

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TRW AUTOMOTIVE US LLC,
Petitioner,

v.

MAGNA ELECTRONICS INCORPORATED,
Patent Owner.

Case IPR2014-00255
Patent 7,423,248 B2

Before JUSTIN T. ARBES, PATRICK R. SCANLON, and
JO-ANNE M. KOKOSKI, *Administrative Patent Judges*.

KOKOSKI, *Administrative Patent Judge*.

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

I. INTRODUCTION

TRW Automotive US LLC (“Petitioner”) filed a Petition (Paper 1, “Pet.”) to institute an *inter partes* review of claims 1, 3–5, 8, 9, 11–13, 17–19, and 21 of U.S. Patent No. 7,423,248 B2 (Ex. 1002, “the ’248 patent”). On June 26, 2014, we instituted an *inter partes* review of claims 1, 3–5, 9, 11–13, 17–19, and 21 on four grounds of unpatentability (Paper 17, “Dec. on Inst.”).

Magna Electronics Inc. (“Patent Owner”) filed a Patent Owner Response (Paper 22, “PO Resp.”). Petitioner filed a Reply (Paper 25, “Reply”).

An oral hearing was held on February 18, 2015. A transcript of the hearing is included in the record. Paper 34 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(b). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1, 3–5, 9, 11–13, 17–19, and 21 of the ’248 patent are unpatentable.

A. *The ’248 Patent*

The ’248 patent, titled “Automatic Exterior Light Control for a Vehicle,” is directed to an automatic exterior light control that characterizes and analyzes light sources to identify headlights of oncoming vehicles and taillights of leading vehicles, and adjusts the state of the vehicle’s headlights based on the presence or absence of these light sources. Ex. 1002, 2:18–34. According to the ’248 patent, the disclosed light control “is exceptionally discriminating in identifying oncoming headlights and leading taillights” and “ignores other sources of light including streetlights and reflections of the

controlled vehicle's headlights off signs, road markers, and the like.” *Id.* at 3:20–25.

The '248 patent describes a vehicle headlight dimming control comprising an imaging sensor module that senses light from a scene forward of the vehicle, an imaging control circuit that receives data from the sensor module, and a vehicle lighting control logic module that exchanges data with the imaging control circuit and controls the headlights. *Id.* at 3:62–4:3. The imaging sensor module includes a spectral separation device for separating light from the scene forward of the vehicle, an optical device such as a lens, and a light-sensing array that includes “a plurality of photosensor elements . . . arranged in a matrix of columns and rows.” *Id.* at 4:42–55. In a disclosed embodiment, the light-sensing array is “an array of 512 rows and 512 columns of light-sensing pixels, each made up of a photosensor element.” *Id.* at 4:55–57. According to the '248 patent, the vehicle headlight dimming control can include an ambient light-sensing circuit, which “samples a subset of photosensor elements” that “detect portions of the forward-looking scene that are just above the earth's horizon” and supplies an indication of the ambient light level as an input to a lighting control module. *Id.* at 5:42–51.

The imaging sensor module can be mounted to, or near, the vehicle's windshield, “because the location within the interior of the vehicle substantially eliminates environmental dirt and moisture from fouling the light sensor module.” *Id.* at 4:22–30. The '248 patent also states that positioning the sensor behind the windshield, “which typically is kept relatively clear through the use of washers and wipers and the like, ensures a relatively clear view of the scene forward of [the] vehicle.” *Id.* at 4:30–36.

Claims 1, 9, and 17 of the '248 patent are independent. Claims 3–5 depend, directly or indirectly, from claim 1, which is reproduced below:

1. An automatic exterior light control, comprising:
an image array sensor, said image array sensor comprising an array of pixel sensors, wherein said image array sensor is configured and mounted such that a field of view of said image array sensor substantially passes through an associated windshield area that is wiped by a windshield wiper; and
a controller connected to said image array sensor and configured to receive at least a portion of at least one image from said image array sensor that is substantially free of windshield surface contamination, said controller, responsive to said image array sensor, generating an output for controlling at least one exterior light of the vehicle.

Ex. 1002, 13:12–25.

Claims 11–13 depend, directly or indirectly, from claim 9, which is reproduced below:

9. An automatic exterior light control, comprising:
an image array sensor, said image array sensor comprising an array of pixel sensors, wherein said image array sensor is configured and mounted such that a field of view of said image array sensor is adjustable electronically; and
a controller connected to said image array sensor configured to acquire pixel data from a subset of pixels associated with a desired field of view, said controller, responsive to said image array sensor, generating an output for controlling at least one exterior light of the vehicle.

Id. at 13:48–58.

Claims 18, 19, and 21 depend directly from claim 17, which is reproduced below:

17. An automatic exterior light control, comprising:
an image array sensor, said image array sensor comprising an array of pixel sensors; and
a controller configured with an ambient light input, said controller, responsive to said image array sensor, generating an output for controlling at least one exterior light of the vehicle, wherein automatic exterior light control is enabled when an ambient light level is below a threshold, wherein manual operation of exterior lights remains functional.

Id. at 14:24–33.

B. Prior Art

The pending grounds of unpatentability in this *inter partes* review are based on the following prior art:

Tadashi	Japanese Patent App. Pub. No. H04-12780	April 28, 1992	Ex. 1004
Yanagawa ¹	Japanese Unexamined Patent Pub. No. S62-131837	June 15, 1987	Ex. 1006
Meitzler	U.S. 4,645,975	Feb. 24, 1987	Ex. 1007

C. Pending Grounds of Unpatentability

This *inter partes* review involves the following grounds of unpatentability:

¹ We refer to “Tadashi” and “Yanagawa” as the English translations of the original references. Petitioner provided affidavits attesting to the accuracy of the translations. See Exs. 1004, 1006; 37 C.F.R. § 42.63(b).

Reference[s]	Basis	Claim[s] challenged
Tadashi	§ 102(b)	1, 4, 5
Tadashi and Yanagawa	§ 103(a)	3, 9, 11–13
Tadashi and Meitzler	§ 103(a)	17, 18, 21
Tadashi, Meitzler, and Yanagawa	§ 103(a)	19

Dec. on Inst. 23.

II. ANALYSIS

A. *Claim Interpretation*

The claims of the '248 patent have expired. *See* Pet. 1; Tr. 24:5–8. For claims of an expired patent, the Board's claim interpretation is similar to that of a district court. *See In re Rambus Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012). We are guided, therefore, by the principle that the words of a claim “are generally given their ordinary and customary meaning” as understood by a person of ordinary skill in the art in question at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc) (internal citations omitted). Only those terms in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

1. “*ambient light*”

In the Decision on Institution, we interpreted the claim term “ambient light” as “light of the surrounding environment, not light introduced by any particular source, such as a headlight that moves in and out of the environment.” Dec. on Inst. 8. The parties do not dispute this interpretation,

and we see no reason to modify that interpretation in light of the record developed at trial. *See* Tr. 4:14–24, 25:16–26:3.

2. *“image array sensor, said image array sensor comprising an array of pixel sensors”*

Patent Owner argues that the term “image array sensor, said image array sensor comprising an array of pixel sensors” in claims 1, 9, and 17 should be interpreted to mean “a two-dimensional image array sensor arrangement of pixel sensors.” PO Resp. 10. As support for this proposed interpretation, Patent Owner cites the Specification’s disclosure of an “[i]maging sensor module” that includes an array of photosensor elements “arranged in a matrix of columns and rows.” *Id.* at 8 (citing Ex. 1002, 4:42–55 and Figure 4). Patent Owner further contends that it was “well known in the art that ‘an array of pixel sensors’ means a two-dimensional image array sensor that has multiple pixels in columns *and* rows forming a width and height of the sensor.” *Id.* at 9 (citing Ex. 2032 ¶ 22). Petitioner responds that Patent Owner is attempting “to read limitations into the claimed ‘image array sensor . . . comprising an array of pixel sensors’ by requiring a two-dimensional array.” Reply 2. According to Petitioner, the Specification supports a broad construction of the claim term, and the term should “be construed to include a one-dimensional array since the [claim] language does not specify a two-dimensional array.” *Id.* at 2–3.

We are not persuaded by Patent Owner’s argument that “image array sensor, said image array sensor comprising an array of pixel sensors” should be limited to a two-dimensional arrangement of pixel sensors. Although Patent Owner directs our attention to an embodiment that shows sensors arranged in an array of 512 rows and 512 columns, we are not inclined to

import this specific configuration into the claim. *See Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 345 F.3d 1318, 1327 (Fed. Cir. 2003) (stating it is improper to read a limitation from the specification into the claims). The claim itself does not recite a two-dimensional array of sensors, or include any language indicating that the image array sensor should be defined as being a two-dimensional array. Moreover, Patent Owner does not identify anything in the Specification that indicates that the claimed image array sensor must have a two-dimensional arrangement of sensors.

Patent Owner also contends that it is “well known in the art” that an array of pixel sensors means a two-dimensional image array sensor. PO Resp. 9. In support of that contention, Patent Owner’s declarant, Dr. Matthew A. Turk, states that a person having ordinary skill in the art would understand “that ‘an array of pixel sensors’ means a two-dimensional image array sensor that has multiple pixels arranged in columns *and* rows to form a sensor having a width and height,” and would further understand that a one-dimensional image sensor “is typically referred to as a vector, not an array,” but does not provide any evidence or explain the reasons why that would be the case. Ex. 2032 ¶ 22. Dr. Turk also acknowledges that “one might argue that a one-dimensional image sensor has a height of one pixel.” *Id.*

Petitioner also notes that the ’248 patent issued from an application that was a continuation of the application that issued as U.S. Patent No. 7,459,664 (Ex. 1011, “the ’664 patent”), and that the ’248 patent and the ’664 patent include “substantially the same specification.” Reply 2. The claims of the ’664 patent recite “an imaging sensor,” and further specify that “said imaging sensor compris[es] a two-dimensional array of light sensing

photosensor elements.” *See, e.g.*, Ex. 1011, 13:9–14 (claim 1), 15:5–10 (claim 24). Petitioner also notes that the ’248 patent claims priority to U.S. Patent No. 5,550,677 (Ex. 1009, “the ’677 patent”), which “claims *both* an ‘array of sensing elements,’ and a ‘two-dimensional array of rows and columns.’” Reply 2 (citing Ex. 1009, claims 1 and 16). That the ’664 and ’677 patents include claims that specifically recite that the image sensor is a two-dimensional array further supports the conclusion that “image array sensor” as used in claims 1, 9, and 17 of the ’248 patent is not limited to just two-dimensional arrays, as Patent Owner contends. *See NTP Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005) (When construing claims in patents that derive from the same parent application and share common terms, “we must interpret the claims consistently across all asserted patents.”); *see also Belden Inc. v. Berk-Tek LLC*, Civ. Nos. 2014-1676, 2014-1677, 2015 WL 1781484, at *3 (Fed. Cir. Apr. 17, 2015) (unpublished) (approving of the Board’s claim construction that referred to a parent and grandparent application that were incorporated by reference).

Accordingly, we interpret “image array sensor, said image array sensor comprising an array of pixel sensors” to include one-dimensional and two-dimensional arrangements of pixel sensors. Patent Owner’s construction is overly restrictive, and Patent Owner does not provide persuasive reasoning as to why the term must be limited to two-dimensional arrays.

B. Anticipation of Claims 1, 4, and 5 by Tadashi

To prevail on its patentability challenge, Petitioner must establish facts supporting its challenge by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). Petitioner asserts that claims 1, 4, and 5 are

unpatentable under 35 U.S.C. § 102(b) as anticipated by Tadashi, and relies on the Declarations of Dr. Jeffrey A. Miller. Pet. 15–21; Reply 1–5, 10–13 (citing Exs. 1010, 1014). Patent Owner disagrees with Petitioner’s assertions, and relies on the Declaration of Dr. Turk. PO Resp. 7–15, 23–31, 34–37 (citing Ex. 2032).

1. *Overview of Tadashi*

Tadashi is directed to tunnel-detection apparatuses that apply to auto-light control devices. Ex. 1004, 1004–006. The disclosed tunnel-detection apparatus comprises a one-dimensional imaging device, means for “binarizing” a one-dimensional video signal output from the one-dimensional imaging device (i.e., creating a video signal with two possible values for each pixel), and a tunnel-judgment means for judging a tunnel by processing the binarized signal. *Id.* at 1004–007.

Figure 1 of Tadashi is reproduced below.

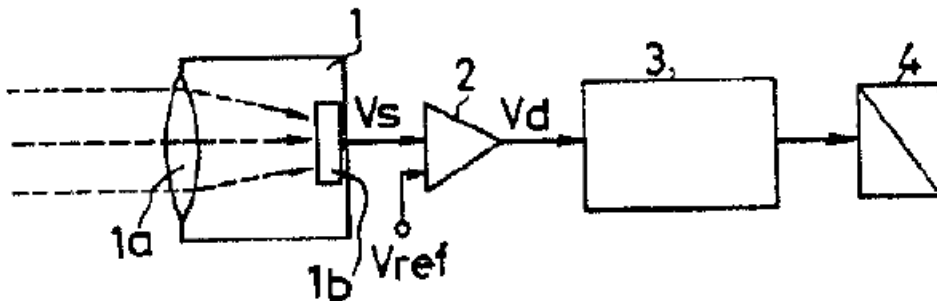


Figure 1 depicts a block diagram of an embodiment of Tadashi’s tunnel-detection apparatus. The tunnel-detection apparatus includes one-dimensional imaging device 1, converter 2 as a binarization-processing means, microcomputer 3 as a tunnel-judgment means, and auto-light control device 4 that is driven by the microcomputer. *Id.* at 1004–008. Imaging

device 1 comprises “[a] 512-pixel [charge-coupled device] linear image sensor 1b and a lens system 1a . . . disposed in a case.” *Id.* Imaging device 1 is mounted on a vehicle dashboard facing the direction of vehicle travel, so that “[l]ight incidented through the front windshield images on the pixel line of the CCD [charge-coupled device] linear image sensor 1b via the lens system 1a.” *Id.* at 1004–008, Fig. 5. CCD linear image sensor 1b outputs a one-dimensional video signal V_s to converter 2, and converter 2 compares V_s to a predetermined threshold voltage V_{ref} and outputs a binarized signal V_d . *Id.* Microcomputer 3 processes binarized signal V_d and, when a tunnel is present, “outputs a light signal to the auto-light control device 4.” *Id.*

2. *Claim 1*

The parties focus their arguments on two elements present in claim 1 of the ’248 patent: (1) “image array sensor comprising an array of pixel sensors,” and (2) “field of view of said image array sensor substantially passes through an associated windshield area that is wiped by a windshield wiper” such that a controller connected to the image array sensor receives “at least a portion of at least one image from said image array sensor that is substantially free of windshield surface contamination.” As to the other elements of claim 1, we have reviewed the evidence and arguments presented in the Petition and find that Petitioner has shown sufficiently that those elements are disclosed. Pet. 15–19. We address the arguments regarding the disputed elements in turn.

a. *Image array sensor comprising
an array of pixel sensors*

Petitioner argues that Tadashi discloses an image array sensor comprising an array of pixel sensors, namely, one-dimensional imaging

device 1, which comprises 512-pixel CCD linear image sensor 1b. Pet. 17 (citing Ex. 1004, 1004-008). Patent Owner responds that Tadashi does not meet the “image array sensor comprising an array of pixel sensors” limitation of claim 1 because “Tadashi discloses a one-dimensional image sensor comprising a *vector* of pixel sensors.” PO Resp. 10–11 (citing Ex. 1004, 1004-007–008 and Ex. 2032 ¶¶ 26–28). Patent Owner’s argument is premised on its contention that the claimed image array sensor requires a two-dimensional arrangement of pixel sensors. *Id.* at 8–10. We do not agree that the claim term should be interpreted in that manner, for the reasons explained above. *See supra* Section II.A.2.

Accordingly, we are persuaded that Tadashi discloses an “image array sensor, said image array sensor comprising an array of pixel sensors” as recited in claim 1.

- b. Field of view of said image array sensor substantially passes through an associated windshield area that is wiped by a windshield wiper; and a controller connected to said image array sensor and configured to receive at least a portion of at least one image from said image array sensor that is substantially free of windshield surface contamination*

Petitioner contends that Tadashi discloses this element of claim 1 because one-dimensional imaging device 1 is mounted on a vehicle dashboard so that light coming through the front windshield images on the pixel line of CCD linear image sensor 1b. Pet. 18 (citing Ex. 1004, 1004-008). Petitioner contends that Tadashi discloses that it is possible for the tunnel-detection apparatus to detect rain or the movement of the windshield wiper blades. *Id.* (citing Ex. 1004, 1004-010). Petitioner further contends that Tadashi senses an image that is substantially free of windshield surface

contamination because the windshield wiper blades clean the windshield in the same manner that is claimed in the '248 patent. *Id.* at 18–19.

Patent Owner asserts that Tadashi does not disclose a sensed image that is substantially free of windshield surface contamination. PO Resp. 13–14. According to Patent Owner, the sensor in Tadashi intentionally images windshield contamination, and “appears to be designed to use images that specifically include windshield surface contamination.” *Id.* at 14–15.

Petitioner replies that Patent Owner is characterizing a part of Tadashi out of context of the disclosure as a whole. Reply 5. Petitioner notes that Tadashi does disclose an embodiment that can detect the presence of a tunnel as well as raindrops and windshield wiper blades, but argues that Tadashi’s tunnel detection function uses an image that is free from windshield surface contamination. *Id.* (citing Ex. 1004, 1004-008). Petitioner further argues that, even when it is raining, the windshield is substantially free of surface contamination at the point at which the windshield wiper passes the image array sensor’s field of view. *Id.*

We agree with Petitioner. Tadashi describes a first embodiment wherein one-dimensional imaging device 1 is mounted on a vehicle dashboard, and is arranged to face in the direction in which the vehicle is traveling. Ex. 1004, 1004-008. Tadashi discloses that light passes through the windshield and images on CCD linear sensor 1b. *Id.* After describing the tunnel detection process, Tadashi states that “[i]t is possible for the apparatus of this embodiment to detect rain droplets adhering to the front windshield and windshield wiper blade action.” *Id.* at 1004-009.

Considered in its entirety, Tadashi’s first embodiment is able to perform at least two functions: (1) tunnel detection, and (2) detecting rain

droplets and windshield wiper action. Patent Owner has not directed us to any disclosure in Tadashi, nor have we identified any, that indicates that the Tadashi image sensor only senses images when it is raining. Thus, Patent Owner's contention that Tadashi is designed to use images that include windshield contamination ignores the tunnel detection functionality of Tadashi, the operation of which is not limited to specific weather conditions, and is unsupported by the record. Petitioner's argument and supporting evidence, as a whole, supports its position that Tadashi discloses an image array sensor that is mounted and configured such that its field of view passes through a windshield area that is wiped by a windshield wiper. Pet. 18–19; Reply 4–5.

We also are persuaded that Tadashi discloses a controller connected to the image array sensor that receives “at least a portion of at least one image from said image array sensor that is substantially free of windshield surface contamination.” Tadashi discloses that CCD linear image sensor 1b outputs video signal Vs to converter 2 after CCD linear image sensor 1b senses light passing through the windshield. Ex. 1004, 1004-008. The binarized signal that microcomputer 3 (Tadashi's “controller”) uses to judge the presence of a tunnel is based on video signal Vs. *Id.* Because video signal Vs is a result of the light imaged on the image sensor, and the image sensor is mounted and configured such that its field of view passes through a windshield area that is substantially free of windshield contamination (by virtue of the windshield wipers), it follows that at least a portion of at least one image from the image sensor also is substantially free of windshield contamination.

c. Conclusion

After considering Petitioner's and Patent Owner's positions, as well as their supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 1 is unpatentable under 35 U.S.C. § 102(b) as anticipated by Tadashi.

3. Claim 4

Claim 4 depends from claim 1, and further requires "an ambient light level input." Petitioner asserts that Tadashi discloses an ambient light level input, because it "utilizes ambient '[l]ight incidented through the front windshield' to generate a 'one-dimensional video signal Vs to the converter 2.'" Pet. 20 (citing Ex. 1004, 1004-008). Petitioner asserts that Tadashi discloses that video signal Vs is compared to threshold voltage Vref to generate binarized signal Vd, which is then used to judge the existence of a tunnel. *Id.*

Patent Owner contends that Tadashi does not disclose an ambient light level input because Tadashi's one-dimensional imaging device images only in a horizontal direction in order to detect a tunnel. PO Resp. 25. According to Patent Owner, by focusing only horizontally, Tadashi is not detecting portions of the forward-looking scene above the earth's horizon that can be indicative of the ambient light condition. *Id.*

Petitioner argues in reply that ambient light does not require detecting portions of the scene above the horizon. Reply 10. We agree. As set forth above, we interpreted "ambient light" to mean "light of the surrounding environment, not light introduced by any particular source, such as a headlight that moves in and out of the environment," and the parties do not dispute that interpretation. *See supra* Section II.A.1. This interpretation

does not set any conditions on the direction from which the light of the surrounding area is to be detected, and there is no indication in claim 4 as to what part of the imaged scene is to be used in the recited “ambient light level input.”

Patent Owner further contends that Tadashi’s disclosure of the entire pixel region being “substantially a white level” demonstrates that Tadashi’s imaging device cannot differentiate between sourced light and ambient light. PO Resp. 25. Patent Owner contends that, in order to provide an ambient light level input, the imaging sensor must have the ability to differentiate between ambient light and sourced light. *Id.* at 28. Patent Owner contends that any source of light, including headlights, taillights, or road lights, is used by Tadashi in determining whether the entire pixel is substantially a white level. *Id.* at 29. Because ambient light is construed to mean “light of the surrounding environment, not light introduced by any particular source, such as a headlight that moves in and out of the environment,” Patent Owner concludes that a person having ordinary skill in the art would have understood that the claimed ambient light level input must be distinguished from particularly sourced light. *Id.*

Petitioner asserts that the construction of “ambient light” does not require an active step of differentiating between ambient light and particularly sourced light. Reply 11. Petitioner asserts that “ambient light” includes all light of the surrounding environment, which “may include *collectively* light from the sun, moon, streetlights, [and] headlamps, but does not include light from a *particular* source (e.g. one specific headlight).” *Id.* Petitioner asserts this understanding of “ambient light” is consistent with the Specification, relying on the following disclosure as support: “Ambient

detection circuit 84 samples a subset of photosensor elements and detects *light levels* sensed by the subset over a long period of time in order to produce significant time filtration.” *Id.* (citing Ex. 1002, 5:42–45).

We are not persuaded by Patent Owner’s argument that the imaging sensor must be able to differentiate between ambient light and particularly sourced light in order to provide the ambient light level input recited in claim 4. Patent Owner has not provided a convincing rationale for requiring an active differentiation step in determining the claimed ambient light level input. For example, Patent Owner argues that a person having ordinary skill in the art “would have understood” that “‘ambient light level input’ must be an input indicative of an ambient light level (light of the surrounding environment), which has been distinguished from sourced light.” PO Resp. 29 (citing Ex. 2032 ¶ 74). Patent Owner cites Dr. Turk’s testimony in support of this contention, but Dr. Turk’s statements regarding what a person having ordinary skill in the art would have understood are not supported by any objective evidence or analysis. Neither Patent Owner nor Dr. Turk point to anything in the Specification that supports Patent Owner’s contention that “ambient light level input” requires an active step of differentiating ambient light from sourced light, and claim 4 does not include an express limitation directed to such an active differentiation step.

Petitioner, in contrast, provides persuasive reasoning as to why a person having ordinary skill in the art would not have understood “ambient light level input” to require an active differentiation step. Reply 11–12. For example, Petitioner argues that the Specification’s description of sampling a subset of photosensors over time in order to determine ambient light levels

would include light impinging on the photosensors from any given source.

Id. at 11. Petitioner cites Dr. Miller’s testimony in support of this argument:

Ambient light is detected in the ’248 Specification based upon [an] ambient detection circuit that “samples a subset of photosensor elements and detects *light levels* sensed by the subset over a long period of time in order to produce significant time filtration.” This does not involve distinguishing light from a particular light source such as a headlamp from general light such as from the moon/sun. Instead, all light impinging on the imaging array is averaged so that the ambient light is not indicative [of light] from a particular light source, but all light in the entire surrounding environment.

Ex. 1014 ¶ 9 (internal citation omitted). We find Petitioner’s arguments and Dr. Miller’s testimony, supported by the Specification of the ’248 patent, that “ambient light level input” does not require an active step of differentiating between ambient light and particularly sourced light, to be persuasive. Reply 11–12.

After considering Petitioner’s and Patent Owner’s positions, as well as their supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 4 is unpatentable under 35 U.S.C. § 102(b) as anticipated by Tadashi.

4. *Claim 5*

Claim 5 depends from claim 4, and further requires that “automatic exterior light control is enabled when an ambient light level is below a threshold.” Petitioner contends that Tadashi discloses turning on the exterior lights when a tunnel is detected, and extinguishing the exterior lights when the entire pixel region is substantially a white level. Pet. 21. Petitioner further contends that the determination as to whether to turn on or extinguish the lights is made by comparing video signal Vs to predetermined threshold

voltage V_{ref} , and therefore Tadashi discloses enabling external light control when the ambient light level is below a threshold, as recited in claim 5. *Id.*

Patent Owner argues that a person having ordinary skill in the art would have understood claim 5 to mean that when the ambient light level drops below a threshold, the automatic exterior light control is enabled (or activated or readied or made available or made operational), “but the controller may not generate an output for controlling at least one exterior light of the vehicle.” PO Resp. 35. Patent Owner argues that Tadashi discloses generating an output for controlling the exterior lights, but does not disclose enabling the exterior light control when the ambient light level input is below a threshold. *Id.* at 36. Petitioner responds that a person having ordinary skill in the art would understand that when Tadashi’s microcomputer 3 outputs a signal to auto-light control device 4, the signal from microcomputer 3 is “activating, making ready, making available, or making operational” auto-light control device 4. Reply 14–15.

Based on our review of the record, we find Petitioner’s argument to be persuasive. Patent Owner’s argument that Tadashi does not enable exterior light control because enabling the exterior light control does not encompass outputting a signal to the light control is not supported by objective evidence or analysis. Patent Owner cites to Dr. Turk’s testimony in support of its argument, but Dr. Turk’s statements are similarly devoid of any reference to evidence to support the assertion that “enabl[ing]” the exterior light control and generating an output for controlling the exterior light are different actions. *See* Ex. 2032 ¶¶ 91–92, 94–96. Additionally, neither Patent Owner nor Dr. Turk identify any disclosure in the Specification that indicates that there is a difference between “enabl[ing]” and generating an output for

controlling the vehicle's exterior lights. Petitioner's argument and supporting evidence, as a whole, supports its position that Tadashi discloses an automatic exterior light control that is enabled when an ambient light level is below a threshold. Pet. 21; Reply 14–15.

Accordingly, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 5 is unpatentable under 35 U.S.C. § 102(b) as anticipated by Tadashi.

C. Obviousness of Claims 3, 9, and 11–13 over Tadashi and Yanagawa

Petitioner asserts that claims 3, 9, and 11–13 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi and Yanagawa. Pet. 24–29, 31–40; Reply 6–15. Petitioner explains how a combination of Tadashi and Yanagawa allegedly discloses or suggests the claimed subject matter, and also relies on the Declarations of Dr. Miller. Exs. 1010, 1014. Patent Owner disagrees with Petitioner's assertions and relies on the Declaration of Dr. Turk. PO Resp. 15–23 (citing Ex. 2032).

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the subject matter sought to be patented 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 the subject matter pertains. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). In the Decision on Institution, we adopted Petitioner's proposed definition of a person having ordinary skill in the art of the '248 patent at the time of the invention, which was supported by Dr. Miller's testimony. Dec. on Inst. 8–9. The parties have not disputed this definition, and we see no reason to modify it in light of the record developed during trial. Therefore,

we conclude that a person of ordinary skill in the art would have had at least the qualifications of or equivalent to either (1) a master's degree in electrical engineering or computer science, with course work or research in vision systems, or (2) an undergraduate degree in electrical engineering or computer science with at least two years of work making optical vision systems. *Id.* at 8 (citing Pet. 6, Ex. 1010 ¶ 27).

Prior art references must be “considered together with the knowledge of one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). A party that petitions the Board for a determination of obviousness must show that “a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.” *Procter & Gamble Co. v. Teva Pharms. USA, Inc.*, 566 F.3d 989, 994 (Fed. Cir. 2009) (quoting *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007)).

1. *Overview of Yanagawa*

Yanagawa is directed to “a recognition device for a traveling vehicle” that recognizes the headlights of oncoming vehicles and the taillights of leading vehicles “and is capable of controlling the device vehicle’s headlights automatically.” Ex. 1006, 1006-007. Yanagawa discloses an embodiment that comprises a television camera that “is set so as to be able to image the forward direction of the vehicle,” a decoder that receives the image signals from the video signal, an image signal processor that extracts a binary image signal from the image signal, and an executing part that receives the extracted signal from the image signal processor and “executes tasks for controlling the headlight beams.” *Id.* at 1006-008–009. Yanagawa

further discloses that “[t]he television camera may also be configured such that the mounting angle of the camera can be varied” and can be “automatically controlled in response to the angle of steering maneuvers.” *Id.* at 1006-011.

2. *Claim 3*

Claim 3 depends from claim 1, and further requires “an image array sensor aim is automatically adjusted.” Petitioner asserts that Tadashi discloses all of the limitations of claim 1, relying on the explanation set forth with respect to Petitioner’s anticipation challenge of claim 1. Pet. 26. Petitioner concedes that Tadashi does not disclose “an image array sensor aim [that] is automatically adjusted,” but states that Yanagawa teaches automatically adjusting the image array sensor aim. *Id.* at 26–27. Petitioner asserts that “Yanagawa provides explicit motivation for adjusting the aim of the image array sensor such that ‘the camera always faces the steered direction of the vehicle’ for more effective imaging.” *Id.* at 27 (citing Ex. 1006, 1006-011).

Patent Owner makes two arguments with respect to claim 3. First, Patent Owner argues that a person having ordinary skill in the art would have understood that Yanagawa discloses automatically adjusting an entire camera assembly to face the steered direction, and that using a similar system with the Tadashi tunnel detection apparatus “would add considerable size and complexity to the Tadashi device and would render Tadashi inoperable as a dashboard mounted image sensor.” PO Resp. 22–23. Patent Owner’s argument is predicated on Dr. Turk’s testimony that a person having ordinary skill in the art “would have understood that the camera in Yanagawa could have been mounted on a gimbal or control arm that

responds to the vehicle steering angle.” Ex. 2032 ¶ 56; PO Resp. 22–23. We do not agree, however, that a person having ordinary skill in the art would have understood that the camera in Yanagawa could be adjusted automatically only by being mounted on a gimbal or control arm. Yanagawa discloses that the camera assembly “may be mounted at any location from which the forward direction of the vehicle can be imaged” (Ex. 1006, 1006-011), which would include mounting it on the vehicle’s dashboard. *See also* Reply 8 (“If, as [Patent Owner] contends, Yanagawa’s automatic adjustability system required significant size and complexity, Yanagawa’s camera could not be located in any forward-viewing location.”). Thus, we are persuaded by Petitioner’s argument that a person having ordinary skill in the art “would understand that Yanagawa’s automatic adjustability system does not add significant size and complexity, at least because Yanagawa teaches location *anywhere* on the vehicle from which the forward direction can be imaged.” *Id.* at 8–9.

Second, Patent Owner argues that moving Tadashi’s image sensor would blur and distort the sensed images, changing Tadashi’s principle of operation because it would not be able to detect rain drops or the action of the windshield wiper blades. PO Resp. 23. Petitioner responds that Patent Owner’s argument is premised on the assumption that images are sensed while the image sensor is moving, and contends that any blurring or distortion of an image sensed during such movement would be negligible. *Id.* at 9–10. Dr. Miller explains that “the camera may move between frames of image data, thereby no blurring or distortion would occur,” and “Tadashi’s camera utilizes a ‘scanning cycle of 64.5μ seconds,’” which is “significantly fast such that any blurring or distortion by movement of the

camera would be negligible.” Ex. 1014 ¶ 7 (citing Ex. 1004, 1004-008). Based on our review of the record, we find Petitioner’s argument to be persuasive.

After considering Petitioner’s and Patent Owner’s positions, as well as their supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 3 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi and Yanagawa.

3. *Claim 9*

Petitioner asserts that Tadashi discloses all of the limitations of independent claim 9 but one, conceding that Tadashi does not disclose an image array sensor that is mounted and configured such that “a field of view of said image array sensor is adjustable electronically.” Pet. 32–35. Petitioner asserts that Yanagawa’s disclosure of automatically adjusting the mounting angle of the camera assembly in response to the angle of steering maneuvers meets this limitation. *Id.* at 33. In response, Patent Owner argues that Yanagawa does not provide guidance as to how the camera assembly is adjusted automatically, and a person having ordinary skill in the art would have understood that such automatic adjustment could be accomplished using mechanical means. PO Resp. 18. Patent Owner further argues that Yanagawa does not “make any mention that the automatic angle control is *electronic*.” *Id.* at 16.

Petitioner cites the following disclosure from Yanagawa with respect to the “image array sensor is configured and mounted such that a field of view of said image array sensor is adjustable electronically” limitation of claim 9:

The television camera for imaging in the forward direction may be mounted at any location from which the forward direction of the vehicle can be imaged. The television camera may also be configured such that the mounting angle of the camera can be varied, such that, for example, the angle is automatically controlled in response to the angle of steering maneuvers. When configured this way, the camera always faces in the steered direction of the vehicle so as to effectively monitor vehicles ahead.

Ex. 1006, 1006-011; Pet. 33. Although this portion discloses that the mounting angle is adjusted “automatically,” we agree with Patent Owner that Yanagawa does not disclose expressly how to adjust the mounting angle of the camera automatically. An obviousness analysis, however, “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 550 U.S. at 418.

Petitioner argues, and we agree, that a person having ordinary skill in the art would have understood that automatically adjusting Yanagawa’s camera could be achieved either mechanically or electronically. Reply 6–7. Patent Owner focuses only on mechanical adjustment, contending that a person having ordinary skill in the art “would have understood that camera angle could easily have been adjusted” mechanically using a gimbal or control arm. PO Resp. 18. We are persuaded by Petitioner’s argument that there were a finite number of identified, predictable ways to adjust Yanagawa’s camera automatically (mechanically and electronically), and that it would have been obvious to try adjusting the camera electronically. Reply 7; *see also KSR*, 550 U.S. at 421 (where “there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason

to pursue the known options within his or her technical grasp,” and “[i]f this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense”).

For example, Yanagawa discloses executing part 15, which receives recognition information from image sensor 14 regarding the presence of taillights or headlights, as well as signals from vehicle speed sensor 16 (corresponding to the vehicle speed), and headlight switch 17 (indicating the state of the headlights). Ex. 1006, 1006-009. Yanagawa further discloses that “executing part 15 then executes tasks for controlling the headlight beams or issuing a warning to the driver based on the recognition information, vehicle speed information and headlight information.” *Id.* Based on the disclosed functionality of executing part 15, a person having ordinary skill in the art would recognize that executing part 15 also could be used to adjust Yanagawa’s camera electronically, and would have a reasonable expectation that such electronic adjustment would be successful.

Patent Owner also raises an untimely new argument, contending that “adjustable electronically” as used in claim 9 “is based on choosing specific pixels to focus on or to emphasize” (Tr. 44:4–6), and is not referring to “physically moving the sensor itself” (*id.* at 45:10–11). That argument, presented for the first time at the hearing, is waived. *Compare* Tr. 44:1–49:23, *with* PO Resp. 15–18 (arguing that Yanagawa does not disclose how the angle of the camera is automatically controlled, and that a person having ordinary skill in the art would have understood that the angle could be adjusted mechanically); *see also* Paper 18, 3 (“The patent owner is cautioned that any arguments for patentability not raised in the response will be deemed waived.”).

Even if the argument is not waived, it is not persuasive. In support of this new argument, Patent Owner relies on a portion of the Specification of the '248 patent that describes taking into account “spatial differentiation” by detecting light sources at a lower threshold in the center of the scene, and at a higher threshold at the periphery of the scene. Tr. 44:20–45:2 (citing Ex. 1002, 10:13–19). Patent Owner further argues that electronically adjusting the *field of view* of the image array sensor, as recited in claim 9, is different than electronically adjusting the *aim* of the image array sensor, as recited in claim 19. *Id.* at 49:4–50:13. According to Patent Owner, claim 9 excludes physical adjustment of the image array sensor, while claim 19 permits such physical adjustment. *Id.* at 50:9–13.

Patent Owner does not explain sufficiently, however, how the Specification’s description of “spatial differentiation” relates to electronically adjusting the field of view of the image array sensor as recited in claim 9. Furthermore, Patent Owner does not direct us to anything in the Specification that indicates that “field of view of said image array sensor is adjustable electronically” does not encompass physically moving the image array in response to an electronic signal, but “an image array sensor aim is adjustable electronically” does encompass such physical adjustment. Based on the evidence presented, we do not discern a significant difference between electronically adjusting the aim of the image array sensor and electronically adjusting the field of view of the image array sensor; when the aim of the image array sensor is adjusted, the field of view of the image array sensor (i.e., what is seen by the image array sensor) would be adjusted as well. We are not convinced, therefore, that the Specification clearly and deliberately limits “field of view of said image array sensor is adjustable

electronically” to choosing specific pixels in the image array sensor, as Patent Owner argues. *See In re Paulsen*, 30 F.3d at 1480 (“Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision.”).

After considering Petitioner’s and Patent Owner’s positions, as well as their supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 9 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi and Yanagawa.

4. *Claims 11–13*

Claim 11 depends from independent claim 9. Claim 11 additionally recites that “said image array sensor is configured and mounted such that a field of view of said image array sensor substantially passes through an associated windshield area that is wiped by a windshield wiper,” and Petitioner contends that this limitation is disclosed by Tadashi. Pet. 37–38. Patent Owner presents the same argument for this limitation as is set forth above with respect to the same limitation in claim 1. PO Resp. 13–15. Claim 12 also depends from independent claim 9, and further requires “an ambient light level input.” Petitioner contends that this limitation also is disclosed by Tadashi. Pet. 38–39. Patent Owner presents the same argument for this limitation as it did for the same limitation in claim 4. PO Resp. 25–29. We are persuaded, based on the analysis set forth above with respect to the recited limitations in claims 1 and 4, that Petitioner has shown, by a preponderance of the evidence, that claims 11 and 12 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi and Yanagawa. *See supra* Section II.B.2, II.B.3.

Claim 13 depends from claim 12, and additionally recites that the “automatic exterior light control is enabled when an ambient light level is below a threshold.” Petitioner contends that Tadashi discloses this limitation. Pet. 39–40. Patent Owner presents the same argument for this limitation as asserted above for the same limitation in claim 5. PO Resp. 34–36. Our analysis is the same as set forth above with respect to claim 5, and need not be repeated here. *See supra* Section II.B.4. Accordingly, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 13 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi and Yanagawa.

D. Obviousness of Claims 17, 18, and 21 over Tadashi and Meitzler

Petitioner asserts that claims 17, 18, and 21 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi and Meitzler. Pet. 43–50; Reply 10–15. Petitioner explains how a combination of Tadashi and Meitzler allegedly discloses or suggests the claimed subject matter, and also relies on the Declarations of Dr. Miller. Exs. 1010, 1014. Patent Owner disagrees with Petitioner’s assertions and relies on the Declaration of Dr. Turk. PO Resp. 7–13, 23–34 (citing Ex. 2032).

1. Overview of Meitzler

Meitzler is directed to “a composite light pickup device in a single unit which monitors both oncoming headlamp lights and ambient light conditions.” Ex. 1007, 1:56-59. Meitzler discloses an embodiment that includes a housing, an oncoming headlight lens, an optical fiber retaining block, and an ambient light collecting element. *Id.* at 2:30-34. Meitzler teaches a logic circuit that automatically controls illumination of the

vehicle's headlights. *Id.* at 3:33-58. Meitzler discloses that "manual override of either logic circuit is provided by" a conventional headlight switch and a high beam actuation switch. *Id.* at 3:58-4:2.

2. *Claims 17, 18, and 21*

Petitioner contends that Tadashi discloses all of the limitations of independent claim 17 but one, and concedes that Tadashi does not disclose that "manual operation of exterior lights remains functional." Pet. 44-46. Petitioner contends that Meitzler discloses manual override of exterior light control, and that a person having ordinary skill in the art would have been motivated by Meitzler to allow a driver of a vehicle to remain in control of the exterior lights in Tadashi's tunnel detection apparatus. *Id.* at 46.

Patent Owner makes three arguments with respect to claim 17. First, Patent Owner asserts that Tadashi does not disclose "an image array sensor, said image array sensor comprising an array of pixel sensors." PO Resp. 7-12. Patent Owner's argument is premised on its contention that the claimed image array sensor requires a two-dimensional arrangement of pixel sensors. *Id.* at 8-10. We do not agree that the claim term should be interpreted in that manner, for the reasons explained above. *See supra* Section II.A.2.

Second, Patent Owner argues that Tadashi does not disclose "a controller configured with an ambient light input, as claimed, for at least the reasons set forth" with respect to claims 4 and 12, even though "claim 17 recites an 'ambient light input' instead of an 'ambient light level input.'" PO Resp. 27; *see also id.* at 23-31. We are not persuaded by Patent Owner's argument, for the same reasons as set forth above with respect to claim 4. *See supra* Section II.B.3.

Third, Patent Owner argues that Tadashi does not disclose “wherein automatic exterior light control is enabled when an ambient light level is below a threshold,” relying on the same argument as it asserted above with respect to the same limitation in claim 5. PO Resp. 34–37. Our analysis is the same as set forth above with respect to claim 5. *See supra* Section II.B.4.

Claim 18 depends from claim 17, and further recites “wherein said ambient light input is derived from said image array sensor.” Petitioner asserts in the Petition that “Tadashi states ‘[o]ne line of the video signal in substantially horizontal direction may be obtained with the one dimensional imaging device that images in the horizontal direction, and it is possible to use one pixel line of an area image sensor,’ and Tadashi therefore “clearly teaches that a portion of a larger image sensor may be used to obtain the video signal.” Pet. 48–49 (citing Ex. 1004, 1004-007). Patent Owner argues that “Tadashi makes no disclosure whatsoever regarding using the one-dimensional image sensor to detect an ambient light level or to provide an ambient light input.” PO Resp. 32. We are not persuaded by Patent Owner’s argument. As set forth above in our analysis of claim 4, Tadashi discloses the use of “[l]ight incidented through the front windshield” imaged on the image array sensor to create video signal Vs that is the basis for determining whether microcomputer 3 detects a tunnel. *See supra* Section II.B.3. Based on our review of the record, we are convinced that Tadashi discloses “said ambient light input is derived from said image array sensor” as recited in claim 18.

Claim 21 depends from claim 17, and further recites “wherein said image array sensor is configured and mounted such that a field of view of

said image array sensor substantially passes through an associated windshield area that is wiped by a windshield wiper.” Petitioner contends that this limitation is disclosed by Tadashi. Pet. 49–50. Patent Owner presents the same argument for this limitation as asserted above for the same limitation in claim 1. PO Resp. 13–15. Our analysis is the same as set forth above with respect to claim 1, and need not be repeated here. *See supra* Section II.B.2.

After considering Petitioner’s and Patent Owner’s positions, as well as their supporting evidence, we determine that, by a preponderance of the evidence, Petitioner has shown that claims 17, 18, and 21 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi and Meitzler.

*E. Obviousness of Claim 19 over
Tadashi, Meitzler, and Yanagawa*

Petitioner asserts that claim 19 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi, Meitzler, and Yanagawa. Pet. 57–58. Petitioner explains how a combination of Tadashi, Yanagawa, and Meitzler allegedly discloses or suggests the claimed subject matter, and also relies on the Declarations of Dr. Miller. Exs. 1010, 1014. Patent Owner disagrees with Petitioner’s assertions and relies on the Declaration of Dr. Turk. PO Resp. 19–20.

Claim 19 depends from independent claim 17, and further recites “wherein an image array sensor aim is adjustable electronically.” Petitioner contends that Yanagawa discloses this limitation. Pet. 57–58. Patent Owner relies on the same arguments with respect to this limitation in claim 19 as it did with respect to the “a field of view of said image array sensor is

adjustable electronically” limitation in claim 9. PO Resp. 20. Specifically, Patent Owner argues that Yanagawa does not provide guidance as to how the camera assembly is adjusted automatically, and a person having ordinary skill in the art would have understood that such automatic adjustment could be accomplished using mechanical means. *Id.* at 18. Patent Owner further argues that Yanagawa does not “make any mention that the automatic angle control is *electronic*.” *Id.* at 16. For the same reasons set forth above with respect to claim 9, we do not find these arguments to be persuasive. See *supra* Section II.C.3.

After considering Petitioner’s and Patent Owner’s positions, as well as their supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 19 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Tadashi, Meitzler, and Yanagawa.

III. CONCLUSION

Petitioner has shown, by a preponderance of the evidence, that claims 1, 4, and 5 of the ’248 patent are anticipated by Tadashi.

Petitioner has shown, by a preponderance of the evidence, that claims 3, 9, and 11–13 would have been obvious over the combination of Tadashi and Yanagawa.

Petitioner has shown, by a preponderance of the evidence, that claims 17, 18, and 21 would have been obvious over the combination of Tadashi and Meitzler.

Petitioner has shown, by a preponderance of the evidence, that claim 19 would have been obvious over the combination of Tadashi, Meitzler, and Yanagawa.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that claims 1, 3–5, 9, 11–13, 17–19, and 21 of the '248 patent are determined to be *unpatentable*; and

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.

PETITIONER:

Josh Snider
Timothy Sendek
A. Justin Poplin
LATHROP & GAGE LLP
patent@lathropgage.com
tsendek@lathropgage.com
jpoplin@lathropgage.com

IPR2014-00255
Patent 7,423,248 B2

PATENT OWNER:

Timothy A. Flory
Terence J. Linn
GARDNER, LINN, BURKHART & FLORY, LLP
Flory@glbf.com
linn@glbf.com

David K.S. Cornwell
STERNE, KESSLER, GOLDSTEIN & FOX PLLC
Davidc-PTAB@skgf.com