arguments relate to the admissibility of the Butler Declaration. *See, e.g.*, PO Resp. 18 ("the Butler Declaration fails to authenticate"), 19 ("the Butler Declaration has no probative value"). Such arguments belong in a Motion to Exclude and not in Patent Owner's Response. Also repeated here is Patent Owner's assertion that the Declaration "fails to present **any** evidence." *Id.* at 19 (emphasis Patent Owner's). As explained before, such a characterization is both inaccurate, and does not persuasively address the merits of the evidence.

Patent Owner argues that neither the Declaration itself, nor the attached webpages establish that Broggi was accessible from the webpage shown at page 16 of Exhibit 1029. PO Resp. 18. According to Patent

Owner, the most that is shown is that the text on page 16 of Exhibit 1029 was available on October 12, 2004. For the reasons that follow, we disagree.

As explained above, the Declaration shows that an abstract of an article having the same title, authors, Symposium name, page numbers, date, and location as Broggi (Ex. 1006) was posted to a public website between April 4, 2004, and October 12, 2004. We add that, significantly, the Wayback Machine archives are public and Patent Owner could have submitted evidence to the contrary in the Patent Owner's Response if they so desired.²⁹ See Ex. 1029 ¶ 2 (noting that the archives give free access to the general public).

Patent Owner argues that we should give no weight to the Butler Declaration because Petitioner fails to state the relevance of this evidence as required by 37 C.F.R. § 42.104(b)(5). PO Resp. 19. This rule applies to the Petition and is not relevant to Exhibit 1029, which was not submitted with the Petition. See 37 C.F.R. § 42.104 (titled "Content of the Petition"). Further, Petitioner explained the relevance of this Exhibit. See Ex. 1035, 3 (Petitioner's response to Patent Owner's first set of objections); Paper 18 (Petitioner's Motion to submit Supplemental information); Pet. Reply 6–8.

Patent Owner contends that changing from alleging a June 2004 publication date to an October 2004 publication date prejudices Patent Owner because under 35 U.S.C. § 102(a) a Patent Owner may antedate a reference. PO Resp. 20. Petitioner does not allege that the October 2004 date is the publication date; rather, Petitioner contends that availability on-

²⁹ The second Grenier Declaration was served on January 20, 2015, and the Patent Owner's Response was filed on April 23, 2015. See Ex. 1035, 5; Paper 25, 1 (changing due date of Patent Owner response);

line in October 2004 is corroboration of, or further evidence of, availability in June 2004. Tr. 17–18 (“certainly we are not trying to shift the publication date”); *see also* Tr. 31–33 (more detailed explanation). For that reason, Patent Owner’s argument is not persuasive. Further, we agree with Petitioner that availability on-line no later than October 2004 is consistent with publication of Broggi at the Symposium. *See* Pet. Reply 6–8.

4. *Summary*

Broggi is a printed article titled “Multi-Resolution Vehicle Detection using Artificial Vision.” The first page makes reference to the 2004 IEEE Intelligent Vehicles Symposium held at the University of Parma in Parma Italy on June 14–17, 2004, and includes a copyright date of 2004 that is consistent with this information. Broggi is not marked with any limitations regarding dissemination.

Dr. Frahm, as a person who has chaired an IEEE conference and regularly attended IEEE conferences, states that it is his experience that IEEE papers, such as Broggi, that are presented are made publically available at that conference as is indicated on the face of the paper.

Although he did not attend the Symposium, the Senior Director of Publishing Technologies for IEEE, Mr. Grenier, states that IEEE records indicate that Broggi was published and presented as part of the proceedings on the date of the Symposium.

The Office Manager of the Internet Archive, Mr. Butler, provides records that indicate that Broggi was posted to a public website no later than October 12, 2004.

All of this information is consistent with Petitioner’s contention that Broggi was publically accessible at the Symposium.

Patent Owner argues that Petitioner's showing is deficient; however, as discussed above, these arguments are not persuasive. Further, Patent Owner does not present evidence that persuasively casts doubt on Petitioner's showing. Patent Owner's expert, Dr. Turk, likewise opines that Petitioner's showing is not definitive. In contrast to Dr. Frahm's opinion, Dr. Turk does not provide the underlying facts or data that led to his opinion.

We determine that a preponderance of the evidence shows that Broggi (Ex. 1006) was sufficiently accessible to the public interested in the art by being available to attendees of the IEEE Intelligent Vehicles Symposium at the University of Parma, in Parma, Italy, on June 14–17, 2004. Consequently, Broggi is prior art under 35 U.S.C. § 102(a) because it was accessible to the public interested in the art before the critical date of the '522 patent.

B. LEVEL OF SKILL IN THE ART

Patent Owner argues that Petitioner fails to resolve the level of ordinary skill in the art, and for that reason Petitioner's obviousness analysis is fatally deficient. PO Resp. 20–22.

Petitioner's expert, Dr. Frahm, provided testimony regarding the level of skill in the art. *See* Ex. 1010 ¶¶ 43–48. Although the level of skill in the art is not discussed in the Petition, Dr. Frahm acknowledged that obviousness is viewed from the perspective of a person of ordinary skill in the art, and applied that standard to his evaluations. *Id.* ¶¶ 28–29. That is, Dr. Frahm's evaluations of the grounds of unpatentability based on obviousness is based on the perspective of a person of ordinary skill in the art at the time of the claimed invention, and this analysis is cited and explained in the Petition.

Patent Owner’s contention is unpersuasive, in part, because it does not address the merits of the level of skill in the art provided. The significance of the level of ordinary skill in the art is the role it plays in an obviousness analysis. *See Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966); *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (“[T]he level of skill in the art is a prism or lens through which a judge, jury, or the Board views the prior art and the claimed invention.”); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991) (“The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.”). Patent Owner’s assertion fails to address how the level of skill in the art impacted the obviousness analysis.

C. 35 U.S.C. § 325(d)

Patent Owner argues, in a footnote, that although the Board exercised its discretion not to deny the Petition under 35 U.S.C. § 325(d), the Board may still deny the Petition on that basis now.³⁰ PO Resp. 27 n.6. Patent Owner emphasizes that the Petition’s combination of Nissan and Hitachi is at least substantially the same as the ground based upon Nissan in a prior petition. *Id.*

Patent Owner’s Preliminary Response argued that we should deny the Petition based on 35 U.S.C. § 325(d). *See* Prelim. Resp. 2, 7–12. We considered this argument and declined to exercise our discretion to deny the Petition. *See* Dec. 12–15. Patent Owner’s current argument adds nothing to

³⁰ We presume the second citation, which is to “§ 315(d)” is a typographical error and “§ 325(d)” was intended.

the previous argument and does not persuade us that we should now deny the Petition on that basis.

D. OVERALL ARGUMENTS

Before addressing the grounds of unpatentability more specifically, we address two general arguments by Patent Owner. *See* PO Resp. 22–29.

1. *Claimed Features*

Patent Owner argues that Petitioner “fails to adequately explain how the asserted references and portions quoted in its claim charts disclose the claimed features.” PO Resp. 23. In particular, Patent Owner contends that the Petition does not identify how the challenged claims are unpatentable or identify portions of the evidence that support the challenge (citing 37 C.F.R. §§ 42.104(b)(4)–(b)(5)). *Id.* Further, according to Patent Owner, the Petition: exceeds page limits, improperly incorporates by reference, and includes claim charts that either do not explain sufficiently or improperly contain argument. *Id.* at 24–26.

To a substantial extent, Patent Owner really is making an untimely request for reconsideration of our Institution Decision. *See* Dec., *passim*; 37 C.F.R. § 42.71(d). Patent Owner elected not to file such a request, and may not do so now. *Id.*

We consider Patent Owner’s argument to the extent it suggests that Petitioner has not demonstrated unpatentability by a preponderance of the evidence. Patent Owner argues against the Petition as a whole and provides but one supporting example. *See* PO Resp. 23–26. Such generalities are not persuasive. The sole example relates to the ground of unpatentability against claim 2 based on Hitachi and Nissan, and we analyze this contention in Section V.A. below.

2. *Reasons for Combining the References*

Regarding the rationale for combining Nissan with Hitachi, Patent Owner argues that the Petition improperly incorporates by reference the rationale from a related case. PO Resp. 26–27. Neither our Institution Decision nor this decision relies upon the rationale from the related case. *See* Dec. 15–16.

Patent Owner goes on to contend that the rationale offered in the Petition is conclusory, does not set forth any obviousness rationale, and is not properly supported by the Declaration of Dr. Frahm because the Petition does not explain this evidence. PO Resp. 28. Patent Owner addresses only the Petition and not the Petitioner’s Reply. We analyze the rationale for this ground of unpatentability, in light of all of the evidence, in Section V.A. below.

V. PATENTABILITY

A. INTRODUCTION

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art;

(3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness.³¹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

We consider Patent Owner to have admitted those aspects of these grounds of unpatentability that are uncontested by Patent Owner and are material facts. See 37 C.F.R. §§ 42.23(a) (in an opposition, any material fact not specifically denied may be considered admitted), 42.120(a) (the patent owner response is an opposition).

We address each of the three asserted grounds of unpatentability in turn.

B. NISSAN AND HITACHI

Petitioner contends that claims 2, 3, 5, 7, 11, 12, 28, 32–35, 37, 40, and 44–46 are unpatentable as obvious over Nissan and Hitachi. Pet. 20–38. For the reasons explained below, Petitioner has established this assertion by a preponderance of the evidence.

1. Nissan

Nissan describes a vehicle-mounted camera optical axis misalignment detection system. Ex. 1003, Title. Vehicle-mounted system 30 of the second embodiment captures an image of a position, which is a blind spot for the driver at the front left of the car (near the left fender) with vehicle-mounted camera 2, in response to an instruction input by the passenger of the car, and displays this image to display 3, thereby providing the driver with driving support when, for example, making a left turn. *Id.* ¶ 32. Vehicle-mounted camera 2 is built in to a left-hand door mirror of the car. *Id.* Vehicle-

³¹ The level of ordinary skill in the art was discussed earlier. Patent Owner does not present evidence of secondary considerations.

mounted camera 2 is mounted on the car such that a left turn signal provided to the side of the car is visible, so as to capture images including the left turn signal. *Id.* Data ROM 8 stores an image showing where the turn signal ought to be observed in images captured by vehicle-mounted camera 2 when vehicle-mounted camera 2 is in an ideal state, mounted in a correct position and with no optical axis misalignment occurring. *Id.* ¶ 34. CPU 6 of control unit 5 executes an optical axis misalignment detection program to determine periodically whether optical axis misalignment has occurred in vehicle-mounted camera 2. *Id.* ¶ 41. Turn signal position detection unit 33 performs a process to detect the position where the turn signal is displayed in the actual image of the left front of the car. *Id.* ¶ 44. Turn signal misalignment evaluation unit 34 compares the position where the left turn signal ought to be observed as shown in the template image stored in data ROM 8 against the position of the left turn signal in the actual image as detected by turn signal position detection unit 33, and judges, based on the degree of misalignment therebetween, whether optical axis misalignment has occurred in vehicle-mounted camera 2. *Id.* ¶ 45. This process is depicted in Figure 8, reproduced below.

FIG. 8

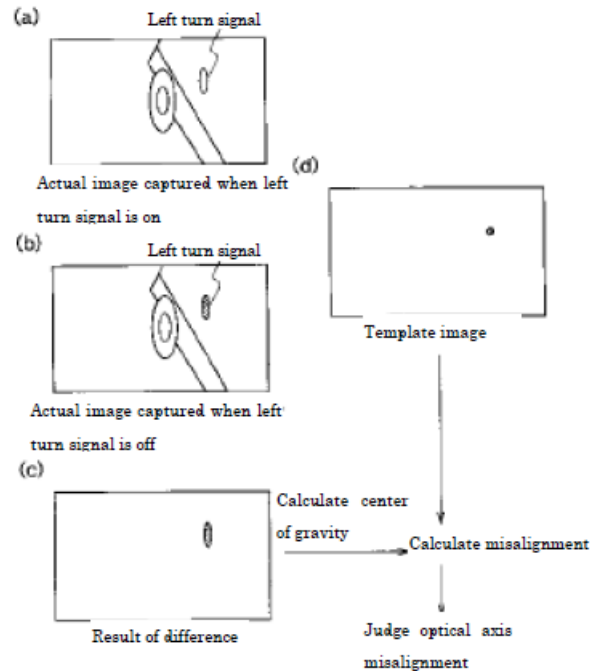


Figure 8 is a view for describing a method for detecting positional misalignment between a position of a left turn signal in an actual image and a position of the left turn signal in a template image in a vehicle-mounted system of the first embodiment. *Id.* at 18. As depicted in Figure 8, (a) shows the image captured when the left turn signal is on, (b) shows the image captured when the left turn signal is off, (c) shows the difference between the two captured images, and (d) shows an image indicating where the left turn signal ought to be observed. *Id.* When optical axis misalignment is detected in vehicle-mounted camera 2, control unit 5 drives an actuator (camera position adjusting means capable of adjusting the direction of the optical axis of vehicle mounted camera 2) according to the detected amount of optical axis misalignment in vehicle-mounted camera 2. *Id.* ¶ 52. Specifically, control unit 5 continuously monitors scores D1 and

D2, which represent the degree of misalignment, and drives the actuator such that both of these scores are substantially zero. *Id.*

2. Hitachi (Exhibit 1013)

Hitachi describes an image capture apparatus for recognizing a vehicle driving environment. Ex. 1013 ¶ 1.

Figure 2 is reproduced below:

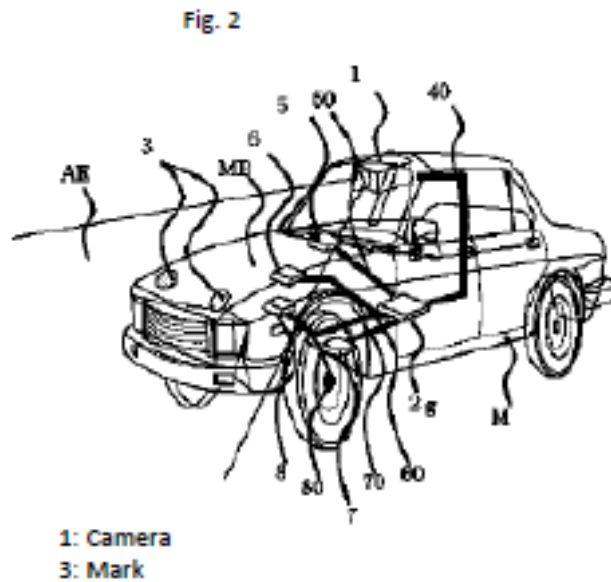


Figure 2 shows an embodiment of the automotive image capture apparatus according to Hitachi being used as a driving environment recognition apparatus. *Id.* ¶ 18. Marks 3 disposed on the left and right of hood MB of the automobile M. *Id.* ¶ 18, Fig. 2. Field of view AE represents the image capture visual field of camera 1, and marks 3 are disposed at two locations on the left and right of the hood of the automobile. *Id.* ¶ 19. When the initial mark position X of mark 3 is not identical to the current mark position Y (steps S4, S5) and correction is within the correctable range (step S9), a correction is calculated (step S10), and image data is corrected (step S11). *Id.* ¶¶ 32–48, Figs. 4, 5.

3. *Petitioner's Contentions*

Petitioner specifically alleges where each element of the claims is found in the prior art with citations by exhibit number to the specific portion of the evidence that supports the challenge. Pet. 20–38. Petitioner explains that a person of ordinary skill in the art would have been motivated to replace Nissan's physical correction for camera position misalignment with Hitachi's image processing technique. Pet. 22 (Ex. 1010 ¶¶ 166–178); *see also* Pet. 23–38 (citations to and explanations of the references).

4. *Patent Owner Arguments*

Patent Owner makes two arguments regarding this ground of unpatentability. First, Patent Owner contends that for compensating for misalignment as required by claim 2, the claim chart quotes a portion of the reference but does not explain adequately how this quote corresponds to the limitation at issue. PO Resp. 23–26. Second, Patent Owner contends that Petitioner's proffered rationale is insufficient. *Id.* at 28.

a) *Claim 2 - Compensating for Misalignment*

Claim 2 depends from independent claim 1 (not challenged) and includes the limitation, "wherein said control . . . is operable to at least partially compensate for the determined misalignment of said imaging array sensor."

Petitioner explains that Nissan discloses a vehicle imaging system that includes an imaging array sensor. Pet. 22–25. Petitioner explains that Nissan's device uses physical adjustment with actuators to correct image misalignment. *Id.* at 22–23. Petitioner explains that Hitachi discloses correction of misalignment by adjusting image data or image processing, and quotes the following passage from Hitachi:

[W]hen the image data correction amount is calculated in Step S10, that result is assessed in Step S14 as to whether or not it is only a case of translational displacement, as shown in Fig. 7(a). If the result is Yes, **instead of image data correction**, the used image area A1 and the initial mark 3A position X are changed, as shown in Fig. 7(b).

Id. at 22, 24 (quoting Ex. 1013 ¶ 54)(emphasis added).

This explanation and quote with emphasis, demonstrates how Hitachi discloses a device operable to at least partially compensate for the determined misalignment using an image sensor. Patent Owner's argument does not persuade us otherwise.

b) Sufficiency of Stated Rationale

Nissan discloses a vehicle imaging system that includes an imaging array sensor that uses physical adjustment with actuators to correct image misalignment, and Hitachi discloses correction of misalignment by adjusting image data or image processing. *See* Pet. 22–25. Petitioner proposes to modify Nissan by adjusting image data or image processing as taught by Hitachi. *Id.* at 22. Specifically, Petitioner contends:

[One] skilled in the art would have been motivated to modify Nissan to include functionality of Hitachi in order to correct (or otherwise account for) the detected misalignment by adjusting the image processing, where such misalignment adjustment would be more cost efficient and less error prone.

Pet. 22 (citing Ex. 1010 ¶¶ 166–178).

Patent Owner contends that Petitioner “does not set forth any obviousness rationale to support its conclusory statement,” and further contends that the cited portion of the Declaration of Dr. Frahm should be disregarded because it is not adequately explained in the Petition. PO Resp. 28.

Initially, we disagree with Patent Owner's characterization that Petitioner "does not set forth *any* obviousness rationale." See PO Resp. 28 (emphasis added). To the contrary, Petitioner contends that modifying Nissan would reduce cost and errors. See Pet. 22. Patent Owner's contention does not address cogently the merits of Petitioner's proffered rationale.

Regarding the citation to a portion of the Declaration, generally, the Board considers declaration evidence commensurate with its discussion in the Petition. See, e.g., *Dominion Dealer Solutions, LLC. v. Autoalert, Inc.*, Case IPR2013-00225, slip op. at 3 (PTAB Oct. 10, 2013) (Paper 15); see also 37 C.F.R. 42.104(b)(5) (requiring a petition to identify: the exhibit number of supporting evidence, specific portions of the evidence that support the challenge, and the relevance of that evidence). Petitioner identifies specific portions (paragraphs 166–178) by exhibit number (1010). See Pet. 22. Further, Petitioner explains the relevance of that evidence. Specifically, the Petition contends that the modification would reduce cost and errors and cites to a portion of Dr. Frahm's Declaration, indicating the Declaration contains supporting details. Indeed, the Declaration states that in Dr. Frahm's opinion, a person of ordinary skill in the art would recognize that correction via Hitachi's method rather than Nissan's would remove the higher production cost of actuators, and avoid the mechanical failure of actuators (i.e., reduce cost and errors). See Pet. 22; Ex. 1010 ¶¶ 170–172.

We are persuaded that the reason provided by Petitioner is based upon a rational underpinning.

5. Petitioner's Preclusion Argument

Petitioner contends that the Office affords a preclusive effect to its own findings in subsequent proceedings before the Office. Pet. Reply 12–13

n.3 (citing Manual of Patent Examining Procedure (“MPEP”) § 2308.03 ESTOPPLE WITHIN THE OFFICE).

The MPEP provides guidance to Examiners regarding practices and procedures relative to prosecution of patent applications before the Office. *See* MPEP, Foreword, (9th ed. July 2015). The MPEP may provide important interpretations of laws and rules, as provided by the Commissioner and the Director. Nevertheless, the guidance in the MPEP is not binding on the Board in its interpretation of the law as part of an adjudication in the same manner as statutes or the rules found in title 37 of the Code of Federal Regulations. *Id.* Accordingly, Petitioner’s contention is not persuasive.³²

6. Conclusion

Petitioner has demonstrated by a preponderance of the evidence that claims 2, 3, 5, 7, 11, 12, 28, 32–35, 37, 40, and 44–46 are unpatentable as obvious over Nissan and Hitachi.

C. NISSAN, HITACHI, AND BROGGI

Petitioner asserts that claims 19, 23, and 24 are unpatentable over Nissan, Hitachi, and Broggi. Pet. 49–53. For reasons explained below, Petitioner has established this assertion by a preponderance of the evidence for claims 19 and 23, but not for claim 24.

³² Even if MPEP guidance applied to *inter partes* reviews, section 2308.03 would not apply here because the determination on the rationale issue in IPR2014-00221 differs from the determination in the case at hand in at least two respects: one, the subject matter of the challenged claims differs, and two, the supporting Declaration in each case differs. *Cf.* IPR2014-00221, *Valeo North America, Inc., et al. v. Magna Electronics, Inc.* (PTAB May 28, 2015), slip op. at 11 (Paper 58) to Dec. 29; *Cf.* Ex. 1010 ¶¶ 190–198 of IPR2014-00221 to Ex. 1010 ¶¶ 166–176.

Nissan and Hitachi are discussed above.

1. *Broggi*

Broggi describes a vehicle detection system using a single camera. Ex. 1006, Abstract. The system is based on the search for areas with high vertical symmetry in multi-resolution images. *Id.* Symmetry is computed using different sized boxes centered on all the columns of the interest areas. *Id.* All the columns with high symmetry are analyzed to get the width of detected objects. *Id.* Horizontal edges are examined to find the base of the vehicle in the individuated area. *Id.* The aim is to find horizontal lines located below an area with sufficient amount of edges. *Id.* The algorithm deletes all the bounding boxes which are too large, too small, or too far from the camera in order to decrease the number of false positives. *Id.* All the results found in different interest areas are mixed together and the overlapping bounding boxes are localized and managed in order to delete false positives. *Id.*

An interesting column is defined as having a high symmetry in: (i) the image that contains the result of Sobel binarization; or (ii) the image that contains the AND between symmetry of horizontal and vertical edges. *Id.* at 313.³³ A columnwise histogram is then used to locate candidate columns. *Id.* In correspondence to these columns the vertical edges symmetry is checked to obtain the expected vehicle width. *Id.* More specifically, if a high value of symmetry is present for small widths too, it means that the algorithm has detected a small object; in this case the column is discarded. *Id.*

Figure 5 is reproduced below:

³³ We refer to the native numbering of this Exhibit.



Fig. 5. Vertical edges symmetry: the horizontal axis represents the position of symmetry axis while the vertical axis represents the width of the symmetry box (small on the top and large on the bottom of the image).

Figure 5 shows an example of discarding a column in which the leftmost peak is discarded because it presents a high symmetry value also for small widths. *Id.* In contrast, the rightmost peak presents an appreciable symmetry value only for widths above a certain size. *Id.*

2. Claim 19

Claim 19 depends from independent claim 1, and recites “wherein said control is operable to distinguish between an object in the field of view of said imaging array sensor and a shadow of an object.” Ex. 1001, 18:4–6.

Claim 19 uses the claim phrase “an object” twice. Consequently, the claimed objects may be different objects. If the claim drafter intended the first use of the term “object” to be antecedent basis for the second use, the second use would have recited, either “the object” or “said object.” Therefore, the claimed shadow need not be the shadow of the first object recited.

Petitioner relies upon the analysis of Nissan and Hitachi of the ground of unpatentability above. Pet. 50–51 (citing section VII.A. of the Petition at 18–38).³⁴ Petitioner contends that Broggi discloses analyzing images to determine the presence of shadows. *Id.* at 51–52 (citing Ex. 1006, 312). Petitioner contends that it would have been obvious to employ shadow detection as disclosed by Broggi in the combined Nissan and Hitachi system in order to filter out shadows of objects from the identification of objects of

³⁴ The ground of unpatentability of claims 23 and 24 also relies upon section VII.A.

interest to lower the false positive detection rate. *Id.* at 50 (citing Ex. 1010 ¶¶ 224–227).

Patent Owner presents two arguments in support of claim 19: one, that Broggi does not disclose distinguishing between an object and a shadow as claimed, and, two, that a person of ordinary skill would not have made the proposed combination.

a) Distinguishing Object from Shadow

Petitioner explains that Broggi discloses analyzing captured images to determine the presence of shadows. Pet. 50–52 (citing Ex. 1010 ¶¶ 224–227). Indeed, Broggi discloses that

The shadow under the car is searched for in order to find the box base. It is defined as a horizontal edge, but since other shadows, like bridges' ones, could be present on the road as well, and the algorithm looks for a high concentration of edges above the horizontal edge; if no base can be detected, the column is discarded.

Ex. 1006 at p. 312.

Patent Owner contends that this disclosure does not correspond to distinguishing between an object and a shadow of an object as claimed. According to Patent Owner, if there was a non-shadow horizontal edge and a high concentration of edges above this non-shadow horizontal edge, the algorithm would have found the box even though there was no shadow. PO Resp. 31 (citing Ex. 2016 ¶ 39). Even if we accept, for the sake of argument, Patent Owner's contention as correct, it demonstrates, at most, that Broggi's technique can find a bounding box even when no shadow is present. See Ex. 1006, 312. That capability does not demonstrate that Broggi's device is incapable of distinguishing an object from a shadow.

Patent Owner contends that if Broggi can distinguish a shadow from an object, then the bounding box would be placed at the base of the object

(vehicle detected) rather than at the bottom of the car's shadow. PO Resp.

31. In support of this argument, Patent Owner contends that each of Figures 10(a)–(d) depict the box base at the bottom of the car's shadow. That is, Patent Owner characterizes Figures 10(a)–(d) as depicting improperly positioned bounding boxes in that the boxes are positioned at the bottom of the shadow rather than at the base of the object. We disagree with this characterization for the reasons that follow.

In Figures 10(a), 10(b), and 10(d), shadows extend from each detected vehicle towards the right side of the Figure. In Figure 10(c) the detected vehicle is so distant from the camera that the shadow of that vehicle cannot be reliably discerned. In light of this, none of the Figures in question depict a shadow between the detected vehicle and the camera. Broggi defines a shadow as a horizontal edge, and therefore shadows to the side of the vehicle (vertical edges) are by definition not shadows. *See* Ex. 1006, 312 (III.D. BOUNDING BASES GENERATION). Accordingly, Patent Owner's characterization that the bounding boxes are placed at the bottom of the detected vehicle's shadow rather than at the base of the vehicle is inaccurate. Supporting our interpretation, Broggi describes that Figures 10(a)–(d) depict vehicles detected (i.e., as indicated by bounding box placement) “with good precision.” Ex. 1006, 313 (IV. DISCUSSION OF RESULTS AND CONCLUSIONS). Consequently, Patent Owner's contention that the bounding boxes are improperly positioned is not persuasive.

Patent Owner contends that Figures 11(b) and 11(d) illustrate that Broggi does not distinguish between an object and a shadow as claimed. PO Resp 31–32 (citing Ex. 2016 ¶¶ 40–43). The premise of Patent Owner's argument is that claim 19 requires distinguishing an object from a shadow

with 100% accuracy. Such an argument is unpersuasive because it is not commensurate in scope in that claim 19 contains no such limitation.

Further, Broggi discloses that Figure 11(b) illustrates an error in detecting the base of the vehicle caused by the presence of a black bumper, and Figure 11(d) depicts a false positive caused by a bridge shadow. Ex. 1006, 313. Broggi's acknowledgment that the system can at times produce errors does not cast doubt on our determination that Broggi distinguishes an object from a shadow of an object.

We are persuaded by Petitioner's contentions. As Petitioner correctly asserts, Broggi states that "[t]he shadow under the car is searched for." Pet. 50–52 (citing Ex. 1006, 312). Searching for a shadow under a car necessarily entails distinguishing between an object in the field of view of the image sensor and a shadow of an object as claimed.

*b) Sufficiency of Stated Rationale*³⁵

Petitioner contends that it would have been obvious to combine the teachings of Nissan, Hitachi, and Broggi, in part, because the references are all in the area of vehicle vision systems and relate to capturing images of vehicle's surroundings to aid a driver with various vehicle-related functions. Pet. 49–50. Petitioner explains that false positives, such as those caused by shadows of objects, were a well-known problem, and elaborates that it

would have been entirely predictable to a person of ordinary skill in the art having the benefit of the disclosure of Nissan and Broggi, to employ shadow detection disclosed in Broggi into the vision system of Nissan in order to filter out shadows of objects from the identification of objects of interest to lower the false positive detection rate.

³⁵ Our analysis here focuses on the reasons for further modification of the Nissan and Hitachi combination in view of Broggi.

Id. (citing Ex. 1010 ¶¶ 224–227).

Patent Owner argues that a person of ordinary skill in the art would not have combined Broggi with Nissan and Hitachi because Broggi does not remove shadows to reduce false positives. PO Resp. 42–45 (citing Ex. 2016 ¶¶ 66–70).

Patent Owner’s argument is not supported by the reference. As discussed above, Broggi discloses searching for the shadow (defined as a horizontal edge) under a vehicle in order to find the box base. Because other shadows, such as that from a bridge, could be present the algorithm looks for a high concentration of edges above the horizontal edge, and if no base can be detected, the column is discarded. *See* Ex. 1006, 312 (III.D. BOUNDING BASES GENERATION). Consequently, discarding columns where no base is associated with a shadow is a technique of reducing false positives. *See* Pet. Reply 17; Ex. 1034 ¶¶ 10–11 (referencing Ex. 1010 ¶¶ 224–227³⁶).

c) Conclusion

We are persuaded Petitioner has demonstrated by a preponderance of the evidence that claim 19 is unpatentable as obvious over Nissan, Hitachi, and Broggi.

3. Claim 23

Claim 23 depends from independent claim 1 and recites, “wherein said control applies an edge detection algorithm to process data of said captured image.” Petitioner contends that:

With respect to claim 23, the Nissan system includes functionality to display, to the driver, the distance between the vehicle and objects external to the vehicle. Broggi teaches edge based object detection. In order to limit the cognitive load on

³⁶ This portion of Ex. 1010 was cited to and explained in the Petition at 50.

the drive[r], one skilled in the art would have recognized that it was obvious to combine modify the Nissan system to incorporate the object detection of Broggi such that only distances between objects of interest and the vehicle would be displayed to the driver.

Pet. 50–52 (citing Ex. 1010 ¶¶ 228–232).³⁷ In context, Petitioner proposes to replace Nissan’s display of distance to all objects with Broggi’s display of distance to detected objects. The cited portion of Dr. Frahm’s Declaration explains that Broggi uses object detection to determine the distance to objects of interest.

Patent Owner does not challenge Petitioner’s assertions regarding Broggi. Rather, Patent Owner argues that Petitioner presupposes that Nissan displays distances to irrelevant objects, but there is no indication this is accurate. PO Resp. 45. Patent Owner elaborates that addition of actual distances as proposed by Petitioner would increase, rather than decrease driver cognitive load. *Id.* at 45–46 (citing Ex. 2016 ¶¶ 72–73).

Contrary to Patent Owner’s assertion, Nissan does indicate the distance to all objects. Specifically, Nissan discloses that when the car’s gear is shifted into reverse position, distance indicators are overlaid on the actual image of the area behind the car captured by vehicle-mounted camera 2 as displayed on display 3. Ex. 1003 ¶ 17; Fig. 1; Pet. 50–51; *see also* Ex. 1010 ¶ 100, 299 (explaining this feature of Nissan).

We agree with Petitioner that if Nissan’s technique for display of the distance to all images is replaced by display of distance to detected objects (objects of interest) as disclosed by Broggi, driver cognitive load would be reduced.

³⁷ This ground also relies upon section VII.A. of the Petition.

We are persuaded Petitioner has demonstrated by a preponderance of the evidence that claim 23 is unpatentable as obvious over Nissan, Hitachi, and Broggi.

4. *Claim 24*

Claim 24 depends from claim 23, and recites,

wherein an algorithmically executed filtering mechanism at least substantially ignores detected edges that are not indicative of a significant object in order to at least one of (a) reduce processing requirement and (b) reduce false signals.

Petitioner contends that Broggi reduces processing requirements by utilizing three different interest areas. Pet. 51 (citing Ex. 1006, 311). Regarding aspect (a) of claim 24, Petitioner adds that Broggi focuses computation on “interesting columns” which are likely to contain interesting objects, and teaches to ignore small objects. *Id.* at 52–53 (citing Ex. 1006, 312). Regarding aspect (b) of claim 24, Petitioner adds that Broggi filters false positives. Pet. 53 (citing Ex. 1006, 312). Petitioner reasons that

it would be entirely predictable for one of ordinary skill in the art to employ regions of interest (or called areas of interest in Broggi) to ignore edges that are not indicative of objects of interest and/or to reduce false signals, to reduce processing requirements of Nissan’s system.

Id. at 51 (citing Ex. 1010 ¶¶ 233–237). We explain how Broggi operates and then analyze Petitioner’s contentions.

Broggi discloses a four part algorithm: (1) vertical symmetry computation, (2) interesting column identification, (3) bounding boxes generation, and (4) position and size filtering. Ex. 1006 ¶ III.³⁸ The

³⁸ At times we cite to paragraph numbers instead of page numbers of this Exhibit to be more specific.

algorithm considers three interest areas in order to speed up execution (reduce processing requirements). *Id.* ¶ III.A.

In step 1 (vertical symmetry computation), Broggi attempts to find all vertical and horizontal edges using a Sobel operator, then three images are built, symmetry for every column of the images is computed, and from horizontal and vertical edges symmetry images, a new image is created. *Id.* ¶ III.B.

In step 2 (interesting column identification), Broggi searches with the new image for interesting columns (columns with high symmetry in one of two respects). *Id.* ¶ III.B.–C. Then a columnwise histogram is used to locate candidate columns and the vertical edge symmetry of these candidate columns is checked. *Id.* ¶ III.C. In this check, small widths having high values of symmetry, which correspond to small objects, are discarded. *Id.*

In step 3 (bounding boxes generation), the width of a bounding box is determined for each peak in vertical edges symmetry image that survives the filters of step 2. *Id.* ¶ III.D. The box base is located based upon the horizontal edge of the shadow under the car. *Id.*

In step 4 (position and size filtering), because not all the boxes detected boxes in step 3 are correct, the boxes are filtered, to include application of a filter that removes boxes that are too small and probably do not identify a vehicle. *Id.* ¶ III.E.

Claim 24 requires ignoring detected edges that have a specified characteristic (those not indicative of a significant object). Petitioner's contention is flawed both with regard to what is ignored (detected edges), and with regard to the specified characteristic. We address these issues in turn.

First, in light of our explanation above, Broggi does not ignore detected edges; rather, Broggi ignores vertical edge symmetry of candidate columns (*see* step 2). Broggi detects edges, but this process is separate from ignoring (discarding) small objects. Specifically, the detected edges are used to create images, within these images symmetry for every column of these images is computed, from this a new image is created, within this new image columns having high symmetry are identified, a columnwise histogram is used to locate candidate columns, and then based on vertical edge symmetry of these candidate columns, small widths are ignored. Petitioner does not explain persuasively how ignoring small widths as indicated from vertical edge symmetry of candidate columns corresponds to ignoring detected edges as claimed. *See* Pet. 51–53; Ex. 1010 ¶¶ 233–237.

Second, regarding the specified characteristic, Petitioner contends that a small object, as indicated by a small width having high vertical edge symmetry, corresponds to something not indicative of a significant object as claimed. Petitioner does not explain persuasively how a small object corresponds to a significant object as claimed. *See* Pet. 51–53; Ex. 1010 ¶¶ 233–237. Further, the disclosures of the '522 patent and Broggi undermine such an interpretation. Specifically, the '522 patent describes that the system utilizes various filtering mechanisms to substantially ignore edges that cannot be indicative of “a vehicle or a significant object.” *See* Ex. 1001, 2:60–65. In this context, a significant object is an object other than a vehicle. The significance is that objects other than vehicles can be significant, that is, the '522 patent seeks to identify objects other than vehicles. In contrast, Broggi is only concerned with detecting vehicles. *See* Ex. 1006, Abstract (“[t]his paper describes a vehicle detection system”), ¶ II. (“[t]he goal is to detect all vehicles in the scene”), ¶ III.E. (boxes that are too

large or too small probably do not identify a vehicle and are discarded).

Consequently, a small object as disclosed by Broggi does not correspond to an object that is not significant as claimed.

Beyond these shortcomings, Petitioner's rationale also is deficient. Petitioner reasons that a person of ordinary skill in the art would have modified Nissan and Hitachi to include three teachings from Broggi (i.e., processing by interest areas, ignoring edges that are not indicative of objects of interest, and reducing false signals) in order to "reduce processing requirements of Nissan's system." Pet. 51. Broggi discloses that use of interest areas reduces processing requirements. Ex. 1006, ¶ III.A. However, Petitioner does not identify, nor does Broggi disclose, that ignoring edges or reducing false positives reduces processing requirements. *See id.* ¶¶ III.C., E. Consequently these aspects of the proposed modification lack a rational underpinning.

Petitioner has not demonstrated by a preponderance of the evidence that claim 24 is unpatentable as obvious over Nissan, Hitachi, and Broggi.

D. NISSAN, HITACHI, AND GUTTA

Petitioner asserts that claims 18, 21, 22, 25, and 26 are unpatentable over Nissan, Hitachi, and Gutta. Pet. 38–43, 56–59. For reasons explained below, Petitioner has established this assertion by a preponderance of the evidence.

1. Gutta

Gutta describes a vehicular vision system to aid a driver of a vehicle to determine whether it is safe to change lanes. Ex. 1002, Abstract.

Figure 2 is reproduced below.

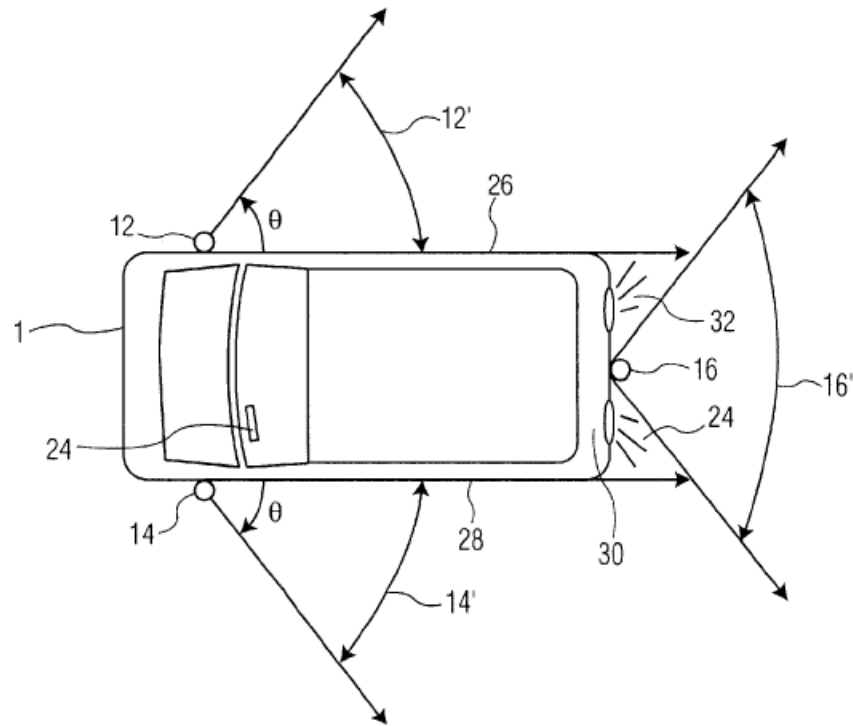


FIG. 2

Figure 2 depicts an overhead view of cameras on a vehicle having the vehicular vision system of Gutta. *Id.* at 2:20–22.

Vehicular system 10 includes first and second side image cameras 12 and 14, rear image camera 16, distance determiner 18, and object identifier 20. *Id.* at 2:29–32. First and second side image cameras 12 and 14 are placed preferably on, e.g., passenger side and driver side front portions of the vehicle, respectively, such that rearward and sideward fields of view 12' and 14' are obtained for both sides of vehicle 1. *Id.* at 2:55–60. Rear image camera 16 is placed preferably on rear portion 30 of vehicle 1 with its field of view oriented such that a rearward view from vehicle 1 is obtained. *Id.* at 3:1–3. Rear image camera 16 preferably has a field of view that results in only very small areas 32 and 34 behind the vehicle not being visible to either rear image camera 16 or first and second side image cameras 12 and 14. *Id.* at 3:3–7. Images generated by cameras 12, 14, and 16 are provided to image

processor 22, which processes the image signals generated by the cameras and provides processed image signals to display 24 for viewing by the driver, to distance determiner 18, and to object identifier 20. *Id.* at 3:14–19, 23–27. Object identifier 20 identifies the type of objects observed by the camera, preferably by the well-known methods of extraction and classification. *Id.* at 3:34–40, 51–56. The identification may be as simple as saying that the object is a car, bus, motorcycle, sport utility, minivan, or truck. *Id.* at 3:56–58.

Figure 3 is reproduced below.

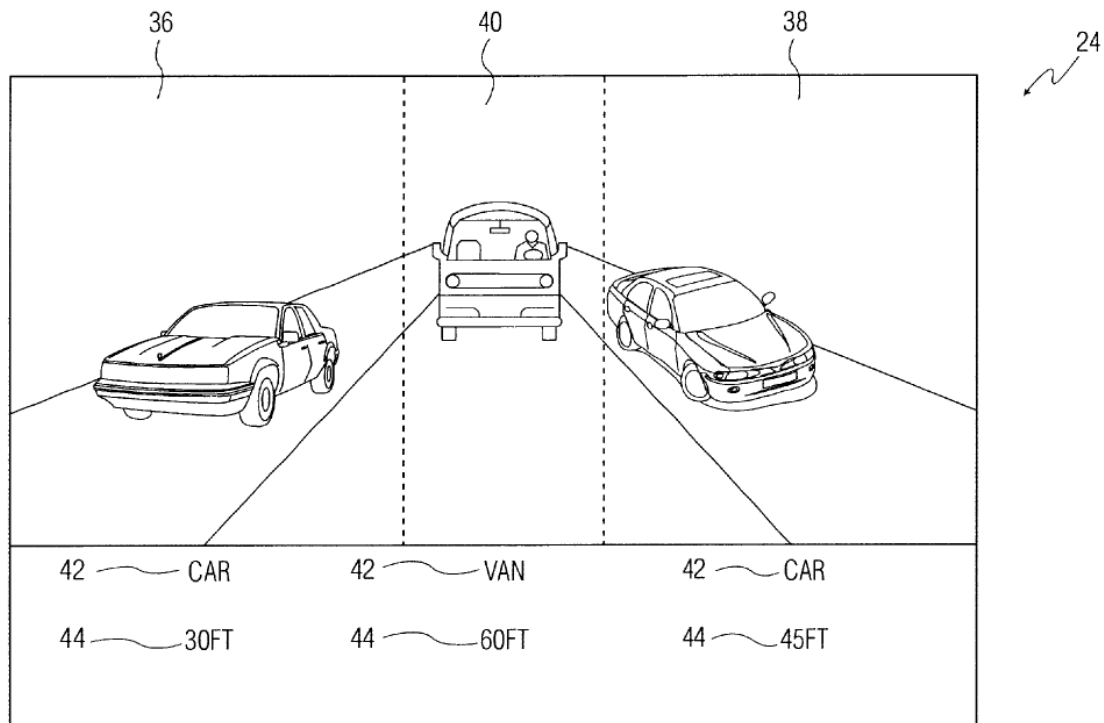


FIG. 3

Figure 3 is an exemplary display according to Gutta. *Id.* at 2:23–24. As depicted in Figure 3, display device 24 displays a composite image that includes: (1) visual representations 36, 38, and 40 of the fields of view 12', 14', and 16' of cameras 12, 14, and 16, respectively; (2) notations 42 as to each type of object identified; and (3) indications 44 of the distance between

the object and vehicle 1. *Id.* at 4:24–32. Based on the information provided by the cameras, object identifier, and distance determiner, the system can provide the driver with an indication that it is now safe to change lanes to the left or right in response to the driver activating the turn signal. *Id.* at 5:22–27.

2. Petitioner’s Contentions

Petitioner specifically alleges where each element of the claims is found in the prior art with citations by exhibit number to the specific portion of the evidence that supports the challenge.³⁹ Pet. 38–43, 56–59. Petitioner asserts that a person of ordinary skill in the art “would have been motivated to combine the teachings of Nissan, Hitachi, and Gutta, given that the references are all in the area of vehicle vision systems and relate to capturing images of a vehicle’s surroundings to aid a driver with various vehicle-related functions.” Pet. 39; *see also id.* at 56–57 (similar contention for claim 22). With regard to the additional modification over Gutta, Petitioner states that it would have been obvious to add Gutta’s object detection system to Nissan in order to limit cognitive load on the driver. *Id.* at 40 (citing Ex. 1010 ¶¶ 179–195), 57–58 (citing Ex. 1010 ¶¶ 249–258).

3. Claims 18 and 21

Claim 18 depends from claim 1 and recites, “wherein said control processes said captured image to detect an object exterior the equipped vehicle.” Ex. 1001, 18:4–6. Similarly, claim 21 depends from claim 1 and recites, “wherein said control is operable to alert the driver of the equipped

³⁹ Petitioner also relies upon the analysis of Nissan and Hitachi in section VII.A. of the Petition.

vehicle that an object is detected exterior to the equipped vehicle.” *Id.* at 18:13–15.

Patent Owner contends that this analysis is based upon an inaccurate portrayal of Nissan. PO Resp. 47–48 (citing Ex. 2016 ¶ 76). Specifically, Patent Owner contends that Petitioner’s statement that “Nissan requires the use of object detection” is inaccurate in that Nissan portrays distances via distance indicators overlaid on the image of the area behind the vehicle. *Id.* at 48 (citing Ex. 1003 ¶¶ 17, 23).

We agree with Patent Owner that it is inaccurate to state that Nissan’s system “requires the use of object detection.” *See* Pet. 40. As discussed above, Nissan portrays distances via distance indicators overlaid on the image of the area behind the vehicle. Ex. 1003 ¶¶ 17, 22–23. However, this inaccuracy does not illustrate that Petitioner’s obviousness reasoning is flawed. Nissan’s system utilizes distance indicators overlaid on the image of the area behind the vehicle in order to convey the distance to all objects viewed to the driver. Ex. 1003 ¶¶ 17, 22–23. Petitioner proposes to replace Nissan’s technique with Gutta’s system that conveys the distances only to objects of interest (as opposed to all objects), in order to reduce cognitive load on the driver. Pet. 40. Even though Nissan does not require object detection, the meaning conveyed by the proposed ground of unpatentability is not changed. Petitioner proposes to replace Nissan’s technique that provides the distance to all objects with Gutta’s technique that provides distance to objects of interest.

4. *Claims 22, 25, and 26*

Claim 22 depends from independent claim 1 and recites,
wherein said control is operable to alert the driver of the
equipped vehicle that an object is detected at the side of the

equipped vehicle in response to at least one of (a) the driver of the equipped vehicle actuating a turn signal toward the side of the equipped vehicle at which the object is detected, and (b) the driver of the equipped vehicle steering the equipped vehicle toward the side of the equipped vehicle at which the object is detected.

Petitioner contends that Gutta discloses a control operable to alert the driver that an object is detected at the side of the vehicle when a turn signal is activated toward the detected object. Pet. 58–59 (citing Ex. 1005, 2:22–31). Petitioner reasons that it would have been obvious to further modify the combination of Nissan and Hitachi to take the motion direction of the car into account so that only potentially hazardous objects would be identified as disclosed by Gutta. Pet. 57–58 (citing Ex. 1010 ¶¶ 249–258). As discussed above, Gutta describes a vehicular vision system having the capability to alert the driver that an object is detected at the side of the vehicle the turn signal is activated towards by indicating to the driver it is safe to change lanes.

Claim 25 depends from claim 1, and recites

wherein said imaging array sensor has a field of view at least partially sideward of the equipped vehicle, said imaging system comprising a side object detection system for detecting an object at a side of the equipped vehicle.

Petitioner contends that Gutta discloses taking images with a field of view exterior to the side of the vehicle and using the information provided by the object identifier to determine whether it is safe to change lanes and to alert the driver if it is not safe to change lanes. Pet. 42 (citing Ex. 1005, 2:22–31; Fig. 2). As discussed above, Gutta discloses this capability.

Claim 26 depends from claim 1 and recites, “wherein said imaging array sensor comprises a CMOS imaging array sensor.”

Petitioner contends that Gutta incorporates Schofield by reference and Schofield discusses use of CMOS arrays of photo-sensing pixels. Pet. 42–43 (citing Ex. 1005 at 3:19–22; Ex. 1010, Att. G at p. 1, lines 10–11⁴⁰). Indeed, the cited portions of the references indicate that Gutta incorporates Schofield’s cameras, and that Schofield discloses CMOS imaging arrays.

Patent Owner makes no additional arguments with regard to claims 22, 25, and 26.

5. Conclusion

Petitioner has demonstrated by a preponderance of the evidence that claims 18, 21, 22, 25, and 26 are unpatentable as obvious over Nissan, Hitachi, and Gutta.

VI. ORDER

For the reasons given, it is:

ORDERED that claims 2, 3, 5, 7, 11, 12, 18, 19, 21–23, 25, 26, 28, 32–35, 37, 40, and 44–46 of U.S. Patent No. 7,991,522 B2 have been shown by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that claim 24 of U.S. Patent No. 7,991,522 B2 has not been shown by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that Patent Owner’s Motion to Exclude is denied;

FURTHER ORDERED that Exhibit 1033 is to be expunged; and

⁴⁰ This refers to the native page number of the exhibit, exhibit page numbers were not added.

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FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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