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IPR2014-00411 Paper 114
IPR2014-00434 Paper 16
IPR2015-00065 Paper 72
Entered: September 3, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FLIR SYSTEMS, INC.,
Petitioner,

v.

LEAK SURVEYS, INC.,
Patent Owner.

Case IPR2014-00411/434 (Patents 8,426,813 B2 and 8,193,496 B2)
Case IPR2015-00065 (Patent 8,426,813 B2)

Before FRED E. McKELVEY, JAMES T. MOORE, and
TREVOR M. JEFFERSON, *Administrative Patent Judges*.

JEFFERSON, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

FLIR Systems, Inc. (“Petitioner” or “FLIR”) filed four petitions seeking *inter partes* review of U.S. Patent No. 8,426,813 B2 (“the ’813 patent”) and U.S. Patent No. 8,193,496 B2 (“the ’496 patent”). Filed were a first petition in IPR2014-00411 (“IPR ’411”) and a second petition in IPR2014-00608 (“IPR ’608”) seeking *inter partes* review of claims 1–58 (all of the claims) of the ’813 patent. 35 U.S.C. § 311; Paper 2 (IPR ’411); Paper 2 (IPR ’608).¹ Also filed were a third petition in IPR2014-00434 (“IPR ’434”) and a fourth petition in IPR2014-00609 (“IPR ’609”) seeking *inter partes* review of claims 1–7 and 9–20 the ’496 patent. 35 U.S.C. § 311; Paper 2 (IPR ’434); Paper 2 (IPR ’609).

Leak Surveys, Inc. (“Patent Owner” or “LSI”) filed a Patent Owner’s Preliminary Response in IPR ’411 (Paper 6 corrected by Paper 8); IPR ’608 (Paper 6 corrected by Paper 8); IPR ’434 (Paper 6); and IPR ’609 (Paper 7).

In a consolidated Decision to Institute (Paper 9 in IPR ’411 and Paper 9 in IPR ’434, “Dec. ’411”), we denied institution in IPR ’608 and IPR ’609 and in IPR ’411 and IPR ’434 instituted this proceeding as to claims 1–22, 31, 37–40, 42–56, and 58 of the ’813 patent and claims 1–7 and 9–20 of the ’496 patent. Dec. ’411, 35–36. Subsequently, we consolidated IPR2014-00434 with IPR2014-00411 and terminated the IPR2014-00434 proceeding. Paper 10 (IPR ’411); Paper 9 (IPR ’434).

¹ The IPR in parentheses after a paper number or exhibit number indicates the IPR docket that contains the numbered filing.

In IPR2015-00065 (“IPR ’065”), FLIR filed a fifth petition, requesting *inter partes* review of claims 23–30, 32–36, 41, and 57 of the ’813 patent pursuant to 35 U.S.C. §§ 311–319. Paper 2 (IPR ’065). FLIR subsequently withdrew claim 29 from the requested *inter partes* review, thus challenging only claims 23–28, 30, 32–36, 41, and 57 of the ’813 patent. Paper 10 (IPR ’065). LSI filed a Preliminary Response in two parts, Part 1 (Paper 8 (IPR ’065)) and Part 2 (Paper 16 (IPR ’065)).

Pursuant to 35 U.S.C. § 314, in our Decision to Institute (Paper 25, “Dec. ’065”), we instituted *inter partes* review as to claims 23–28, 30, 32–36, 41, and 57 of the ’813 patent. Dec. ’065, 18–19. We further combined IPR2014-00411 with IPR2015-00065 for purposes of scheduling, briefing, and trial. Paper 28, 7 (IPR ’065).

LSI filed a Patent Owner Response as to all IPRs (Paper 65 (IPR ’411), Paper 37 (IPR ’065), “PO Resp.”) and FLIR filed a Reply to the Patent Owner Response (Paper 77 (IPR ’411), Paper 42 (IPR ’065), “Reply”).² A consolidated oral hearing for IPR2014-00411 and IPR2015-00065 (Paper 70 in IPR ’065 and Paper 112 in IPR ’411, “Tr.”) was held on July 2, 2015.

For the reasons that follow, we determine that FLIR has shown by a preponderance of the evidence that claims 1–28 and 30–58 of the ’813 patent and claims 1–7 and 9–20 of the ’496 patent, are unpatentable.

² All references herein to the Patent Owner Response (PO Resp.) are to the redacted Paper 66 (IPR ’411) and Paper 37 (IPR ’065).

B. Related Cases

FLIR states that the '813 patent, which claims priority to the '496 patent, has been asserted by LSI in *Leak Surveys, Inc. v. FLIR Systems, Inc.*, Civil Action No. 3:13-CV-02897-L (N.D. Tex.) (filed July 25, 2013). Paper 2, 1 (IPR '411); Paper 4, 2 (IPR '065).

C. The Asserted Grounds

In the consolidated IPRs, we instituted trial on the grounds that the following cited references³ render the challenged claims unpatentable as obvious pursuant to 35 U.S.C. § 103(a):

References	IPR	Claim(s) Challenged
Merlin Brochure ⁴ and Strachan ⁵	IPR '411	'813 Patent: 1–4, 6, 8–22, 31, 37–40, 42–56, 58
Merlin Brochure, Strachan, and Piety ⁶	IPR '411	'813 Patent: 5 and 7
Merlin Brochure and Strachan	IPR '434	'496 Patent: 1–5 and 9–20
Merlin Brochure, Strachan, and Brengman ⁷	IPR '434	'496 Patent: 6

³ Exhibit numbers herein refer to exhibits filed in both IPR '411 and IPR '065 that share the same number. An exhibit number followed by a specific IPR in parentheses denotes an exhibit filed in the identified IPR.

⁴ Indigo Systems Corporation, Merlin: The ultimate combination of flexibility and value in high-performance Infrared Cameras (Rev. A 1/02), dated ©2002 (Ex. 1007, “Merlin Brochure”).

⁵ D.C. Strachan et al., *Imaging of Hydrocarbon Vapours and Gases by Infrared Thermography*, 18 J. PHYS. E: SCI. INSTRUM. 492-498 (1995) (Ex. 1008, “Strachan”).

⁶ U.S. Patent No. 5,386,117 issued on January 31, 1995 (Ex. 1018, “Piety”).

References	IPR	Claim(s) Challenged
Merlin Brochure, Strachan, and Hart ⁸	IPR '434	'496 Patent: 7
Merlin Brochure and Strachan	IPR '065	'813 Patent: 23, 25, 28, 30
Merlin Brochure, Strachan, and Spectrogon ⁹	IPR '065	'813 Patent: 27, 32–35, 41
Merlin Brochure, Strachan, and OCLI ¹⁰	IPR '065	'813 Patent: 24, 26, 36, 57
Merlin User's Guide ¹¹ and Kulp ¹²	IPR '065	'813 Patent: 23, 33, 35
Merlin User's Guide, Kulp, and Spectrogon	IPR '065	'813 Patent: 25, 27, 28, 30, 32, 34, 41
Merlin User's Guide, Kulp, and OCLI	IPR '065	'813 Patent: 24, 26, 36, 57

⁷ U.S. Patent No. 3,662,171 issued on May 9, 1972 (Ex. 1013 (IPR '434), “Bregman”).

⁸ U.S. Patent No. 6,056,449 issued on May 2, 2000 (Ex. 1014 (IPR '434), “Hart”).

⁹ Spectrogon Catalog of Bandpass Filters (<http://www.spectrogon.com/bandpass.html> dated October 6, 2001) (Ex. 1017, “Spectrogon”).

¹⁰ OPTICAL COATING LABORATORY, INC. SPECTRABAND STOCK PRODUCTS CATALOG, Vol. 5 (1994) (Ex. 1014, “OCLI”).

¹¹ Indigo Systems Corporation, MERLINTM MID, INSB MWIR CAMERA, User's Guide, Version 1.10, 414-0001-10 (Ex. 1011, “Merlin User's Guide”).

¹² Thomas J. Kulp et al., *Remote Imaging of Controlled Gas Release using Active and Passive Infrared Imaging Systems*, 3061 SPIE 269 (1997) (Ex. 1012, “Kulp”).

D. The '813 Patent and Illustrative Claims

The '813 patent is based on an application which is a continuation of the application that matured into the '496 patent. Ex. 1001, 1:6–9.¹³ The '813 patent relates to an infrared (IR) camera system which can be used to visually detect and identify chemical, gas, and petroleum product leaks. Ex. 1001, 1:27–29, 28:44–67.

The '813 invention is readily understood by reference to its drawings and exemplary claims 1, 23, and 24. Figs. 1 and 2 of the '813 patent are reproduced below.

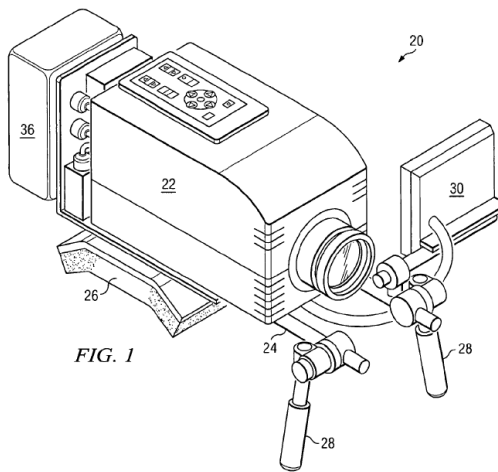


Fig. 1 depicts a perspective view of a chemical leak detection system

¹³ Ex. 1001 refers to the '813 patent filed in both IPR '411 and IPR '065.

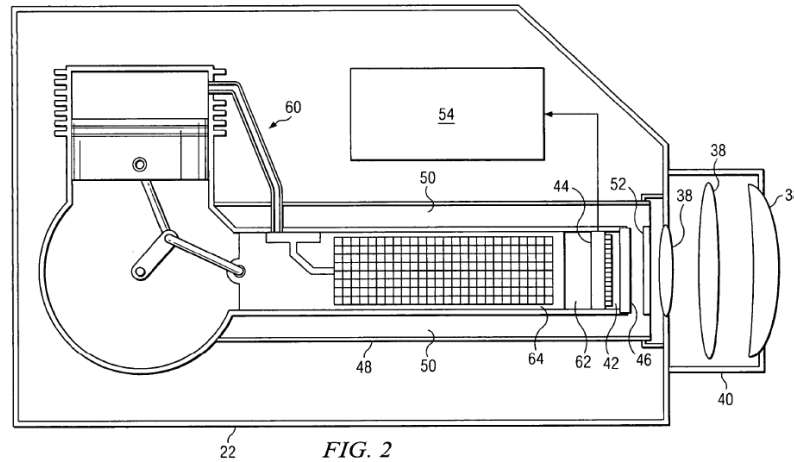


Fig. 2 depicts a schematic of an infrared camera system of Fig. 1

Figures 1 and 2 show infrared camera system 22, lens assembly 40, and lens 38. Ex. 1001, 5:34–38. Camera system 22 has refrigerated portion 42 cooled by refrigeration system 60. *Id.* at 5:34–41, 5:66–67. The refrigerated portion 42 also comprises infrared sensor device 44 and optical bandpass filter 46. *Id.* at 5:41–43. The refrigeration cools optical bandpass filter 46, reducing the background noise of bandpass filter 46 as perceived by infrared sensor device 44. *Id.* at 6:45–47. Optical bandpass filter 46 is located along an optical path between lens 38 and infrared sensor device 44. *Id.* at 5:41–43. At least part of a pass band for optical bandpass filter 46 is within an absorption band for the detected chemical. The infrared image of the detected chemical passes through the lens and optical bandpass filter and the filtered infrared image of the leak is received with the infrared sensor device. *Id.* at 3:4–11. The visible image of the leak is produced by processing the filtered infrared image received by the infrared sensor device. *Id.*

Independent claim 1 and dependent claims 23 and 24 are illustrative of the claimed subject matter of the '813 patent.

1. A system for producing a visible image of a leak of any one or more chemicals of a group of chemicals, the leak emanating from a component, including:

a passive infrared camera system including:

a lens assembly including a lens;

a refrigerated portion including an interior;

an infrared sensor device located in the interior of the refrigerated portion;

a single filter configuration located in the interior of the refrigerated portion and including an optical bandpass filter fixed along an optical path between the lens assembly and the infrared sensor device;

a refrigeration system that can cool the interior of the refrigerated portion;

wherein at least part of the pass band for the single filter configuration is within an absorption band for each of the chemicals; and

wherein the aggregate pass band for the single filter configuration is at least about 100 nm; and

a processor that can process a signal representing the filtered infrared image captured by the infrared sensor device to produce a visible image of the chemical emanating from the component under variable ambient conditions of the area around the leak.

23. The system of claim 1, wherein the aggregate pass band for the single filter configuration is at least about 200 nm.

24. The system of claim 1, wherein the pass band for the filter configuration has a center wavelength located between about 3375 nm and about 3385 nm.

Ex. 1001, 28:44–67, 30:3–7.

E. The '496 Patent and Illustrative Claim

The '496 patent relates to a method of using an IR camera system to visually detect and identify chemical, gas, and petroleum product leaks. Ex. 1001, 1:25–27, 28:41–29:8.¹⁴ The drawings and written description portion of the Specification of the '496 patent are essentially the same as the drawings and written description portion of the Specification of the '813 patent. *Compare* Ex. 1001 (IPR '434) *with* Ex. 1001.

Claim 1 is illustrative of the subject matter of the '496 patent.

1. A method of visually detecting a gas leak of any one or more chemicals of a group of predetermined chemicals, the gas leak emanating from a component of a group of components in different locations, the method comprising:

aiming a passive infrared camera system towards the component, wherein the passive infrared camera system comprises:

a lens,

a refrigerated portion defined by the interior of a Dewar flask, the refrigerated portion comprising therein:

an infrared sensor device; and

a single filter configuration comprising at least one fixed optical bandpass filter, each filter fixed along an optical path between the lens and the infrared sensor device, wherein at least part of the aggregate pass band for the single filter configuration is within an absorption band for each of the predetermined chemicals and

¹⁴ Ex. 1001 (IPR '434) refers to the '496 patent filed in IPR '434.

wherein the aggregate pass band for the single filter configuration is at least about 200 nm; and

a refrigeration system adapted to cool the refrigerated portion, the refrigeration system comprising a closed-cycle Stirling cryocooler;

filtering an infrared image associated with the area of the gas leak under normal operating and ambient conditions for the component with the at least one optical bandpass filter;

receiving the filtered infrared image of the gas leak with the infrared sensor device;

electronically processing the filtered infrared image received by the infrared sensor device to provide a visible image of the gas leak under variable ambient conditions of the area around the leak; and

visually detecting the leak based on the visible image under the variable ambient conditions.

Ex. 1001 (IPR '434), 28:40–29:8.

II. ANALYSIS

A. *Claim Construction*

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278–79 (Fed. Cir. 2015). Claim terms generally 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. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. “leak”

In the preliminary Decision to Institute, we found that “leak” is broad enough to include both fugitive and non-fugitive emissions. Dec. ’411, 17. Thus, on the preliminary record we agreed with FLIR that “leak” should be defined as any chemical emission including (1) an unwanted (“fugitive”) chemical emission and (2) a known (“non-fugitive”) chemical emission, such as a chemical gas emission from an exhaust outlet of an airplane or a smokestack. Paper 2, 12 (IPR ’411); Paper 2, 10 (IPR ’434); Paper 2, 12–13 (IPR ’065). We found that the ’813 patent states that “[a]n embodiment of the present invention may be used to inspect any of a wide variety of components having [a] chemical . . . of interest . . . , including (but not limited to) a pipe, a compressor, . . . a flare, an exhaust outlet, . . . [or] a vent for a blow-off valve.” Ex. 1001, 12:17–25.

LSI disagrees with our preliminary construction and argues that the construction of “leak” deviates from the ordinary meaning of the term. PO Resp. 31–33. LSI relies on extrinsic evidence to support its contention that the ordinary meaning of “leak” as recited in the ’813 and ’496 patents is limited to unintended or fugitive emissions. PO Resp. 33. LSI’s contention fails to recognize and distinguish the express teaching that chemicals of interest from flares, exhausts, vents or blow off valves are expressly described as uses of the claimed invention. Ex. 1001, 12:17–25. Indeed, one portion of the specification that LSI relies on to distinguish known versus unknown emissions, indicates that the invention is used to survey known emissions of gas from vents. Ex. 1001, 20:28–31; *see* PO Resp. 34.

Although LSI admits that exhaust valves and flares will have known emissions and that the invention is used to survey these structures (PO Resp.

32), LSI argues that the term “leak” does not include the known emissions from these structures, as the ordinary use of the term is limited to fugitive or unknown emissions. We disagree, concluding that a person of ordinary skill in the art would understand that the specification describes a chemical of interest that is present in valves and exhausts that have known emissions. Ex. 1001, 12:22, 20:28–32.¹⁵

Under the broadest reasonable interpretation, LSI’s extrinsic evidence does not persuade us that a person of ordinary skill in the art would understand that “leak” as used in the specification and claims is limited to only unknown or fugitive emissions. Accordingly, on the full record, we maintain our construction of “leak” as including both fugitive and non-fugitive emissions.

2. *“produce a visible image of the chemical emanating from the component under variable ambient conditions of the area around the leak”*

In the Decision to Institute, we preliminarily construed “produce a visible image of the chemical emanating from the component under variable ambient conditions of the area around the leak” means “being able to produce a visible image under the ambient conditions of the area around the

¹⁵ In addition, we note that LSI’s claims using the term “leak” were rejected over intended or known emissions from a smokestack. *See* Ex. 1002, 319, 416–419. Patent Owner disputed and overcame the Examiner’s rejection on different grounds, but did not dispute the Examiner’s application of smokestack emissions to gas leaks. *See id.* Thus, at least during prosecution, the term leak was determined by the Examiner to include known emissions.

leak.” Dec. ’411, 17–18. LSI does not dispute this construction, but instead argues that

POSITA [i.e., a person having ordinary skill in the art,] would understand this claim limitation to require that the claimed invention be capable of operating under a full range of normal operating conditions, such as different temperatures or sunlight; and it would not encompass prior art systems that could image gases only within a narrow range of field conditions, such as temperature.

PO Resp. 27. Specifically, LSI argues that “in the context of the full claims, this limitation should be construed to mean that an infringing method must operate to image gas leaks under real-world field conditions, without taking steps to artificially control any variables such as background temperature, wind, etc.” *Id.* at 25. LSI does not provide any argument or evidence that the patent describes the range of “real-world” versus “artificially controlled” conditions. Instead, LSI’s construction merely seeks to eliminate any conditions obtained in a lab or test setting from ambient conditions in other settings.

We are not persuaded that the patent claims’ references to variable ambient conditions are limited to “real-world” conditions. As we previously noted, a person having ordinary skill in the art would understand that the claimed system and method would typically be used outdoors, where environmental conditions change, at the point where a leak may occur. Dec. ’411, 18. For example, in the summer, a chemical of interest may be present at higher temperature than the same chemical of interest in the winter. *Id.* Similarly, exhaust temperature may vary depending on conditions.

LSI admits that “the claim does not specify what the normal operating conditions would be” under given circumstances. Oral Argument Transcript (“Tr.”) 62:23–24. LSI also admits that a smokestack, for example, would have “a different range of normal operating conditions.” Tr. 63:6–8. Because these conditions vary and the ’813 and ’496 patent specifications are silent on the range or limits of normal operating conditions, we are not persuaded by LSI’s attempt to exclude controlled environments from the claimed ambient conditions. *See* PO Resp. 26–27. We find no support for LSI’s contention that “variable ambient conditions” or “normal operating in variable ambient conditions” is limited to those instances that are not constrained or controlled in some artificial manner. *Id.*

On the full record, we maintain our constructions of “produce a visible image of the chemical emanating from the component under variable ambient conditions of the area around the leak” as meaning “being able to produce a visible image under the ambient conditions of the area around the leak.”

B. Asserted Prior Art

1. Merlin Brochure (Ex. 1007)

The Merlin Brochure discloses a mid-wavelength (MWIR) infrared camera (“Merlin-MID”) that includes an infrared sensor device (InSb focal plane array) and a 3-5 μm bandpass cold filter within a refrigeration portion defined by the interior of a Dewar flask. Ex. 1007, 3, 6; *see* Ex. 1011, 1. The Merlin-MID also includes a refrigeration system (a closed-cycle Stirling cryocooler) that cools the refrigeration portion of the Merlin-MID and the filter. Ex. 1007, 6.

The '813 patent states that “[a] preferred infrared camera system 22, for example, for use in an embodiment of the present invention is a Merlin™ mid-wavelength infrared (MWIR) high-performance camera available from Indigo Systems, Inc. in California.” Ex. 1001, 6:19–23. The Merlin-MID camera described in the brochure is the Merlin MWIR camera discussed in the '813 patent. Ex. 1001, at [56] (citing Merlin Brochure by Indigo Systems Corp. (2002)), 6:19–23 (citing Merlin mid-wavelength infrared MWIR camera as the preferred embodiment of camera system 22).

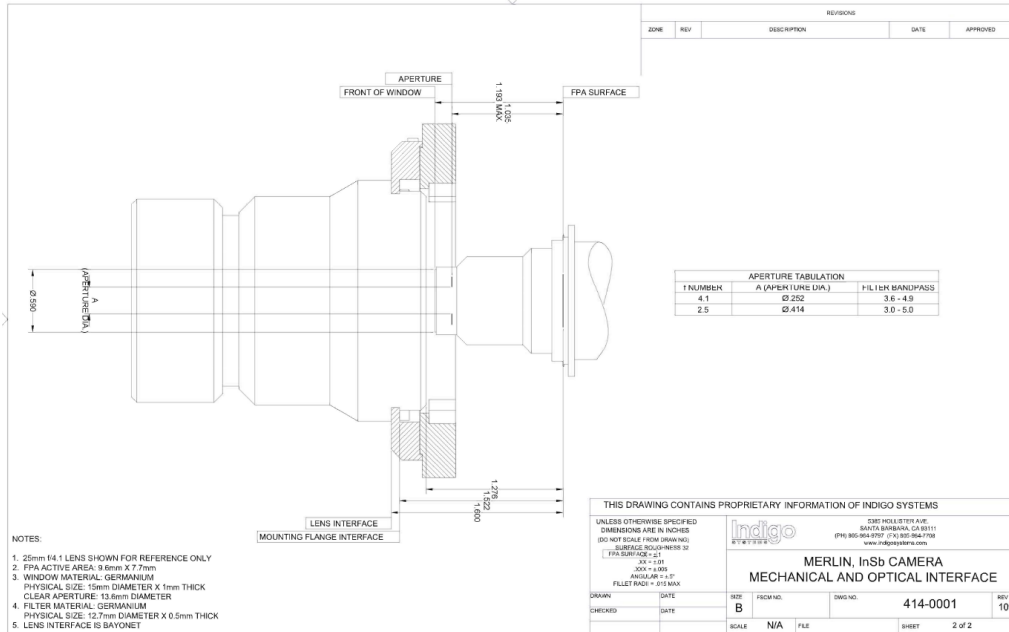
2. *Merlin User's Guide (Ex. 1011)*

The Merlin User's Guide describes features of the Merlin Brochure MID InSb camera. The Merlin User's Guide discloses a passive infrared camera with a refrigeration portion including an interior. Ex. 1011, 2, 51. Merlin User's Guide describes both a cold filter and infrared sensor device located in the interior of the refrigeration portion. *Id.* at 51.

The Merlin User's Guide states:

Merlin Mid is a mid-wavelength infrared (MWIR) high-performance camera offered by Indigo systems Corp. The camera consists of a Stirling-cooled Indium Antimonide (InSb) Focal Plane Array (FPA) built on an Indigo Systems ISC9705 Readout Integrated Circuit (ROIC) using indium bump technology. The FPA is a 320 x 256 matrix or 'staring' array of detectors that are sensitive in the 1.0 μm to 5.4 μm range. The standard camera configuration incorporates a cold filter that restricts the camera's spectral response to the 3.0-5.0 micron band. The FPA is enclosed in an all-metal evacuated [D]ewar assembly cooled by a closed-cycle Stirling cryocooler, and is thermally stabilized at a temperature of 77 K.

Ex. 1011, 1. “The lens-to-camera interface is shown in Appendix B” (Ex. 1011, 3) reproduced below.



Depicted above is the Merlin InSb camera, mechanical and optical interface.

The filter is located in the general area of the “aperture” and the filter bandpass is identified as 3.6 to 4.9 or 3.0 to 5.0 depending on the aperture diameter. Ex. 1101, 51. The IR sensor is located in the general area identified as FPA (focal point array) sensor. The refrigerated area is the space between the filter and the IR sensor.

3. Kulp (Ex. 1012)

Kulp discloses “results of field tests of an active backscatter absorption gas imaging (BAGI) system and a passive imager on a Ga:Si infrared focal-plane array.” Ex. 1012, 269 (Abstract). The passive imager on an infrared focal-plane array “images gases through temperature or emissivity differences.” *Id.*

Specifically, Kulp discloses a camera equipped with a narrow bandpass cold filter to detect sulfur hexafluoride (SF₆) gas. Ex. 1012, 270. Figure 2 of Kulp shows that the cold filter has an aggregate passband of about 570 nm between wavenumber 920 (about 10870 nm) and wavenumber 970 (about 10300 nm). *Id.* at 270 (Figure 2). In addition, Figure 9 of Kulp shows that the Ga:Si passive infrared camera provides a visible image of the SF₆ gas at different times of day at different temperatures. *Id.* at 277. Figure 9 is depicted below.

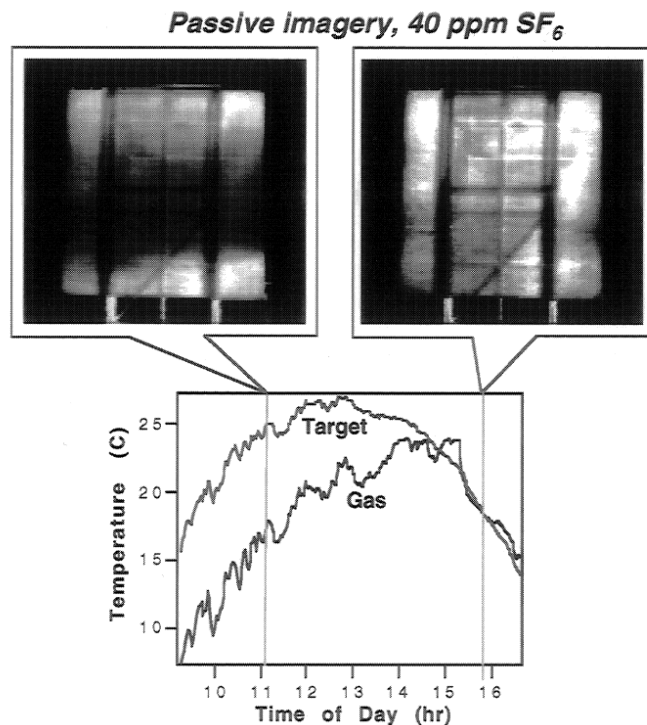


Figure 9 shows passive images collected of gas releases at two different times of the day. The graph plots the target and air temperature during the day. *Id.* Kulp states that “[the passive IR approaches] are attractive because of its unlimited range and spectral bandwidth, and its simplicity Its use must, however, be accompanied by the assumption

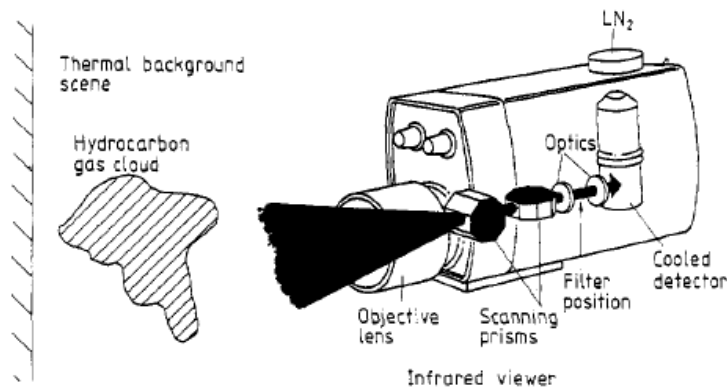
that the required temperature and/or emissivity differences between the gas and background will always exist.” Ex. 1012, 277.

4. Strachan (Ex. 1008)

Strachan discloses a demonstration of “an infrared imaging technique for the visualization of hydrocarbon gases and vapours.” Ex. 1008, 1 (Abstract). Strachan describes “a qualitative imaging approach to gas/vapour detection.” *Id.* at 1 (Section 1). Strachan states:

The technique is based on real-time infrared imaging (thermography), which produces images of objects from their own infrared heat radiation. By selecting spectral absorption windows characteristic of hydrocarbon vapours and gases it is possible to visualise such gases against a background thermal scene. The approach and its limitations in terms of hydrocarbon detection and instrument development requirements for ambient temperature operations are discussed.

Id. Figure 3 shows the schematic of a hydrocarbon imaging system disclosed in Strachan.



“Figure 3 indicates schematically the operation of a hydrocarbon detection system.” Ex. 1008, 493. Figure 3 shows “a detector is housed in its own Dewar flask, which contains a small quantity of liquid nitrogen coolant.

Infrared radiation from the source object is imaged by a multi-element lens, generally silicon or germanium.” Ex. 1008, 493. Strachan states:

The detector signal is then processed electronically to produce a real-time infrared television picture or thermogram. . . . The camera views the thermal background scene around and through any intervening hydrocarbon cloud. Providing background and cloud are not in total thermal equilibrium with each other, then it is possible to visualise the gas cloud against the background.

Id. Strachan disclosed an infrared imaging system fitted with a specific filter for detecting hydrocarbon gases, discussing two different example filters, having bandwidths centered approximately at 3.4 μm , for detecting hydrocarbon gases. *Id.* Furthermore, Strachan discloses the use catalogs of infrared absorption spectra for various hydrocarbon vapors. *Id.*

5. Hart (Ex. 1014 (IPR '434))

Hart is a U.S. patent, issued on May 2, 2000, titled “Frame Assembly For Supporting A Camera.” Figure 1 of Hart is reproduced below.

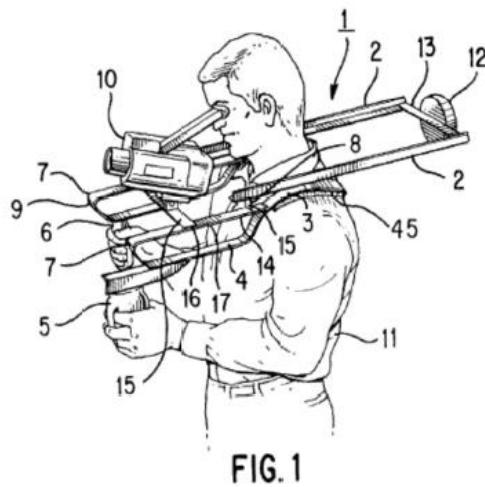


Figure 1 of Hart shows a camera supported by a frame assembly that includes frame 4, 7, shoulder rest 3, and handle 5, 6 extending from the frame. Ex. 1014 (IPR '434), 4:41–45, 52–55, 5:24–25. Figure 1 of Hart also discloses that aiming the camera towards a component is performed by a person holding the infrared camera system.

6. Spectrogon (Ex. 1017) and OCLI (Ex. 1014)

Spectrogon shows a catalog of bandpass filters available at the time of the invention. Ex. 1017. The Optical Coating Laboratory, Inc. (“OCLI”) products catalog likewise discloses a catalog of optical filters available at the time of invention. Ex. 1014.

7. Piety (Ex. 1018)

Piety is a U.S. patent issued in 1995, titled “Infrared Thermography System Including Mobile Unit,” and discloses a mobile infrared thermography unit that includes a data processing device operable to record user notes. Ex. 1018, 14: 18-22. Specifically, Piety discloses:

The mobile infrared thermography unit includes an infrared camera, a storage device such as a videotape recorder for at least recording thermographic images captured by the infrared camera, and a mobile unit computer. The mobile unit computer includes a touch screen display for presenting information to a thermographer and for receiving data and command inputs from the thermographer.

Ex. 1018, Abstract ll. 4–11.

8. *Brengman (Ex. 1013 (IPR '434))*

Brengman is a U.S. patent that issued in 1972, titled “Methane Gas Detection System Using Infrared.” Brengman discloses using an infrared gas detection system mounted on an airborne platform to detect methane gas leaks in buried gas pipelines. Ex. 1013 (IPR '434), 1:70–72, 4:12–15. Brengman further discloses that the airborne platform may be a helicopter. *Id.* at 7:38–40.

C. *Merlin References as Prior Art and Printed Publication*

FLIR contends that the Merlin Brochure (Ex. 1007) is a prior art printed publication. Paper 2, 10 (IPR '65); Paper 2, 8–9 (IPR '411). At the time of filing the Response, LSI contested whether the Merlin Brochure is publicly available prior art. PO Resp. 70–73. At oral argument, LSI withdrew its argument that the Merlin Brochure was not publicly available. Tr. 40:1–9 (stating that LSI no longer contends that the Merlin Brochure was not publicly available).

With respect to the Merlin User’s Guide (Ex. 1011), FLIR argues that testimony evidence shows that the guide was distributed with sales of the Merlin camera. Ex. 1016 ¶ 7 (stating that “[t]he Merlin User’s Guide is a user guide that describes the Merlin-MID camera sold by Indigo” and “distributed to customers with the Merlin-MID camera”).

LSI argues that because the Merlin User’s Guide was only delivered to purchasers of the expensive Merlin MID camera (citing Ex. 2063 at LSI0000483, LSI0000816, LSI0000853), it was not available such that ordinarily skilled artisans could locate it by exercising reasonable diligence. *See In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004). LSI further

argues that publications that are available only at high costs render the document effectively inaccessible to members of the general public. PO Resp. 70 (citing *Virginia Innovation Scis., Inc. v. Samsung Elecs. Co.*, 983 F. Supp. 2d 713, 738 (E.D. Va. 2014)). We note that LSI acknowledges that a Merlin user's guide with the same title as the Merlin User's Guide (Ex. 1011) was previously considered during prosecution. PO Resp. 73. LSI also acknowledges that FLIR's witnesses state the Merlin User's Guide (Ex. 1011) was available to purchasers of the Merlin MID as of the critical date. PO Resp. 71. Despite this evidence of public availability, LSI argues that the guide was only available to purchasers of the camera and the expense of buying the camera means the Merlin User's Guide (Ex. 1011) is not a printed publication freely accessible to the public prior to the critical date. PO Resp. 71 (citing *Virginia Innovation*. 983 F. Supp. 2d at 738).

We are not persuaded by LSI's arguments. The case LSI relies on, *Virginia Innovation*, is neither binding authority nor persuasive authority. The facts in *Virginia Innovation* can be distinguished from the facts of the present case, as the prior art in question in *Virginia Innovation* was not sufficiently shown to be generally on sale to the interested public, and was instead "restricted" to members of a publishing organization, which required membership dues for access. *See* 983 F. Supp. 2d at 737–38. Indeed, the district court in *Virginia Innovation* noted that there was no evidence that the document was available for sale to the general public outside of the publishing organization members. *Id.* In the present case, no membership fee or organization membership is required for access to the Merlin User's Guide, which testimony shows was available and sold to the interested

public as early as late 2000. *See* Ex. 1026 ¶¶ 17–19; Ex. 1024 ¶¶ 12–14; Ex. 1016 ¶ 12.

Based on the complete record, we find by a preponderance of the evidence that distribution of the Merlin User’s Guide with the sale of the Merlin MID camera shows sufficient public accessibility and distribution. The cost to obtain the camera does not negate the evidence that the camera and accompanying user’s guide was available to the interested public. The testimony evidence shows that the Merlin User’s Guide was available for sale and distribution to the interested as early as 2000. Thus, FLIR has shown by a preponderance of the evidence that the Merlin User’s Guide was a publicly available printed publication.

D. Level of Ordinary Skill in the Art

FLIR contends that a person of ordinary skill in the art would have relevant experience with passive IR (infrared) systems in addition to the requisite engineering or physics education. Paper 2, 10–11 (IPR ’065); Reply 19–20. LSI contends that in addition to the requisite physics or optical science/engineering education a person of ordinary skill the art would have experience developing IR camera systems generally. PO Resp. 22. LSI’s contention is that FLIR’s definition of a person of ordinary skill is too narrowly focused on passive IR systems and is evidence of hindsight bias. PO Resp. 23.

LSI’s arguments are contradictory and confusing; asserting not only that FLIR’s person of ordinary skill in art is overly narrow and defined as a “specialist in the [’813 and ’496 patents’] specific solution to the problem being solved,” but also that FLIR’s artisan “would not [] have been familiar

with the technical problem being addressed by the invention.” PO Resp. 22 (emphasis omitted). Regardless, FLIR argues that the invention would have been obvious under either FLIR’s or LSI’s proposed person of ordinary skill in the art. Reply 20.

Based on the full record, we find that the level of ordinary skill in the art is evidenced by the prior art references and the type of problems and solutions described in the ’813 and ’496 patents (Ex. 1001, 1:25–2:34), and includes experience in imaging of chemical gases using IR camera systems generally in addition to the requisite engineering, physics or optical science education. *See In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Moreover, and apart from any differences of opinion between FLIR and LSI on the precise background and knowledge of one skilled in the art, the prior art itself is highly indicative of the level of skill. *See id.* (“the level of ordinary skill in the art . . . was best determined by appeal to the references of record”). In any event, we do not find that a person of ordinary skill’s understanding of the teachings of the prior art would differ if an ordinarily skilled artisan possessed knowledge of both active and passive IR systems rather than knowledge of passive IR systems alone. *See* PO Resp. 22–24.

E. Obviousness of the Challenged Claims

FLIR contends that the combinations of the Merlin Brochure, the Merlin User’s Guide, Kulp, Strachan, Piety, Spectrogon, and OCLI render claims 1–28 and 30–58 of the ’813 patent unpatentable based on obviousness. For the reasons given below, after consideration of the Petition, the arguments in the Patent Owner Response, and the evidence of record, we conclude that FLIR has shown by a preponderance of the

evidence that each of claims 1–28 and 30–58 of the ’813 patent is unpatentable as obvious.

FLIR also contends that the Merlin Brochure and Strachan render claims 1–5 and 9–20 of the ’496 patent unpatentable as obvious. Paper 2, 14–48 (IPR ’434). FLIR asserts that dependent claim 6, which depends from claim 1, is rendered unpatentable as obvious by Brengman, the Merlin Brochure and Strachan. *Id.* at 48–50. Finally, FLIR contends that dependent claim 7, which depends from claim 1, is rendered unpatentable as obvious by Hart, the Merlin Brochure, and Strachan. *Id.* at 50–51.

For the reasons that follow, we find by a preponderance of the evidence that FLIR has demonstrated that the challenged claims, claims 1–28 and 30–58 of the ’813 patent and claims 1–7 and 9–20 of the ’496 patent, are unpatentable as obvious.

1. Petitioner’s ’813 Patent Contentions

FLIR asserts that claims 1–4, 6, 8–22, 31, 37–40, 42–56, and 58 are unpatentable under 35 U.S.C. § 103(a) over the Merlin Brochure (Ex. 1007) and Strachan (Ex. 1008). Paper 2, 9, 34 (IPR ’411). FLIR also asserts dependent claims 5 and 7, which depend from claim 1, are unpatentable under 35 U.S.C. § 103(a) over the Merlin Brochure (Ex. 1007), Strachan (Ex. 1008), and Piety (Ex. 1018). Paper 2, 9, 54 (IPR ’411).

FLIR provides claim charts and citations to the Declaration testimony of Dr. Jonas Sandsten (Ex. 1006) supporting its contention that it would have been obvious to combine the Merlin Brochure and Strachan to yield the camera of the claims. *Id.* at 34–40, 41–53. FLIR asserts that “[i]t would have been an obvious design choice to one skilled in the art to replace the

standard 3-5 μm filter [disclosed in the Merlin Brochure] with a narrower filter that covers hydrocarbon gases of interest” disclosed in Strachan as a combination of known elements that yield predictable results. *Id.* at 34.

FLIR argues that the claimed camera is nothing more than the result of equipping Petitioner’s own Merlin-MID camera disclosed in the Merlin Brochure with a custom filter selected to monitor gas as disclosed in Strachan. Paper 2, 34 (IPR ’411). For example, FLIR contends that the Merlin Brochure discloses a passive infrared camera that includes a refrigeration system (a closed-cycle Stirling cryocooler) that contains a standard 3-5 μm cold filter within the interior of a Dewar flask, and an infrared sensor device (InSb focal plane array). *Id.* at 35. FLIR contends Strachan’s disclosure of the absorption band for multiple hydrocarbon gases and the selection of an appropriate filter to detect multiple gases, discloses the “the pass band for the single filter configuration” limitation of claim 1. *Id.* at 42–43. Indeed, FLIR further asserts that Strachan discloses that it was known to use catalogs of infrared absorption spectra for gases to select filters for use in an infrared camera with a narrow bandpass filter to monitor and detect hydrocarbon gas and vapor. *Id.* at 36; *see* Ex. 1008, 492–493.

FLIR argues that

Strachan shows that at the time of the alleged invention, it was known in the art to select a filter that covers the absorption band of more than one gas of interest and to use the selected filter in a passive infrared camera to detect leaks of the gases of interest.

Paper 2, 37 (IPR ’411); Ex. 1006 ¶ 80.

With respect to independent claim 1 of the ’813 patent, FLIR shows that the Merlin Brochure discloses a camera for detecting gas, wherein the

Merlin Brochure discloses “a single filter configuration” in the bandpass filter (cold filter) that is less than 200 nm. Paper 2, 20–31 (IPR ’411)(citing Ex. 1007, 3). FLIR further alleges that Strachan discloses the absorption of various hydrocarbon gases and the selection of filters for such detection. Paper 2, 37 (IPR ’411) (citing Ex. 1008, 493). In addition, FLIR asserts that the Merlin Brochure and Strachan disclose producing visual images of gas detected at various ambient conditions and temperatures. Paper 2, 40 (IPR ’411) (citing Ex. 1006 ¶ 74; Ex. 1008, 492; Ex. 1007, 3).

In IPR ’065, FLIR asserts that claims 23, 25, 28, and 30, which depend from independent claim 1, are unpatentable as obvious over the Merlin Brochure (Ex. 1007) and Strachan (Ex. 1008). Paper 2, 17–26 (claim 1), 26–28 (claims 23, 25, 28, and 30). In support of its contentions, FLIR provides claim charts and citations to Dr. Sandsten’s testimony (Ex. 1006). *Id.*

FLIR also contends that claims 23, 33, and 35, which depend from independent claim 1, are unpatentable as obvious in view of Kulp (Ex. 1012) and Merlin User’s Guide (Ex. 1011). Paper 2, 41–48 (IPR ’065). FLIR provides claim charts and citations to the testimony of Dr. Sandsten (Ex. 1006) in support of its contentions. *Id.* FLIR argues that Kulp discloses all the limitations of claim 1, expressly or inherently, except for the “refrigeration portion” limitation of claim 1. Paper 2, 41–43(IPR ’065). With respect to refrigeration, FLIR argues that it would have been obvious to locate the cooled filters and array disclosed in Kulp within the refrigeration portion disclosed in the Merlin User’s Guide as it represents an obvious design choice. Paper 2, 43–44 (IPR ’065) (citing Ex. 1006 ¶¶ 98–100).

FLIR provides claim charts, citations to the testimony of Dr. Sandsten and analysis in support of its contentions that (1) claims 27, 32–35, and 41 are unpatentable as obvious in view of Merlin Brochure, Strachan, and Spectrogon (Paper 2, 28–37 (IPR '065)); and (2) claims 24, 26, 36, and 57 are unpatentable as obvious in view of Merlin Brochure, Strachan, and OCLI (Paper 2, 38–41 (IPR '065)). FLIR relies on the filter characteristics disclosed in Spectrogon and OCLI for “the pass band for the filter configuration” limitations of dependent claims 24, 26, and 27.

With respect to Kulp (Ex. 1012) and the Merlin User’s Guide (Ex. 1011), FLIR provides claim charts, analysis and citations to the testimony of Dr. Sandsten in support of its contentions that Kulp and the Merlin User’s Guide render dependent claims 23, 33, and 35 (which depend from claim 1) unpatentable as obvious. Paper 2, 41–48 (IPR '065). FLIR asserts the Kulp discloses every limitation of claims 1, 23, 33, and 35, except for the limitations for “an infrared sensor device located in the interior of the refrigerated portion” and “a single filter configuration located in the interior of the refrigerated portion” as recited in claim 1. *Id.* at 44–47. FLIR argues that

it would have been obvious, in view of the Merlin User’s Guide, to modify the camera of Kulp, which already discloses a cooled filter and a cooled infrared sensor device, to locate both the cooled filter and cooled infrared sensor device in the interior of a refrigeration portion, as disclosed in the Merlin User’s Guide.

Id. at 44; Ex. 1006 ¶¶ 99–100.

With respect to “the pass band for the filter configuration” limitations of dependent claims 25, 27, 28, 30, 32, 34, and 41, which depend from claim

1, FLIR provides citations to Spectrogon to disclose the filter characteristics, in combination with the Kulp and the Merlin User's Guide to disclose the limitations of independent claim 1. Paper 2, 48–52 (IPR '065). Similarly, FLIR provides citations to OCLI in combination with Kulp and the Merlin User's Guide to disclose “the pass band for the filter configuration” and “optical bandpass filter” limitations of dependent claims 24, 26, 36, and 57. *Id.* at 53–54.

2. *Petitioner's '496 Patent Contentions*

FLIR also contends that the Merlin Brochure and Strachan render claims 1–5 and 9–20 of the '496 patent obvious. Paper 2, 14–48 (IPR '434). FLIR provides claim charts, analysis and citations to the testimony of Dr. Sandsten in supports of its contentions that independent claim 1, 18, 19, and 20 are unpatentable as obvious in view of the Merlin Brochure and Strachan. *Id.* at 14–47.

FLIR asserts that dependent claim 6, which depends from claim 1, is rendered unpatentable as obvious by Brengman, the Merlin Brochure and Strachan. *Id.* at 48–50. Finally, FLIR contends that dependent claim 7, which depends from claim 1, is rendered unpatentable as obvious by Hart, the Merlin Brochure and Strachan. *Id.* at 50–51. In support of its contentions, FLIR provides claim charts and citations to the testimony of Dr. Standsten showing that the combination of the Merlin Brochure and Strachan with Hart or Brengman discloses the limitations of dependent claims 6 and 7. *Id.* at 48–51.

3. *Patent Owner Contentions*

LSI contends that FLIR has not met its burden because none of the asserted prior art teaches a system for detecting or visualizing gas leaks under (1) “variable ambient conditions” as recited in the challenged independent claims or (2) using a “single filter configuration located in the interior of the refrigerated portion” as recited in the challenged claims. PO Resp. 1–2. LSI also argues that FLIR fails to articulate a fact-based rational underpinning for a person of ordinary skill in the art to combine the references. *Id.* at 2. Instead, LSI argues that the prior art teaches away from use of passive-IR to detect gas leaks. *Id.* Finally, LSI asserts that secondary considerations of non-obviousness show that the invention is non-obvious. *Id.* at 2–3. We address LSI’s contentions below.

a. *“Variable Ambient Conditions” and “Under “Normal Operating Conditions”*

LSI contends that the inventive feature that differentiates the patents at issue from the prior art is the detection of leaks in the “real-world” setting. PO Resp. 24. The claim limitations requiring detection under “variable ambient conditions” (all challenged claims) and “normal operating conditions” (the challenged claims of the ’496 patent). As discussed above, we disagree with LSI’s contention that ambient conditions and normal operating conditions require operating under a “full range of normal operating conditions, such as different temperatures or sunlight; and would not encompass prior art systems that could image gases only within a narrow range of field conditions, such as temperature.” *Id.* at 27.

We are not persuaded by LSI because the claims at issue do not require imaging gas under any specific conditions. At oral argument, LSI argued that “the claims cover essentially or require a camera that can image a gas under the range of expected ambient—variable ambient conditions around the leak. . . . [I]n order for this to work in the field that’s what it has to do.” Tr. 62:7–11. However, LSI concedes that claims at issue do not specify what the normal operating conditions would be and that such conditions would vary depending on the application. Tr. 62:23–24, 63:6–8. LSI’s restrictive reading of the claims is not supported by the specifications or claims of the ’496 or ’813 patents. As discussed above, we conclude that the broadest reasonable construction of “variable ambient conditions” (all challenged claims) and “normal operating conditions” (the challenged claims of the ’496 patent) is the ambient conditions of the area around the leak.

Accordingly, we are not persuaded by LSI’s argument that the imaging of gas in Strachan and Kulp under artificial or controlled conditions means that it does not teach the claim limitations for “variable ambient conditions” and “normal operating conditions.” PO Resp. 28–30. For example, LSI’s expert, Dr. Martini, agreed that Kulp only monitored the ambient temperature of the test, and did not strictly control the temperature. Ex. 1032, 42:11–43:7. Indeed, Kulp only discloses a passive IR system that imaged a gas plume whose shape and concentration was controlled as part of the test comparing active and passive IR gas detection. Ex. 1012, 270, 275. Although Kulp uses a sandpaper backdrop in his test, we credit the cross-examination testimony of LSI’s expert Dr. Martini, who testified that the sandpaper was used to mimic the earth’s surface and was used to maintain

consistency between the tests of the active versus passive IR systems.
Ex. 1032, 65:5–66:25.

We also disagree with LSI's characterization of Kulp as requiring that certain temperature and/or emissivity differences between gas and the background must always exist to image gas. PO Resp. 15. We agree with FLIR that Kulp's discussion of the differences in temperature between the gas and background acknowledges that some Delta-T (temperature difference between the background and target gas) is necessary for a passive IR system to detect gas. Reply 11 (citing Ex. 1036 ¶¶ 50, 53). We also credit the testimony of FLIR's witness, Dr. Sandsten, over LSI's witness, Dr. Martini, that Kulp imaged gases at different times of the day and at different temperatures. Ex. 1006 ¶ 55.

Furthermore, we are also not persuaded by LSI's proffered testimony characterizing Strachan as only imaging gases under artificially uniform conditions. PO Resp. 28 (citing Ex. 2084 and Ex. 2051). Because the '813 and '496 patent do not specify any particular conditions, LSI's argument and testimony is not consistent with what the claims require. Second, we do not find the testimony of Dr. Martini (Ex. 2084), Dr. Hausler and Dr. Hossack (Ex. 2051) cited by LSI to be persuasive on the disclosure of Strachan. PO Resp. 28. As Dr. Hausler, an LSI expert, stated under cross-examination, the physics of whether gas can be imaged depend on the relative difference in temperature (Delta-T) between the gas and the background, regardless of whether the conditions are controlled or uncontrolled. Ex. 1029, 83:9–84:3. We find that Strachan discloses that practical quality images of hydrocarbon gas can be obtained at various temperatures. Ex. 1008, 497; Reply 9. We also find that a person of

ordinary skill in the art would understand that the study disclosed in Strachan is done to explore the feasibility of imaging gas in uncontrolled settings. *See* Ex. 1030, 71:19–24. Accordingly, we find that both Strachan and Kulp disclose the ambient or normal conditions recited in the challenged claims.

b. “visible image of a leak” with a “single filter configuration”

LSI contends that the Merlin Brochure and Merlin User’s Guide do not disclose producing a “visible image of a leak” with a “single filter configuration” as recited in the challenged claims. PO Resp. 35–38. We do not agree. First, we do not find convincing the testimony of Dr. Parrish (Ex. 2068) or Dr. Martini (Ex. 2084) regarding the filter wheel location in the Merlin references or whether the Merlin references read on the “single filter configuration” limitation. PO Resp. 35–38.

Second, the Merlin Brochure states that the chemical signatures in aircraft, rocket and missile exhaust can be performed with the “filter wheel option available for the Merlin Lab camera [which] permits wavelength selectivity for spectroscopy and signature analysis.” Ex. 1007, 3; Ex. 1036 ¶ 66. We credit FLIR’s witness, Dr. Sandsten, that this filter option is described as a cold filter and an InSb detector which supports that a person of ordinary skill in the art would understand that it is located in the single cooling unit of the disclosed camera. Ex. 1007, 6; Ex. 1006 ¶ 71; Ex. 1036 ¶ 71. Indeed, Dr. Parrish, LSI’s witness, agrees that the Merlin Brochure describes the cold filter and InSb detector as being located in the Dewar (refrigeration unit). Ex. 1033, 33:14–17. The Merlin User’s Guide also

contains similar disclosure regarding the cold filter. Ex. 1011, 1–2, 51. Ex. 1039 ¶ 98.

We also disagree with LSI’s narrow understanding of a person of ordinary skill in the art as being limited to inserting a filter in the optical path outside of the refrigeration unit. PO Resp. 37. “A person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 421 (2007). We find that the Merlin Brochure or Merlin User’s Guide teaches that cold filter can be factory-optimized for wavelength selectivity. Ex. 1007, 2; Reply 7. In addition, we find that FLIR has shown by a preponderance of the evidence that the prior art recognized the practical use of cold filters. Ex. 1036 ¶ 79; *see* Ex. 2027, 114 (stating that the filter should be “cryogenically cooled along with the [detector]” to “achieve the full effect of a narrow-band imaging system”).

In sum, we are not persuaded by FLIR that the combination of the Merlin User’s Guide with Kulp or the Merlin references with Strachan fails to disclose “a single filter configuration located in the interior of the refrigerated portion” as recited in the challenged claims.

- c. *“visually detecting the leak based on the visible image under the variable ambient conditions” and “visually detecting a gas leak . . . emanating from a component of a group of components in different locations”*

The challenged claims of the ’496 patent recite “visually detecting the leak based on the visible image under the variable ambient conditions.”

LSI argues that the Merlin Brochure and Strachan cannot “detect” a leak because the references visually image known emissions whose location and composition are controlled. PO Resp. 39–40. As discussed above, we

construed “leak” to include known or unknown emissions. We do not agree with LSI that “visually detecting” is not taught in the Merlin Brochure, which discloses imaging of jet exhaust and detection of chemical signatures in the exhaust. Ex. 1007, 3. Thus, LSI’s arguments are not well founded.

We also are not persuaded by LSI’s argument that Merlin Brochure does not disclose detecting leaks from a group of components. PO Resp. 41–42. We find that the exhaust from an aircraft indicates that the Merlin Brochure discloses monitoring of a group of components that make up the aircraft exhaust. *See Reply 6 n.2*. Indeed, the image in the Merlin Brochure shows imaging half of an aircraft and not only the aircraft’s exhaust. Ex. 1007, 3.

d. Reason to Combine and Teaching Away

LSI argues that a person of ordinary skill in the art would not have combined the teachings of the cited references because the references teach away from the passive infrared configuration. We disagree.

“A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the [inventor].” *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). A reference does not teach away, however, if it merely expresses a general preference for an alternative invention but does not “criticize, discredit, or otherwise discourage” investigation into the invention claimed. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). We will not, however, “read into a reference a teaching away from a process where no

such language exists.” *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1364 (Fed. Cir. 2006).

LSI’s evidence that the Merlin references disclose an emission based instrument and that Kulp and Strachan disclose an absorption based instrument, does not show that the references teach away from their combination. Indeed, LSI’s citation to the testimony of Dr. Martini does not demonstrate that the Merlin references discourage their combination with Strachan or Kulp. To the contrary, the record shows that a person of ordinary skill in the art would have combined the filter teachings of Strachan with the camera disclosed in the Merlin references. Ex. 1030, 50:1–16, 84:14–85:19, 87:16–88:19, 160:4–14; *see* Ex. 1036 ¶ 22. Although LSI’s witness, Dr. Hossack, disputes where the filter would have been placed on a Merlin camera, he does not dispute that Strachan discloses modifying a similar camera to detect gas. Ex. 1030, 50:1–16, 84:14–85:19, 87:16–88:19; 160:4–14.

LSI’s argument that the combinations of the Merlin camera disclosed in the Merlin references would destroy the intended functionality of the camera and fundamentally alter its principle of operation is equally unpersuasive. *See* PO Resp. 49–52. LSI has not shown that modification of the Merlin camera as disclosed in the Merlin User’s Guide or Brochure would no longer be useful for imaging gas as described. We credit the testimony of Dr. Sandsten in finding that the Merlin MID operates on the principles of thermography before and after modification as disclosed in Kulp and Strachan. Ex. 1036 ¶ 74. In addition, modification of such a camera is expressly taught by Strachan and Kulp. Therefore, regardless of whether the possibility of modifying the Merlin MID camera was disclosed

in the Merlin references, the combination of Kulp and/or Strachan with the Merlin references teaches one of ordinary skill in the art that the standard filter could be replaced in a passive IR camera, such as the Merlin MID, to improve imaging. *See, e.g.*, Ex. 1030, 50:1–16, 84:14–85:19, 87:16–88:19; 160:4–14; Reply 15. Indeed, Strachan and Kulp both disclose that gas can be successfully imaged by optimizing the spectral selectivity of a passive IR system using a narrow bandpass filter tuned to the gases of interest. Kulp specifically discloses that a cold filter and Strachan includes a Dewar flask for cooling. Ex. 1008, 493; Ex. 1012, 270. LSI's arguments regarding the modifications of the camera disclosed in the Merlin references fail to address the teachings of the Merlin references in combination with Kulp and/or Strachan. *See In re Keller*, 642 F.2d 413, 426 (CCPA 1981) (attacking references individually cannot demonstrate nonobviousness; rather, the test is what the combined teachings of the references would have suggested to one of ordinary skill in the art).

LSI's contention that the references themselves teach away from their combination is mistaken. *See* PO Resp. 52–61. We are not persuaded by LSI's evidence and testimony that a person of ordinary skill in the art would have selected a different Merlin camera for gas detection and placed a warm filter behind the lens or on a filter wheel rather than insert a narrow bandpass cold filter into the Dewar. PO Resp. 52–57. The fact that the Merlin Brochure discloses multiple cameras for imaging gas does not indicate that it discourages the use of the Merlin MID camera over the uncooled Microbolometer camera. Reply 16. We find that a person of ordinary skill in the art interested in imaging gas within the range of the Merlin MID camera would have modified the filter as disclosed by Strachan and Kulp.

Reply 13. Use of the cold filters disclosed in Strachan and Kulp in the camera of the Merlin references amounts to use of a known element for its known use to achieve an expected result. *KSR*, 550 U.S. at 416.

We also disagree with LSI's argument that Strachan and Kulp both teach that passive IR does not work under normal operating (or variable) ambient conditions, such that a person of ordinary skill in the art would not look to a passive IR system as a solution for gas leak detection in the field. PO Resp. 59. LSI's characterization of Strachan and Kulp is not supported by the plain reading of the references themselves, which do not criticize, discredit, or otherwise discourage use of passive IR. To the contrary, Strachan and Kulp expressly describe imaging gas using passive IR imaging with appropriate narrow cold filters and suggest improvements for future passive IR gas imaging systems. *See* Ex. 1008, 493; Ex. 1012, 270. In addition, LSI's erroneous understanding of Strachan and Kulp is based on the narrow construction of normal operating (or variable) ambient conditions, which we previously rejected.

Finally, we are not persuaded by LSI's argument that active IR or warm filtering are taught in Strachan and Kulp as solutions for imaging gas where the temperature difference between the gas and background is small, (the low Delta-T problem). PO Resp. 60. The claims at issue in the challenged patents do not require any specific operating conditions, nor do they require any specific low or high Delta-T. Thus, we are not persuaded by Dr. Martini's testimony that Kulp and Strachan teach away when there is a low Delta-T. PO Resp. 58–60.

Even assuming that the Merlin Brochure does not disclose modification of the cold filter as LSI argues, such an omission is not

teaching away. In addition, with respect to LSI's arguments regarding the permanence of the modification, this also is not teaching away. Choosing where to modify the Merlin MID camera as disclosed in the Merlin Brochure or Merlin User's Guide with the cold filter disclosed in Kulp or Strachan is a simple design choice. The preponderance of the evidence indicates that several prior art references taught putting cold filters narrowband filters inside the refrigerator portion to improve imaging of gas. Ex. 2027, 114; Ex. 1031, 39:22–41:10 (stating that it was known to put the filter and sensor in the same refrigerator portion).

We also do not agree with LSI's frequent reference to FLIR's analysis as being based on hindsight. PO Resp. 23, 61, 66–70. LSI's argument mischaracterizes the disclosures of the prior art, in particular Strachan and Kulp, and ignores the contemporary evidence that filters should be cooled to improve narrowband imaging systems. *See* Ex. 1008, 497; Ex. 1012, 276; Ex. 2027, 114; Ex. 1031, 18:19–19:21, 53:17–54:2; Ex. 1033, 33:14–17, 35:10–36:7; Ex. 1030, 97:21–24; Ex. 1032, 110:20–111:6; Ex. 1039 ¶¶ 98–101; Ex. 1045 ¶ 5.

Based on the full record, we find, by a preponderance of the evidence, that FLIR has provided articulated reasons with rational underpinnings for the proposed combinations of prior art. FLIR's evidence shows that combinations of the Merlin Brochure with Strachan or the Merlin User's Guide with Kulp is the combination of known elements that yield predictable results. *See* Paper 2, 17–18 (citing Ex. 1006 ¶ 55), 20–21 (citing Ex. 1006 ¶ 60) (IPR '065); Paper 2, 37–38 (citing Ex. 1006 ¶ 81) (IPR '411). In addition, we find by a preponderance of the evidence that the prior art demonstrates that it would have been an obvious design choice to one skilled

in the art to replace the filters disclosed in Strachan and Kulp to target hydrocarbon gases of interest using the camera disclosed in the Merlin Brochure and Merlin User's Guide. Paper 2, 38–39 (citing Ex. 1006 ¶¶ 81–82) (IPR '411). Accordingly, we do not agree with LSI that FLIR's expert testimony is conclusory. PO Resp. 23, 61, 67–68.

4. *Secondary Considerations*

LSI argues that there is overwhelming evidence that demonstrates the nonobviousness of the challenged claims. PO Resp. 74–83. In evaluating whether an invention would have been obvious, “[s]uch secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.” *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). While the party seeking to demonstrate nonobviousness has the burden to introduce evidence supporting such objective indicia, *see In re Huang*, 100 F.3d 135, 139 (Fed. Cir. 1996), the ultimate burden of persuasion never shifts to Patent Owner, *see* 35 U.S.C. § 316(e).

Objective indicia should be considered along with all of the other evidence in making an obviousness determination. *See Eurand, Inc. v. Mylan Pharm. Inc. (In re Cyclobenzaprine Hydrochloride Extended–Release Capsule Patent Litig.)*, 676 F.3d 1063, 1076–77 (Fed. Cir. 2012) (“It is to be considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.”) (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538–39 (Fed. Cir. 1983)). Factual inquiries for an obviousness determination include secondary considerations

based on evaluation and crediting of objective evidence of nonobviousness. *Graham*, 383 U.S. at 17. Secondary considerations may include any of the following: long-felt but unsolved needs, failure of others, unexpected results, commercial success, copying, licensing, and praise.

“For objective evidence to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention.” *GPAC*, 57 F.3d at 1580. In particular, the objective indicia “must be tied to the novel elements of the claim at issue” and must “be reasonably commensurate with the scope of the claims.” *Institut Pasteur & Universite Pierre Et Marie Curie v. Focarino*, 738 F.3d 1337, 1347 (Fed. Cir. 2013) (quoting *Rambus Inc. v. Rea*, 731 F.3d 1248, 1257 (Fed. Cir. 2013)).

LSI provides voluminous evidence the inventor, David Furry, modified an Indigo MID camera (now manufactured by FLIR) to produce a prototype passive infrared camera and achieve unexpected results. PO Resp. 75 (citing Ex. 2068 ¶¶ 15, 18, 30–38; Ex. 2063 ¶¶ 28–29; Ex. 2051 ¶ 80). LSI contends that Mr. Furry’s modified camera “allowed the operator to quickly and efficiently identify the source of hydrocarbon leaks, and, perhaps most importantly for field use, *it worked under normal plant operating conditions and variable ambient conditions*, such as variable atmospheric temperatures and wind conditions.” PO Resp. 75 (emphasis added) (citing Ex. 2082, 001–002, 005, 007, 013–16, 17–32, 33–38).

As discussed above, the challenged claims do not recite or require any specific conditions. Indeed, the challenged claims require imaging of known or unknown gas under “some” operating conditions. Thus, there is no nexus that is tied to the novel elements of the claims at issue or that are reasonably

commensurate with the scope of the claims. Contrary to LSI's position that the Furry camera was the only solution that worked at field trials of leak detection systems (PO Resp. 75–76), the evidence shows that all of the tested imaging systems successfully imaged gas. Ex. 2009, ES-7–ES-9, 2-15, 4-11; Ex. 1036 ¶ 109. The record shows that Kulp and Strachan both successfully imaged gas using passive IR cameras with appropriate cold filters.

Although there is evidence that the FLIR-marketed GasFindIR camera that was initially licensed by Mr. Furry and LSI was a market leader for leak detecting cameras (PO Resp. 76–77), LSI has not shown a sufficient nexus between the novel elements of the claims at issue and the GasFindIR camera or its predecessors.

a. Long Felt Need

LSI contends that the long felt need to find alternatives to the EPA's Method 21 for leak detection and repair and the failure of others to find a workable solution supports its contentions of nonobviousness. PO Resp. 77–78. “Evidence that an invention satisfied a long-felt and unmet need that existed on the patent's filing date is a secondary consideration of nonobviousness.” *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1332 (Fed. Cir. 2009). To show a long-felt need, LSI must introduce evidence to show when such a need first arose and how long this need was felt, and must introduce evidence to show that this need was met by the patented invention. *See id.* “[L]ong-felt need is analyzed as of the date of an articulated identified problem and evidence of efforts to solve that

problem.” *Tex. Instruments, Inc. v. U.S. Int’l Trade Comm’n*, 988 F.2d 1165, 1178 (Fed. Cir. 1993).

As discussed above, LSI has not provided persuasive evidence showing the intrinsic nexus to the challenged claims and how the claimed invention resolved the long-felt need. Although evidence shows that camera-based solutions have been adopted as alternatives to the EPA’s Method 21, the cameras are not limited to LSI’s claimed passive camera. Ex. 1034, 90:5–14, 96:2–97:1. Indeed, LSI has not shown that the claimed invention created the alternative to Method 21. Instead, we find that the evidence shows that active and passive IR cameras successfully imaged gas emissions in the API tests and in the prior art. Ex. 2009, ES-7–ES-9, 2-15, 4-11; Ex. 1008; Ex. 1012. The novel functions and features that LSI identifies as necessary “to develop a workable solution for imaging gas leaks” and the failure of others to find a workable solution are not commensurate in scope with the challenged claims, which broadly require imaging gas at some variable ambient conditions.

b. Skepticism of Others and Teaching Away

We are not persuaded by LSI’s evidence that the prior art teaches away from the use of modified passive IR cameras for gas leak detection. PO Resp. 78–79. For the reasons discussed above, we do not find that the prior art references teach away from their combination. In addition, LSI’s evidence of skepticism of others does not show evidence based on the claimed limitations of the challenged patents. At best, LSI’s evidence shows the business-related issues Mr. Furry encountered in obtaining and modifying the passive IR camera. PO Resp. 79 (citing Ex. 2068 ¶¶ 16, 21;

Ex. 2176–Ex. 2178 (deposition exhibits to Ex. 2063)). Indeed, evidence shows that financial considerations in the ordering and modifications prompted the skepticism LSI cites. Ex. 1031, 149:25–152:11. In addition, LSI’s evidence of unexpected results when Mr. Furry built his passive IR camera is not commensurate with the scope of the challenged claims, nor do they comport with the prior art, Strachan and Kulp, which disclose imaging gas at variable conditions.

c. Commercial Success, Copying, and Industry Praise

Commercial success is relevant only if it flows from the merits of the invention claimed. *Sjolund v. Musland*, 847 F.2d 1573, 1582 (Fed. Cir. 1988). Thus, a “nexus” is required between the merits of the claimed invention and any objective evidence of nonobviousness offered, if that evidence is to be given substantial weight en route to a conclusion on obviousness. *Stratoflex*, 713 F.2d at 1539; *see also Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311–12 (Fed. Cir. 2006) (“Evidence of commercial success, or other secondary considerations, is only significant if there is a nexus between the claimed invention and the commercial success.”).

LSI has presented evidence that FLIR developed and marketed its GasFindIR camera under license and a business development agreement. PO Resp. 81–82. However, LSI has not sufficiently tied the success to the novel elements of the claim at issue. Indeed, the unmodified Merlin MID camera as disclosed in the Merlin references predates the GasFindIR camera and Mr. Furry’s Hawk camera, which LSI contends FLIR copied. PO Resp.

81 (stating that FLIR “took the specifications for David Furry’s Hawk camera and copied them exactly to make the GasFindIR camera”)

Even assuming *arguendo* that the GasFindIR camera is a copy of Mr. Furry’s Hawk Camera and shows evidence of commercial success, the only feature LSI identifies with a nexus to the claimed invention that is not present in the preexisting Merlin MID camera is the use of a narrowband cold filter that is described in marketing material for the GasFindIR camera. PO Resp. 81 (citing Ex. 2082, 020). Such objective evidence of nonobviousness cannot overcome the disclosures that narrowband cold filters were disclosed in the prior art, Kulp and Strachan. *See Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d 1358, 1371 (Fed. Cir. 2011).

LSI also has failed to show that the commercial praise (PO Resp. 82–83) is due to novel aspects of the claimed invention. For example, LSI’s emphasis on Mr. Furry inventing the first “working system for imaging gas leaks under variable field conditions” (PO Resp. 83 (citing Ex. 2068 ¶¶ 33–35)) is not commensurate in scope with the claims which are not limited to working under field conditions as LSI asserts.

d. Secondary Consideration Conclusion

Where the evidence shows that the commercial success derived from some aspect of the prior art, or was the result of economic and commercial factors unrelated to the claimed limitations, evidence of commercial success will not be sufficient to demonstrate nonobviousness of a claimed invention. *See In re DBC*, 545 F.3d 1373, 1384 (Fed. Cir. 2008); *see also Tokai*, 632 F.3d at 1369–70 (finding that secondary considerations did not overcome obviousness case).

In the present case, even where evidence of commercial success and copying is present, the nexus between the claimed invention and secondary consideration evidence that LSI relies on is not commensurate with the claims at issue. Having considered the full record, we find that LSI's evidence of secondary considerations, including evidence of commercial success, copying and industry praise, does not outweigh FLIR's strong prima facie case of obviousness. *See Tokai*, 632 F.3d at 1370; *see also Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010) (discussing cases). LSI's evidence regarding normal field condition success is not commensurate in scope with the patent claims at issue, nor are they compelling enough to rebut the strong prima facie showing of obviousness.

5. *Conclusion as to Obviousness*

Based on the full record including LSI's evidence of secondary considerations, we find that FLIR has shown by a preponderance of the evidence in IPR2014-00411 that the Merlin Brochure and Strachan disclose claims 1–4, 6, 8–22, 31, 37–40, 42–56, and 58 of the '813 patent; the Merlin Brochure, Strachan, and Piety disclose claims 5 and 7 of the '813 patent; the Merlin Brochure and Strachan disclose claims 1–5 and 9–20 of the '496 patent; the Merlin Brochure, Strachan, and Brengman disclose claim 6 of the '496 patent; and the Merlin Brochure, Strachan, and Hart disclose claim 7 of the '496 patent.

Finally, in IPR2015-00065, FLIR has shown by a preponderance of the evidence that the Merlin Brochure and Strachan disclose claims 23, 25, 28, and 30 of the '813 patent; the Merlin Brochure, Strachan, and Spectrogon disclose claims 27, 32–35, and 41 of the '813 patent; the Merlin

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Brochure, Strachan, and OCLI disclose claims 24, 26, 36, and 57 of the '813 patent; the Merlin User's Guide and Kulp disclose claims 23, 33, and 35 of the '813 patent; the Merlin User's Guide, Kulp, and Spectrogon disclose 25, 27, 28, 30, 32, 34, and 41 of the '813 patent; and the Merlin User's Guide, Kulp, and OCLI disclose 24, 26, 36, and 57 of the '813 patent.

F. Motions to Seal

LSI filed unredacted and redacted versions of the Patent Owner Response (Papers 51 and 64 (IPR '411)) and redacted exhibits (Ex. 2073, Ex. 2074, and Ex. 2082) along with unopposed Motions to Seal (Papers 48, 61, and 98), a default protective order (Paper 49) and stipulated protective order (Paper 50). Identical redacted papers, unopposed motions, and protective orders were filed in IPR2015-00065 (*see* Papers 34, 35, 36, 37; Ex. 2113, Ex. 2114, Ex. 2122).

There is a strong public policy in favor of making information filed in an *inter partes* review open to the public, especially because the proceeding determines the patentability of claims in an issued patent and, therefore, affects the rights of the public. Under 35 U.S.C. § 316(a)(1) and 37 C.F.R. § 42.14, the default rule is that all papers filed in an *inter partes* review are open and available for access by the public; however, a party may file a concurrent motion to seal and the information at issue is sealed pending the outcome of the motion. It is only "confidential information" that is protected from disclosure. 35 U.S.C. § 316(a)(7); *see* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,760 (Aug. 14, 2012).

The standard for granting a motion to seal is "for good cause." 37 C.F.R. § 42.54(a). The party moving to seal bears the burden of proof in

showing entitlement to the requested relief, and must explain why the information sought to be sealed constitutes confidential information. 37 C.F.R. § 42.20(c). As set forth in the Office Patent Trial Practice Guide, there is an expectation that information will be made public if identified in this Final Written Decision. 77 Fed. Reg. at 48,761.

Based on our review, we conclude that Exhibits 2073, 2074, and 2082 in IPR '411 and Exhibits 2113, 2114, and 2122 in IPR '065 and the unredacted Patent Owner Response currently filed under seal contain confidential business information. The contents of those documents that are asserted as constituting confidential business information have not been relied upon in this Final Written Decision. We are persuaded that good cause exists to have those documents remain under seal.¹⁶

III. CONCLUSION

In IPR2014-00411, FLIR has demonstrated by a preponderance of the evidence that claims 1–22, 31, 37–40, 42–56, and 58 of the '813 patent, and claims 1–7 and 9–20 of the '496 patent are unpatentable based on the following grounds of unpatentability:

¹⁶ The sealed documents record will be maintained undisturbed pending the outcome of any appeal taken from this Final Written Decision. At the conclusion of any appeal proceeding, or if no appeal is taken, the documents will be made public. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. at 48,760–61. Either party may file a motion to expunge the sealed documents from the record pursuant to 37 C.F.R. § 42.56. Any such motion will be decided after the conclusion of any appeal proceeding or the expiration of the time period for appealing.

(1) Claims 1–4, 6, 8–22, 31, 37–40, 42–56, and 58 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin Brochure and Strachan;

(2) Claims 5 and 7 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin Brochure, Strachan, and Piety;

(3) Claims 1–5 and 9–20 of the '496 patent under 35 U.S.C. § 103(a) over the Merlin Brochure and Strachan;

(4) Claim 6 of the '496 patent under 35 U.S.C. § 103(a) over the Merlin Brochure, Strachan, and Brengman; and

(5) Claim 7 of the '496 patent under 35 U.S.C. § 103(a) over the Merlin Brochure, Strachan, and Hart.

In IPR2015-00065, FLIR has demonstrated by a preponderance of the evidence that claims 23–28, 30, 32–36, 41, and 57 of the '813 patent are unpatentable based on the following grounds of unpatentability:

(1) Claims 23, 25, 28, and 30 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin Brochure and Strachan;

(2) Claims 27, 32–35, and 41 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin Brochure, Strachan, and Spectrogon;

(3) Claims 24, 26, 36, and 57 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin Brochure, Strachan, and OCLI;

(4) Claims 23, 33, and 35 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin User's Guide and Kulp;

(5) Claims 25, 27, 28, 30, 32, 34, and 41 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin User's Guide, Kulp, and Spectrogon; and

(6) Claims 24, 26, 36, and 57 of the '813 patent under 35 U.S.C. § 103(a) over the Merlin User's Guide, Kulp, and OCLI.

IV. ORDER

For the reasons given, it is

ORDERED that, based on a preponderance of the evidence, claims 1–28 and 30–58 of U.S. Patent No. 8,426,813 and claims 1–7 and 9–20 of U.S. Patent No. 8,193,496 are held unpatentable; and

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

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