

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 IPR2014-00221
Patent 7,991,522 B2

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

CLEMENTS, *Administrative Patent Judge*.

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

I. INTRODUCTION

Valeo North America, Inc., Valeo S.A., Valeo GmbH, Valeo Schalter und Sensoren GmbH, and Connaught Electronics Ltd. (collectively, “Petitioner”) filed a Corrected Petition requesting *inter partes* review of claims 1–50 of U.S. Patent No. 7,991,522 B2 (Ex. 1001, “the ’522 patent”). Paper 6 (“Pet.”). Magna Electronics, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 12 (“Prelim. Resp.”). On May 29, 2014, we instituted an *inter partes* review of claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 (“the instituted claims”) on certain grounds of unpatentability alleged in the Petition. Paper 13 (“Dec. to Inst.”).

After institution of trial, Patent Owner filed a Patent Owner Response (Paper 22, “PO Resp.”) to which Petitioner filed a Reply (Paper 26, “Pet. Reply”). Patent Owner filed a Motion to Exclude (Paper 54), which Petitioner opposed (Paper 56). Patent Owner filed a Reply to Petitioner’s Opposition to its Motion to Exclude. Paper 57.

Oral hearing was held on January 14, 2015.¹

The Board has jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner has shown, by a preponderance of the evidence, that the instituted claims of the ’522 patent are unpatentable. Patent Owner’s Motion to Exclude is dismissed as moot.

¹ A transcript of the oral hearing is included in the record as Paper 53 (“Tr.”).

A. Related Proceedings

Petitioner and Patent Owner indicate that the '522 patent is involved in a case captioned *Magna Elecs., Inc. v. Valeo, Inc.*, No. 2:13-cv-11376 (E.D. Mich.), filed March 28, 2013. Pet. 3; Paper 8 at 2. Petitioner also has filed five petitions for *inter partes* review of other related patents of Patent Owner: IPR2014-00220 (U.S. Patent No. 7,859,565 B2), IPR2014-00222 (U.S. Patent No. 8,386,114 B2), IPR2014-00223 (U.S. Patent No. 8,386,114 B2), IPR2014-00227 (U.S. Patent No. 7,877,175 B2), and IPR2014-00228 (U.S. Patent No. 7,877,175 B2).

The '522 Patent is also the subject of IPR2014-01208. Paper 30, 1.

B. 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, 1:18–23. 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 1:29–33. Such known systems statistically analyzed all of the pixels in a pixelated image. *Id.* at 1:48–51. Such systems, however, continuously analyze every pixel for every frame captured and as such, they require expensive processing controls and computationally expensive software to handle continuously and to process substantially all of the data. *Id.* at 1:60–67. In addition, prior art warning systems may result in many intended maneuvers causing a warning. *Id.* at

2:19–24. As a result, the driver may begin to ignore the warnings. *Id.* at 2:25–27.

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 2:35–44. The system uses an edge detection algorithm to detect edges of objects in the captured images. *Id.* at 2:44–51. 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 2:51–55. The system processes the detected edges within the subset of image data to determine whether they are part of a vehicle. *Id.* at 2:55–59. The system utilizes various filtering mechanisms to eliminate substantially or to ignore substantially 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 2:60–65.

Figure 1 is reproduced below.

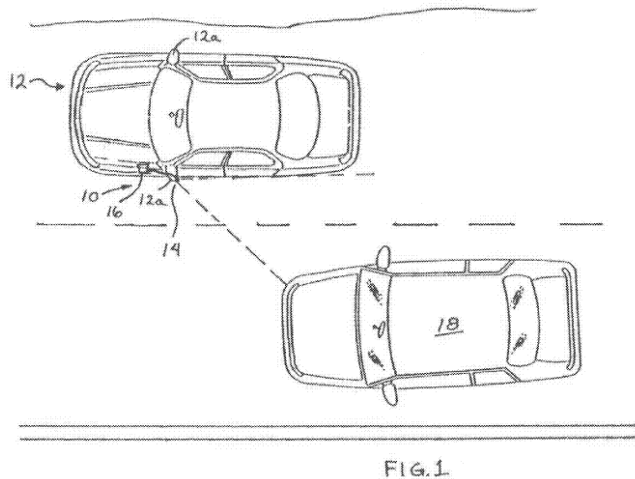


Figure 1 depicts an overhead view of a vehicle incorporating the object detection system of the present invention. *Id.* at 4:7–8. Lane change assist or aid system 10 is positioned at vehicle 12 (such as at exterior rearview mirror 12a) and is operable to capture an image of a scene occurring sidewardly and rearwardly at or along one or both sides of vehicle 12. *Id.* at 4:47–51. 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 4:51–57. 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 4:57–60.

Figure 2 is reproduced below.

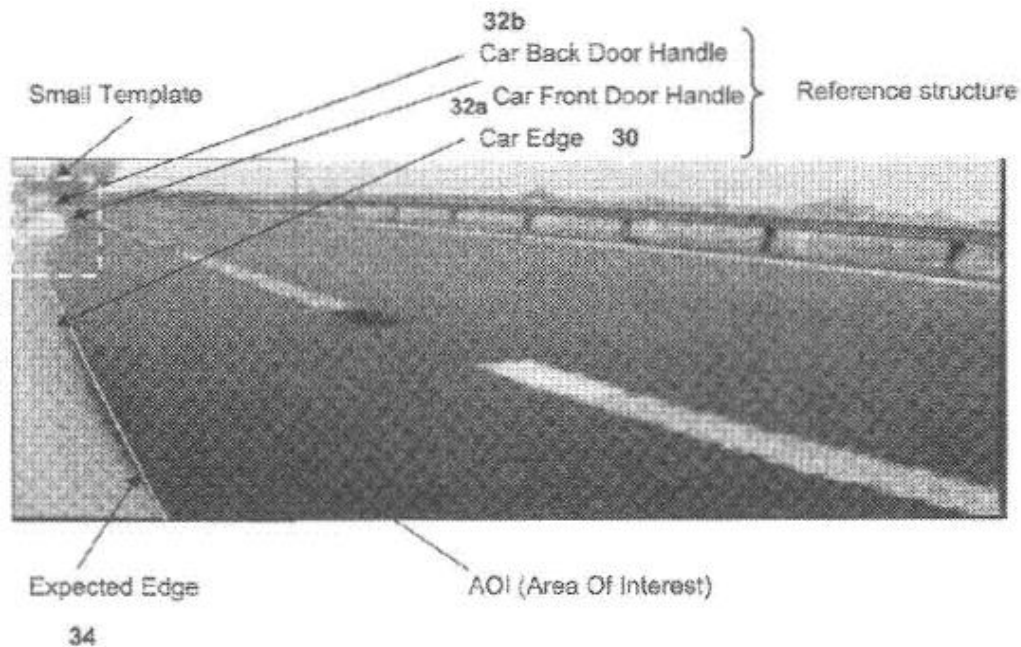
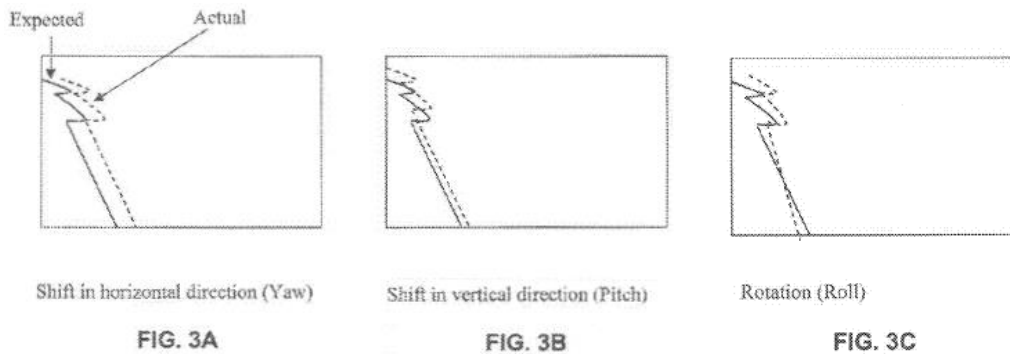


FIG. 2

Figure 2 is a representation of a captured image of a side area of a vehicle as captured by an imaging sensor. *Id.* at 4:9–11. 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 the vehicle (30) and/or the 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 6:11–19. 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 6:19–24. 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 6:24–28.

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 4:12–14. 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 6:42–47. 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 co-ordinates and H depression pixel calibration parameters, so that the expected vehicle edges are aligned substantially with the actual or detected vehicle edges. *Id.* at 6:47–52.

C. Illustrative Claim

Of the instituted claims, claims 1, 27, 36, 41, and 47 are independent.

Claim 1 is 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.

D. Prior Art Supporting Instituted Challenges

Petitioner relies upon the following references:

Saito (“Nissan”) ²	JP 2004-1658	Jan. 8, 2004	Ex. 1002
Furusawa (“Hitachi”) ³	JP 2002-74339	Mar. 15, 2002	Ex. 1012

E. The Instituted Ground of Unpatentability

We instituted *inter partes* review of claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 under 35 U.S.C. § 103 as obvious over Nissan and Hitachi.

II. MOTION TO EXCLUDE

A. Analysis of Motion

Patent Owner seeks to exclude Exhibit 1016, which is an article published by Dr. Turk, et al., titled, “VITS - A Vision System for Autonomous Land Vehicle Navigation” (the “VITS article”). As movant, Patent Owner has the burden of proof to establish that it is entitled to the requested relief. *See* 37 C.F.R. § 42.20(c). For the reasons stated below, Patent Owner’s Motion to Exclude is dismissed as moot.

Prior to filing its Motion to Exclude, Patent Owner objected to Exhibit 1016 within the required five business days. Petitioner did not respond to the objections. Paper 54, 2. Patent Owner preserved the objections by filing a Motion to Exclude Evidence. Paper 37. The Board expunged this motion

² Nissan is a Japanese language document. Ex. 1002. Unless indicated otherwise, all citations to Nissan in this decision will refer to its certified English language translation. Ex. 1003.

³ Hitachi is a Japanese language document. Ex. 1012. Unless indicated otherwise, all citations to Hitachi in this decision will refer to its certified English language translation. Ex. 1013.

because it failed to comply with an earlier order stating that a Motion to Exclude Evidence should not include arguments alleging that a reply exceeds the scope of a proper reply. Paper 48 (referring to earlier order at Paper 15). Patent Owner requested rehearing of that order. Paper 50. The Board granted the request for rehearing to permit filing of a revised Motion to Exclude with inappropriate argument removed. Paper 51. Specifically, in a follow-up conference call, we clarified that arguments alleging that Petitioner's Reply was beyond the scope of a proper reply were to be marked in strikethrough. Paper 52, 2. Patent Owner also was told to consider whether other arguments, such as those related to the weight of evidence rather than admissibility, were appropriate in a motion to exclude evidence. *Id.* at 2–3. Patent Owner's revised Motion to Exclude Evidence seeks to exclude Exhibit 1016. Paper 54.

On this record, we need not decide Patent Owner's Motion to exclude because our analysis does not rely upon Exhibit 1016. Consequently, Patent Owner's Motion to Exclude Evidence is dismissed as moot.

B. Related Issues

We note that the VITS article is referenced by Dr.-Ing. Frahm in Exhibit 1015. *See* Ex. 1015 ¶ 14. Patent Owner does not contest the admissibility of Exhibit 1015. Indeed, an expert may base an opinion on facts or data that the expert has been made aware of or personally observed. *See* Fed. R. Evid. 703; 37 C.F.R. § 42.62(a).

Patent Owner argued that certain evidence submitted with Petitioner's reply was introduced improperly. Paper 31. Specifically, Patent Owner alleged the following evidence was improperly introduced: (1) paragraph 14 of Dr.-Ing. Frahm's Reply Declaration (Ex. 1015); (2) VITS article (Ex.

1016); and (3) portions of Petitioner’s Reply (Paper 26) relying on that evidence (pp. 5–6). Paper 32.

A Petitioner’s reply may only respond to arguments raised in Patent Owner’s response. See 37 C.F.R. § 42.23(b). Therefore, the question raised by Patent Owner is whether the arguments on pages 5–6 of Petitioner’s Reply that rely upon the identified exhibits (1015, 1016) are in response to arguments raised in Patent Owner’s Response. We need not reach this issue because we do not rely, in this Final Written Decision, on any of the disputed evidence or disputed portions of the Petitioner’s Reply.

III. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); see also *In re Cuozzo Speed Techs LLC*, 778 F.3d 1271, 1281–82 (Fed. Cir. 2015) (“Congress implicitly adopted the broadest reasonable interpretation standard in enacting the AIA,” and “the standard was properly adopted by PTO regulation”). Under the broadest reasonable interpretation, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

In the Decision on Institution, we interpreted various claim terms of the ’522 patent as follows:

Claim Term (Claims)	Interpretation
“operable to at least partially compensate for the determined misalignment” (1, 27, 36, and 47)	operable to adjust image processing of captured image data
“operable to adjust said data” (7, 29, 38, and 44)	operable to adjust said data previously captured by the imaging array sensor
“operable to adjust processing” (6, 30, 39, and 41)	operable to adjust image processing

See Dec. on Inst. 9–14. The parties do not dispute these interpretations in their Patent Owner Response and Reply. We adopt the above claim constructions based on our previous analysis, and see no reason to deviate from those constructions based on the complete record now before us.

B. Claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 – Obvious over Nissan and Wang

Petitioner argues that claims 1–5, 7–9, 11–14, 27–29, 32–38, 40, and 44–46 are unpatentable under 35 U.S.C. § 102(a) as anticipated by Nissan. Pet. 20–35. Petitioner argues that claims 6, 10, 15, 30, 31, 39, 41–43, and 47–50 are unpatentable under 35 U.S.C. § 103(a) as obvious over Nissan and Hitachi. Pet. 36–45. In support of these grounds of unpatentability, Petitioner explains how each claim limitation is taught by Nissan or Hitachi and relies upon the Declaration of Dr.-Ing. Jan-Michael Frahm (“Dr.-Ing. Frahm”) (Ex. 1010). *Id.* (citing Ex. 1010 ¶¶ 169–73, 190–98).

In our Decision on Institution, we recognized that Petitioner did not articulate specifically a ground of unpatentability against claims 1, 8, 9, 13, 14, 27, 29, 36, and 38 based on the combination of Nissan and Hitachi, but we exercised our discretion to recognize that the assertion was made implicitly by alleging that claims 6, 10, 15, 30, 31, and 39 are unpatentable

as obvious over the combination of Nissan and Hitachi. Dec. to Inst. 19–29; *see also Cuozzo Speed Techs.* 778 F.3d at 1283–85 (upholding the Board’s final decision on claims instituted upon an implied ground).

Patent Owner argues that (1) the Petition fails to explain sufficiently the portion of Hitachi cited for teaching “adjust[ing] processing;” and (2) Petitioner did not articulate a reason with rational underpinnings to support a legal conclusion of obviousness. PO Resp. 4–11.

Upon consideration of the parties’ contentions and supporting evidence, we determine that Petitioner has established, by a preponderance of the evidence, 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.

1. Nissan (Exhibit 1003)

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-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.⁴

⁴ Figure 8 depicts a second embodiment of Nissan. Ex. 1003 ¶¶ 43–47. Nissan describes a first embodiment in paragraphs 10–31 and a second embodiment in paragraphs 32–51.

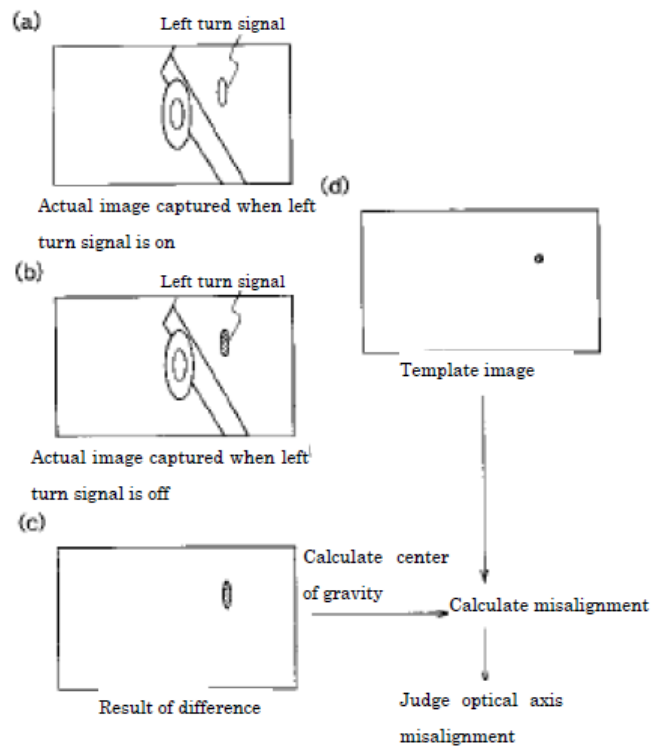


Figure 8 is a view for describing a method for detecting positional misalignment between a position of a left turn signal in an actual image and a position of the left turn signal in a template image in a vehicle-mounted system of the first embodiment. *Id.* at 18. As depicted in Figure 8, (a) shows 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:

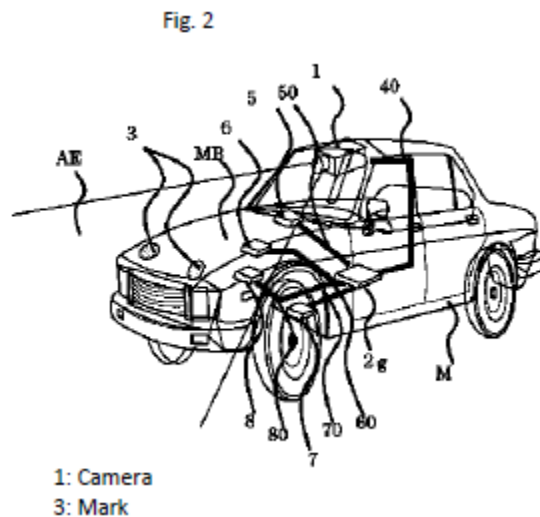


Figure 2 shows an embodiment of the automotive image capture apparatus according to Hitachi being used as a driving environment recognition apparatus. *Id.* ¶ 18. Marks 3 disposed on the left and right of hood MB of the automobile M. *Id.* ¶ 18, Fig. 2. Field of view AE represents the image capture visual 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. Analysis

In light of the arguments and evidence, Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 are unpatentable as obvious over the combination of Nissan and Hitachi.

a. Claims 41–43 and 47–50

We are persuaded that the record supports a finding that the limitations of independent claim 41 listed in the first column of the following table are taught by the corresponding disclosure of Nissan identified in the second column of the table:

<i>Independent Claim 41</i>	<i>Nissan</i>
an imaging array sensor comprising a plurality of photo-sensing pixels	vehicle-mounted camera 2
wherein said imaging array sensor is disposed at least partially within an exterior rearview mirror assembly at a side of a vehicle equipped with said imaging system	“[V]ehicle-mounted camera 2 is built in to a left-hand door mirror of the car.” Ex. 1003 ¶ 32.
wherein . . . 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	“[V]ehicle-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.” <i>Id.</i>
a control for processing said captured image	control unit 5

wherein said control is operable to determine that said imaging array sensor is misaligned when said imaging array sensor is disposed at least partially within the exterior rearview mirror assembly at the side of the equipped vehicle	“[T]he turn signal misalignment evaluation unit 34 compares the position where the left turn signal ought to be observed as shown in the template image . . . against the position of the left turn signal in the actual image as detected by the turn signal position detection unit 33, and judges . . . whether or not optical axis misalignment has occurred in the vehicle-mounted camera 2.” <i>Id.</i> ¶ 45.
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Independent claim 41 also recites “wherein said control, responsive to a determination of misalignment of said imaging array sensor, is operable to adjust processing of said captured image to at least partially compensate for the determined misalignment of said imaging array sensor.” Petitioner cites Hitachi for disclosing that:

[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).

Ex. 1013 ¶ 54. We are persuaded that Petitioner’s citations support Petitioner’s contentions.

We also are persuaded that Petitioner’s arguments and evidence with respect to claims 42, 43, and 47–50 (Pet. 41–45) support Petitioner’s contentions.

b. Claims 1 and 6

Claim 6 depends from independent claim 1. Claim 6 recites, “wherein said control, responsive to a determination of misalignment of said imaging array sensor, is operable to adjust processing of said captured image to at

least partially compensate for the determined misalignment of said imaging array sensor.” (Emphasis added.) Thus, claim 6 specifies that the control “at least partially compensate[s] for the determined misalignment of said imaging array sensor,” as recited in claim 1, by “adjust[ing] processing of said captured image.”

Petitioner cites Hitachi as teaching the limitation of claim 6. Pet. 37 (citing Ex. 1013⁵ ¶ 54). As discussed above with respect to claim 41, we are persuaded that Hitachi teaches adjusting processing of said captured image data to at least partially compensate for misalignment of an imaging array sensor. *See, e.g.*, Ex. 1013 ¶ 54.

In teaching this limitation of claim 6, Hitachi teaches that the “control . . . is operable to at least partially compensate for the determined misalignment of said imaging array sensor,” as recited in claim 1. Petitioner cites Nissan as disclosing every other element of claim 1. Pet. 20–22. Accordingly, we are also persuaded that the combination of Nissan and Hitachi teaches every limitation of claim 1.⁶ We recognize that Petitioner did not articulate specifically a ground of unpatentability against claim 1 based on Nissan and Hitachi. However, we exercise discretion to recognize that the assertion was made implicitly by alleging that claim 6 would have been obvious over Nissan and Hitachi.

c. Claims 8–10

Claim 10 depends from claim 9, which depends from claim 8, which depends from independent claim 1. As discussed above in connection with

⁵ The Petition appears to cite Exhibit 1003 inadvertently rather than Exhibit 1013.

⁶ We address Petitioner’s reason to combine Nissan and Hitachi below.

claim 1, we are persuaded that the combination of Nissan and Hitachi teaches every limitation of claim 1. We also are persuaded that Nissan discloses the limitations recited in dependent claims 8 and 9. Pet. 24.

Claim 10 recites:

wherein processing undertaken by said control at least partially accounts for misalignment of said imaging array sensor at the side of the equipped vehicle at least in part responsive to image data captured of the portion of the side of the equipped vehicle encompassed by said field of view of said imaging array sensor.

Petitioner cites Hitachi for teaching processing undertaken by the control to at least partially account for misalignment of an imaging array sensor. Pet. 37 (citing Ex. 10[1]3 ¶ 54). We are persuaded that Hitachi, as cited by Petitioner, supports Petitioner's contention.

Accordingly, we are persuaded that the combination of Nissan and Hitachi teaches every limitation of dependent claims 8, 9, and 10.⁷ We recognize that Petitioner did not articulate specifically a ground of unpatentability against claims 8 and 9 based on the combination of Nissan and Hitachi. We, however, exercise discretion to recognize that the assertion was made implicitly by alleging that claim 10 would have been obvious over Nissan and Hitachi.

d. *Claims 13–15*

Claim 15 depends from claim 14, which depends from claim 13, which depends from independent claim 1. As discussed above in connection with claim 1, we are persuaded that the combination of Nissan and Hitachi teaches every limitation of claim 1. Claim 14 recites a “control . . . operable

⁷ We address Petitioner's reason to combine Nissan and Hitachi below.

to at least partially compensate for the determined degree of misalignment of said imaging array sensor.” As discussed above in connection with claim 6, we are persuaded that Hitachi teaches this limitation. Pet. 37–38 (citing Ex. 10[1]3 ¶ 54). We also are persuaded that Nissan discloses the limitations recited in dependent claim 13. See Pet. 25.

Claim 15 recites:

wherein said control processes said captured image to detect a reference structure at the side of the equipped vehicle, and wherein said control is operable to adjust said processing to position the reference structure at an appropriate location in the captured image to at least partially compensate for the determined degree of misalignment of said imaging array sensor.

Petitioner cites Hitachi for teaching a control operable to adjust processing of a captured image to position a reference structure at an appropriate location in the captured image to at least partially compensate for the determined degree of misalignment. Pet. 37–38 (citing Ex. 10[1]3 ¶ 54). We are persuaded that Hitachi, as cited by Petitioner, supports Petitioner’s contention.

Accordingly, we are persuaded that the combination of Nissan and Hitachi teaches every limitation of dependent claims 13, 14, and 15.⁸ We recognize that Petitioner did not articulate specifically a ground of unpatentability against claims 13 and 14 based on Nissan and Hitachi. We, however, exercise discretion to recognize that the assertion was made implicitly by alleging that claim 15 would have been obvious over Nissan and Hitachi.

⁸ We address Petitioner’s reason to combine Nissan and Hitachi below.

e. Claims 27 and 29– 31

Claims 30 and 31 depend from claim 29, which depends from independent claim 27. As with claim 1, discussed above, we are persuaded that Nissan discloses every limitation of independent claim 27 except for “operable to at least partially compensate for the determined misalignment.” Similarly, we are not persuaded that Nissan discloses a “control . . . operable to adjust said data to at least partially compensate for the determined misalignment of said imaging array sensor,” as recited in claim 29. However, for claims 30 and 31, Petitioner presents sufficient and credible evidence that Hitachi teaches these limitations of claims 27 and 29. Pet. 38–39 (citing Ex. 10[1]3 ¶ 54).

Specifically, claim 30 recites, “wherein said control, responsive to a determination of misalignment of said imaging array sensor, is operable to adjust processing of said data.” Thus, claim 30 specifies that the control “at least partially compensate[s] for the determined misalignment of said imaging array sensor,” as recited in claim 27, by “adjust[ing] processing of said data.” We are persuaded that Hitachi teaches adjusting processing of said captured image data to at least partially compensate for misalignment of an imaging array sensor. *See, e.g.*, Ex. 1013 ¶ 54. In teaching this limitation of claim 30, Hitachi teaches that the “control . . . is operable to at least partially compensate for the determined misalignment of said imaging array sensor,” as recited in claim 27.

Likewise, claim 31 recites:

wherein processing undertaken by said control at least partially accounts for misalignment of said imaging array sensor at the side of the equipped vehicle at least in part responsive to processing of data captured of the portion of the side of the equipped vehicle encompassed by said field of view of said imaging array sensor.

Petitioner cites Hitachi for teaching processing undertaken by the control to at least partially account for misalignment of an imaging array sensor. Pet. 38–39 (citing Ex. 10[1]3 ¶ 54). We are persuaded that Hitachi, as cited by Petitioner, supports Petitioner’s contention.

Accordingly, we are persuaded that the combination of Nissan and Hitachi teaches every limitation of claims 27, 29, 30, and 31.⁹ We recognize that Petitioner did not articulate specifically a ground of unpatentability against claims 27 and 29 based on Nissan and Hitachi. We, however, exercise discretion to recognize that the assertion was made implicitly by alleging that claims 30 and 31 would have been obvious over Nissan and Hitachi.

f. Claims 36, 38, and 39

Claim 39 depends from claim 38, which depends from independent claim 36. As with claim 1, discussed above, we are persuaded that Nissan discloses every limitation of independent claim 36 except for “operable to at least partially compensate for the determined misalignment.” Similarly, we are not persuaded that Nissan discloses a “control . . . operable to adjust said data to at least partially compensate for the determined misalignment of said imaging array sensor,” as recited in claim 38. For claim 39, however, Petitioner presents sufficient and credible evidence that Hitachi teaches these limitations of claims 36 and 38. Pet. 39 (citing Ex. 10[1]3 ¶ 54).

Specifically, claim 39 recites “wherein said control, responsive to a determination of misalignment of said imaging array sensor, is operable to adjust processing of said data.” Thus, claim 39 specifies that the control “at

⁹ We address Petitioner’s reason to combine Nissan and Hitachi below.

least partially compensate[s] for the determined misalignment of said imaging array sensor,” as recited in claim 36, by “adjust[ing] processing of said data.” Petitioner cites Hitachi for teaching a control operable to adjust processing of a captured image to at least partially compensate for the determined misalignment of an imaging array sensor. Pet. 39 (citing Ex. 10[1]3 ¶ 54). We are persuaded that Hitachi, as cited by Petitioner, supports Petitioner’s contention. In teaching this limitation of claim 39, Hitachi teaches that the “control . . . is operable to at least partially compensate for the determined misalignment of said imaging array sensor,” as recited in claim 36 and that the “control . . . is operable to adjust said data,” as recited in claim 38.

Accordingly, we are persuaded that the combination of Nissan and Hitachi teaches every limitation of claims 38 and 39.¹⁰ We recognize that Petitioner did not articulate specifically a ground of unpatentability against claims 36 and 38 based on Nissan and Hitachi. We, however, exercise discretion to recognize that the assertion was made implicitly by alleging that claim 39 would have been obvious over Nissan and Hitachi.

g. Adjusting image processing

Patent Owner contends that the Petition only provides a series of unexplained quotes and therefore fails to satisfy Petitioner’s burden of providing a detailed explanation of the significance of the evidence. *Id.* at 3–4 (citing 37 C.F.R. §§ 42.22(a)(2), 42.104(b)(4)). PO Resp. 4–5. Specifically, Patent Owner argues that “Petitioners’ selected quote from Hitachi does not state that the image processing of the device is adjusted in the manner required by the claims,” and that “Petitioners do not explain how

¹⁰ We address Petitioner’s reason to combine Nissan and Hitachi below.

this quote discloses adjusting image processing in the claimed manner.” PO Resp. 6. According to Patent Owner, Dr.-Ing. Frahm’s Declaration also fails to provide any support and makes it unclear whether Dr.-Ing. Frahm regards the quoted passage as adjusting image processing or adjusting the area used by the camera. *Id.* Finally, Patent Owner argues that Petitioner’s reliance on the same portion of Hitachi for multiple claim limitations creates “confusion and logical inconsistency.” *Id.* at 7.

Petitioner counters that (1) Hitachi clearly discloses adjustment of image processing; and (2) the Petitioner provided ample analysis and evidence with respect to this limitation. Pet. Reply 2–3.

We determine that Petitioner’s arguments are persuasive. Hitachi teaches that an “image data correction amount” is calculated. Ex. 1013 ¶ 54. If it is only a case of translational displacement, then “the used image area A1 and the initial mark 3A position X are changed.” *Id.* If it is not, image data correction is performed. *Id.* The Petition’s reliance on Hitachi’s adjustment of the used area is clear. For example, the Petition states, “Hitachi discloses selecting a different portion of the captured image as part of the image processing instead of correcting the image data.” Pet. 37. Also, Dr.-Ing. Frahm’s testimony relies on Hitachi’s disclosure of adjusting the used area. Ex. 1010 ¶ 197 (“By using the wider field of view camera of Hitachi to be able to adjust the used area within the wider field of view, a person of ordinary skill in the art . . .”).

Moreover, the Petition and Dr.-Ing. Frahm specifically allege that adjusting the used area involves selecting a different portion of *captured* image data. Pet. 37; Ex. 1010 ¶ 197. Patent Owner’s expert, Dr. Matthew A. Turk, alleges that an ambiguity exists in Dr.-Ing. Frahm’s testimony (Ex.

2003 ¶ 27), but does not testify that Hitachi is *not* adjusting image processing of *captured* image data. On this record, we credit the testimony of Dr.-Ing. Frahm. Accordingly, we are persuaded and we agree that the Petition has identified sufficiently how Hitachi discloses adjusting processing of captured image data, as we have construed the claim language to require.

h. Reason to combine

Patent Owner argues that Dr.-Ing. Frahm does not provide a sufficient explanation for his opinion that a person of ordinary skill in the art would have combined Nissan with Hitachi. PO Resp. 8–11. Specifically, Patent Owner argues that Dr.-Ing. Frahm’s testimony relies upon assumptions, such as “an assumption that cost and mechanical failure of physical actuators were problems at the time of the priority date of the ’522 patent” (*Id.* at 9), that are unsupported by evidence. *Id.* at 9–10. According to Patent Owner, “Dr.[–Ing.] Frahm impermissibly used the invention to define the problem that the invention solves.” *Id.* at 10. Patent Owner also argues that Nissan solves the problem of camera physical realignment, and “[a person of ordinary skill in the art], therefore, would not have concluded that software-based image processing, such as that of Hitachi, would necessarily have improved Nissan.” *Id.*

Petitioner counters that Dr.-Ing. Frahm testified “as to why it would have been obvious [to] implement the misalignment correction using software in place of the mechanical solution described in Nissan” (Pet. Reply 3–4 (citing Ex. 1010 ¶¶ 192, 193)), and argues that “Patent Owner completely ignores the evidence of well-established principles of vehicle vision system design that were well known at the time of the filing of the

'522 patent" (Pet. Reply 4). According to Petitioner, "one skilled in the art would clearly have looked to minimize the mechanical stresses that are experienced by hardware components by implementing various mechanical functions in software." *Id.* at 5.

We determine that Petitioner's arguments are persuasive. As Petitioner correctly points out, Nissan describes the problem to be solved as accurate detection of optical axis misalignment in a vehicle mounted camera. Pet. Reply 6; Ex. 1003, Abstract; *contra* PO Resp. 10. Nissan describes that an actuator may be used to adjust the direction of the vehicle-mounted camera to correct for such detected misalignment. Ex. 1003 ¶ 52. Patent Owner characterizes Nissan's solution (physical camera realignment) as the problem faced by Nissan in an attempt to make it appear that Nissan has no need of the improvement proposed by Petitioner.

Patent Owner asserts that a common symptom of hindsight is an insufficient rationale for combining the references (PO Resp. 9), but Patent Owner does not address the merits of the rationale proffered by Petitioner. Petitioner reasons that a person of ordinary skill in the art would have recognized that physical adjustment as disclosed by Nissan has higher production cost and greater potential for mechanical failure than adjusting the image data set or image processing. Pet. 36; Ex. 1010 ¶ 192. Patent Owner's expert, Dr. Turk, essentially concedes that physical actuators add cost and present risk of mechanical failure, but reasons that actuators were a suitable tool for solving Nissan's problem of camera physical alignment. Ex. 2003 ¶ 39. Again, Nissan sought to solve the problem of accurately detecting camera misalignment, not camera physical misalignment. Petitioner has articulated a rational underpinning to support the legal

conclusion of obviousness. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

Conclusion

Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 are unpatentable as obvious over the combination of Nissan and Hitachi.

IV. CONCLUSION

Petitioner has shown, by a preponderance of the evidence, that claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 of the '522 patent are unpatentable under 35 U.S.C. § 103(a).

V. ORDER

Accordingly, it is

ORDERED that claims 1, 6, 8–10, 13–15, 27, 29–31, 36, 38, 39, 41–43, and 47–50 of the '522 patent are held unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude is *dismissed*; and

FURTHER ORDERED that, because this is a Final Written Decision, the 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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