

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. AND SAMSUNG
ELECTRONICS AMERICA, INC.

Petitioners v.

MANUFACTURING RESOURCES INTERNATIONAL, INC.
Patent Owner

Case IPR2023-00221

Patent 11,013,142

PATENT OWNER'S RESPONSE

TABLE OF CONTENTS

I.	INTRODUCTION	9
II.	MRI’S THERMAL MANAGEMENT SYSTEM AND SAMSUNG’S FAILURES	10
A.	Background of the Technology	10
B.	The ’142 Patent’s Innovative Cooling System	12
III.	LEVEL OF SKILL IN THE ART	15
IV.	PETITIONER’S EXPERT TESTIMONY SHOULD BE GIVEN LITTLE WEIGHT	16
V.	CLAIM CONSTRUCTION	18
VI.	PETITIONER MISREADS THE CHALLENGED PATENT.....	19
A.	The proper plain and ordinary meaning of “heat exchanger” is the known device in the art of thermal management referred to as a “heat exchanger”	20
B.	Petitioner improperly attempts to transform a heat exchanger into anything that exchanges heat in order to sweep in prior art.	24
VII.	PETITIONER FAILS TO SHOW THE ASSERTED PATENTS ARE OBVIOUS.....	28
A.	Karppanen in view of the knowledge of a POSITA does not render the Challenged Claims obvious.	28
1.	Claims 1, 3, 6, 12, and 15: Karppanen does not render obvious a “closed loop” under Petitioner’s Proposed Construction	28
2.	Claims 3, 6, and 15: Karppanen does not render obvious a “heat exchanger”	31
i.	Karppanen does not describe a heat exchanger	31
ii.	Petitioner and Its Expert Argue for an Insupportably Broad Meaning of Heat Exchanger	35

3.	Claims 3, 6, and 15: Karppanen does not disclose a heat exchanger that “forms part of said open loop airflow pathway” and “forms part of said closed loop gas circulation pathway”	37
B.	Yare in view of the knowledge of a POSITA does not render the Challenged Claims obvious.....	40
1.	Claims 1, 6, and 12: Yare does not render obvious a “closed loop gas circulation pathway contained within the housing wherein a portion of said closed loop gas circulation pathway passes between said transparent cover panel and said electronic image assembly”	40
i.	Yare Is Silent as to the Form of Electronic Image Assembly Cooling System Within the Electronic Display	41
ii.	Petitioner and Its Expert Misread Yare	44
2.	Claims 3, 6, and 15: Yare does not render obvious a heat exchanger that “forms part of said open loop airflow pathway” and “forms part of said closed loop gas circulation pathway”	47
VIII.	NO MOTIVATION TO COMBINE KARPPANEN OR YARE WITH LARSON	50
IX.	OBJECTIVE INDICIA SHOW THE NON-OBVIOUSNESS OF THE CHALLENGED CLAIMS	52
A.	There is a Nexus to Both Samsung and MRI Products.....	52
B.	Samsung’s Long Felt Need, Failure, and Copying	53
C.	Commercial Success.....	59
D.	Industry Praise and Willingness of Others to License the ’142 Patent	61
X.	CONCLUSION.....	65

EXHIBIT LIST

Exhibit	Description	Confidentiality Designation
2001	MRI-ITC-1331_0000435123-24 (4/24/2020 Romulus Stoain email to Dunn)	Filed Publicly
2002	MRI-ITC-1331_0000435125-27, Mutual Non-Disclosure Agreement	Filed Publicly
2003	MRI-ITC-1331_0000435133-34 (5/4/2020 Romulus Stoain email to Dunn)	Filed Publicly
2004	Response to Office Action filed December 18, 2020	Filed Publicly
2005	Office Action mailed April 11, 2018, in Application No. 12/234,360	Filed Publicly
2006	Office Action mailed August 11, 2011, in Application No. 12/237,365	Filed Publicly
2007	Office Action mailed November 24, 2020, in Application No. 16/983,842	Filed Publicly
2008	Decision Denying Institution of <i>Inter Partes</i> Review of U.S. Patent No. 8,854,572 in <i>Civiq Smartscales LLC v. Manufacturing Resources International, Inc.</i> , IPR2018-00774, Paper 6 (PTAB Sep. 25, 2018)	Filed Publicly
2009	Curriculum Vitae of Dr. Himanshu Pokharna	Filed Publicly
2010	U.S. Provisional Application No. 61/138,736 (the “’736 Application”)	Filed Publicly
2011	U.S. Provisional Application 61/033,064 (the “’064 Application”)	Filed Publicly
2012	MRI-ITC-1331_0000092739	Filed Publicly
2013	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Day 1 Public Hearing Tr. (June 26, 2023)	Filed Publicly
2014	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Day 4 Public Hearing Tr. (June 29, 2023)	Filed Publicly
2015	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Day 5 Public Hearing Tr. (June 30, 2023)	Filed Publicly

Exhibit	Description	Confidentiality Designation
2016	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Transcript, Deposition of Chris Bolton (Feb. 23, 2023)	Filed Sealed in Its Entirety, Parties and Board Only
2017	Frank Incropera et al., FUNDAMENTALS OF HEAT AND MASS TRANSFER, at 670 (2006).	Filed Publicly
2018	European Patent Application No. 1 951 020 A210("Wellhofer")	Filed Publicly
2019	Certified translation of Japanese Patent No. 3118907 to Ohta ("Ohta")	Filed Publicly
2020	U.S. Patent No. 6,798,655 to Nagashima, et al. ("Nagashima")	Filed Publicly
2021	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Transcript, Deposition of Robert Smith-Gillespie (April 26, 2023)	Filed Publicly
2022	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Transcript, Deposition of Robert Smith-Gillespie (Feb. 20, 2023)	Filed Publicly
2023	<i>See IP ratings, Int'l Electrotechnical Comm'n</i> , https://www.iec.ch/ip-ratings (last visited Aug. 29, 2023) ("IEC Standards")	Filed Publicly
2024	Declaration of Dr. Himanshu Pokharna ("Pokharna Dec.")	Filed Publicly
2025	Samsung White Paper: Taking the Message Outdoors (Dec. 4, 2015)	Filed Publicly
2026	Website - Samsung White Paper: Taking the Message Outdoors (Dec. 4, 2015) https://insights.samsung.com/2015/12/04/taking-the-message-outdoors-with-high-brightness-display-tech-white-paper/ (last visited Sept. 26, 2023)	Filed Publicly
2027	Respondents' Notice of Prior Art, <i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331 (Jan. 4, 2023).	Filed Publicly
2028	Digital Solutions for Convenience Stores, Samsung, dated 2021	Filed Publicly

Exhibit	Description	Confidentiality Designation
2029	Sung Ki Kim deposition transcript excerpts, <i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331 (Mar. 31, 2023)	Filed Sealed in Its Entirety, Parties and Board Only
2030	Sungsu Lee deposition transcript excerpts, <i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331 (Mar. 20, 2023)	Filed Sealed in Its Entirety, Parties and Board Only
2031	Wunkil Lee deposition transcript excerpts, <i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331 (Mar. 21, 2023)	Filed Sealed in Its Entirety, Parties and Board Only
2032	John Palmer deposition transcript excerpts, <i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331 (Mar. 16, 2023)	Filed Sealed in Its Entirety, Parties and Board Only
2033	U.S. Patent Application Publication No. 2006/0077636 A1 to Kim, dated Apr. 13, 2006	Filed Publicly
2034	U.S. Patent Application Publication No. 2006/0132699 A1 to Cho et al., dated Jun. 22, 2006	Filed Publicly
2035	U.S. Patent No. 7,948,575 to Oh et al., dated May 24, 2011	Filed Publicly
2036	Certified translation of Korean Unexamined Patent Application KR 10-2006-0016469 to Na, dated Feb. 22, 2006 (“Na”)	Filed Publicly
2037	U.S. Patent No. 7,800,706 B2 to Kim et al., dated Sep. 21, 2010)	Filed Publicly
2038	SEITC0027754 McDonald’s Outdoor DMB presentation, dated Mar. 2017	Filed Sealed in Its Entirety, Parties and Board Only
2039	Infringement Claim Chart for U.S. Patent No. 11,013,142, Samsung OH75 / OH85	Filed Publicly
2040	Samsung OH product sales spreadsheet, CX-1728C	Filed Sealed in Its Entirety, Parties and Board Only

Exhibit	Description	Confidentiality Designation
2041	SEITC0028579 Samsung Market Requirements Document, Outdoor LCD Signage, dated Apr. 23, 2021, and English translation	Filed Sealed in Its Entirety, Parties and Board Only
2042	SEITC0035224 [REDACTED], dated Mar. 24, 2016, and English translation	Filed Sealed in Its Entirety, Parties and Board Only
2043	SEITC0035259 [REDACTED]	Filed Sealed in Its Entirety, Parties and Board Only
2044	MRI-ITC-1331_0000046205 MRI Sales Detail	Filed Sealed in Its Entirety, Parties and Board Only
2045	Declaration of Alan Brand, <i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331 (Aug. 19, 2022)	Filed Sealed in Its Entirety, Parties and Board Only
2046	MRI-ITC-1331_0000444713 MRI Sales Detail	Filed Sealed in Its Entirety, Parties and Board Only
2047	Article – Sunlight and Solar Clearing, https://lg-mri.com/sunlight-and-solar-clearing/ (last visited Sept. 26, 2023)	Filed Publicly
2048	Letter from Chris Bolton (Vertigo Group) to Bill Dunn (MRI), dated Apr. 6, 2009	Filed Sealed in Its Entirety, Parties and Board Only
2049	Trademark and Technology License Agreement, dated Feb. 18, 2014	Filed Sealed in Its Entirety, Parties and Board Only

Exhibit	Description	Confidentiality Designation
2050	Joint Venture and Limited Liability Company Agreement, dated Jan. 8, 2014	Filed Sealed in Its Entirety, Parties and Board Only
2051	License Agreement, dated Aug. 27, 2008	Filed Sealed in Its Entirety, Parties and Board Only
2052	Confidential Agreement, dated Jan. 22, 2020	Filed Sealed in Its Entirety, Parties and Board Only
2053	Samsung Outdoor Installation Guide	Filed Publicly
2054	Claim Chart for U.S. Patent No. 11,013,142, MRI 75" & 86" Units	Filed Publicly

I. INTRODUCTION

Petitioner fails to meet its burden of establishing that claims 1-15 (collectively the “Challenged Claims”) of U.S. Patent No. 11,013,142 (the “’142 Patent” or “Challenged Patent”) are obvious in view of the cited prior art.

Petitioner, and its expert, misread the ’142 Patent and the prior art—ignoring clear disclosures of the patent, the understanding of a person of ordinary skill in the art (“POSITA”), and the basic teachings of the prior art. The Challenged Patent concerns thermal management systems for large format electronic display boards that are placed in direct sunlight or areas of high thermal load. Prior to the inventions disclosed in the Challenged Patent, existing thermal management schemes for electronic displays were either not sufficient to adequately cool the electronic display in outdoor and direct sunlight environments, or utilized air conditioning units that generated excess noise and condensation that threatened the long-term viability of the system. The Challenged Patent disclosed and claimed novel airflows and pathways, and the integration of specific thermal management devices. The combination of these elements enabled, for the first time, large format displays to be used outside in prolonged direct sunlight.

Petitioner also failed to rebut the substantial objective *indicia* of non-obviousness in its petition or in its expert’s declaration, evidence of which Samsung was indisputably aware. Using the inventions disclosed in the ’142

Patent, MRI created a novel market for outdoor electronic displays that led to

MRI's commercial success. Even Samsung recognized MRI's thermal management systems as a "unique and impressive" solution for companies desiring to replace outdoor static poster displays with electronic display panels. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Collectively, the secondary considerations are entitled to substantial weight and strongly corroborate the absence of obviousness. That is particularly true here where Petitioner's proposed combination relied on multiple modifications, all of which are undercut by operability problems they create. For at least these reasons, all Challenged Claims are patentable.

II. MRI'S THERMAL MANAGEMENT SYSTEM AND SAMSUNG'S FAILURES

A. Background of the Technology

The Challenged Patent generally describes to cooling systems and methods for electronic displays that are located in areas where thermal stability of the electronic display is at risk. '142 Patent at 1:59-61, 9:33-37. Often, such displays are located in outdoor environments, where high ambient heat and radiation from the sun create temperatures in excess of the electronic display's normal operating

range. *Id.* at 2:10-13, 2:19-20, 7:31-22. In addition to stress created by solar loading, electronic displays operating in outdoor environments must also be able to function in the areas with high pollution, dust, and humidity. *Id.* at 2:25-29.

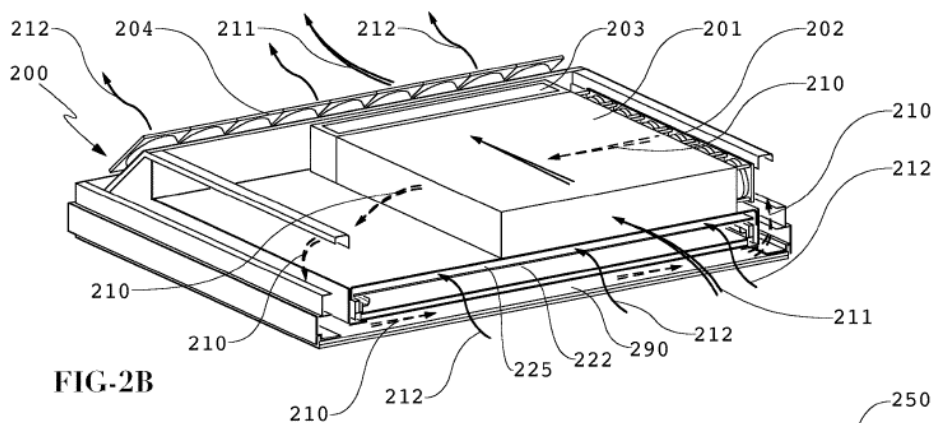
Such outdoor and semi-outdoor electronic display systems generally comprise four main elements: structural support components, the electronic image assembly, electrical components for operating the various devices in the display system, and a thermal management system. The structural support components comprise both the external housing of the display system and the internal support elements that secure and enclose the electronic display.

Electronic image assemblies are devices that visually present static or moving images. The electronic display can consist of many different forms of electronic image assemblies, including plasma, LEDs, and LCD modules, among others. *Id.* at 5:54-61. In the case of an LCD module, an LCD stack is located forward from a backlight. Though the liquid crystal material itself can modulate light to create different images, but the liquid crystal material itself does not produce light. Instead, the liquid crystal material must be illuminated using a light source. That light source is termed the backlight. The light from the backlight is modulated pixel-by-pixel in the LCD panel to provide a color image to the viewer.

B. The '142 Patent's Innovative Cooling System

The '142 Patent claims an electronic image assembly within a housing that is cooled by the flow of two separate airflows—an open loop ambient air pathway behind (and sometimes along) the rear surface of the electronic image assembly and a closed loop gas pathway around the electronic image assembly. *See* '142 Patent at Abstract, Claim 1. The cooling of the electronic image assembly is further facilitated by preventing heat from entering the system using solar energy reduction layers, such as polarizers and anti-reflective film. *See id.*, Abstract, claim 1, claim 2. Further, more efficient transfer of heat from the hotter closed loop to the cooler open loop is facilitated by the integration of a heat exchanger into the device housing. *See id.* claim 3.

Figure 2B of the '142 Patent shows an exemplary embodiment claimed in the '142 Patent, with the rear surface of the electronic display housing removed and a horizontal cross-section through the product.



As seen in Figure 2B, the cooling system includes a closed loop gas path shown by dotted lines flowing around the electronic display 220. *Id.* at 6:38-39. The closed loop gas path extends between the front surface of the electronic display and the front surface of the overall display housing. *Id.* at 7:25-38. As explained by the '142 Patent, “[s]olar loading (radiative heat transfer from the sun[]) through the front display surface 221 may result in a heat buildup on the image assembly 80 (ex. OLED or LCD assembly).” *Id.* 7:27-30. By facilitating the airflow of circulating cooling gas through a space defined between the front glass of the electronic display and the front surface of the electronic image assembly, radiant heat incident on the face of the display is transferred by the circulated cooling gas before rather than heating the electronic image assembly. *Id.* 7:30-38.

Heat buildup on the electronic image assembly is further ameliorated by preventing heat from entering the system entirely. *Id.* 8:2-12. The '142 Patent teaches the use of solar reduction layers that are added to the front cover glass of the housing. *Id.* The solar reduction layers prevent a portion of solar radiation from passing through the front cover glass and heating the circulating gas passing in front of the front surface of the electronic image assembly. *Id.* As a result, the circulating gas has a greater capacity of absorbing heat from the front surface of the electronic image assembly. *Id.*

The open loop air path shown in solid lines flows through two possible pathways: (1) through the heat exchanger 201, or (2) through a channel 225 created by the backlight assembly 222 (or rear of the electronic image assembly 220) and another surface. *Id.*, 6:39-48. The channel is created by placing a second surface 224 behind the rear surface 223 of the backlight assembly 222 (or rear surface of the electronic image assembly 220 if no backlight is used). *Id.*, 6:27-34. The purpose of this “additional optional open loop channel 225” in the “space defined by the rear surface 223 of the backlight and the second surface 224” is to provide direct cooling of the backlight assembly—a significant heat source in LCD modules specifically. *Id.*

A heat exchanger is a thermal management device that facilitates increased heat transfer between the two airflows passing through the heat exchanger. *Id.*, 4:22-42. The '142 Patent describes “many types” of fluid-to-fluid heat exchangers that use multiple alternative channels for two different air flows (an open loop and a closed loop). *Id.* As the two air pathways flow through the alternating channels, the heat is transferred through the walls of the channels from one air system to the other. *Id.*, 4:26-42. The channels may be arranged to facilitate the airflow travelling in multiple directions: (1) parallel in the same direction (“parallel flow heat exchanger”); (2) parallel but in opposite directions (“counter-flow heat

exchanger”); and (3) perpendicular direction (“cross-flow heat exchanger”). *Id.*, 4:24-27.

III. LEVEL OF SKILL IN THE ART

A POSITA would possess a bachelor’s degree in a pertinent discipline, such as mechanical or electrical engineering, physics, applied physics, or a related field. Such a person would also have had 2-4 years of experience in working with electronic displays including thermal management associated with electronic displays. Alternatively, a POSITA would have had 4-6 years of experience in the field and would have developed a similar understanding of thermal management associated with electronic displays.

Petitioner proposes a POSITA definition that includes “industrial designers” as persons with ordinary skill and does not require any special experience or knowledge of a thermal management of the electronic displays. Instead, under Petitioner’s definition, it is sufficient that a POSITA have a generalized knowledge of “product design issues and failure modes associated with electronic displays.” This definition is overly inclusive and sweeps in individuals who clearly fall short of the ordinary skill necessary to ascertain the thermal management systems disclosed in the ’142 Patent, including individuals who design the external housing of displays (e.g. bus shelters), electrical outlet of the display, or computer hardware. Such mechanisms are not components of the cooling system for

electronic displays, which is the subject matter of the '142 Patent. '142 Patent, 1:59-61.

IV. PETITIONER'S EXPERT TESTIMONY SHOULD BE GIVEN LITTLE WEIGHT

Petitioner's expert, Smith-Gillespie, should be given little weight as his analysis contains plain errors in thermal physics and was later contradicted during deposition and at trial the 1331 Investigation. *See Fanduel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1343-44 (Fed. Cir. 2020) (explaining the Board was not obligated to accept Petitioner's expert's explanation that a claim element is well known in the art where the expert failed to provide sufficient explanation for why a person of skill in the art would be motivated to add that element to the prior art system); *Yorkey v. Diab*, 601 F.3d 1279, 1284 (Fed. Cir. 2010) (“[T]he Board was well within its discretion to give more credibility to [one expert's] testimony over [another expert's testimony] unless no reasonable trier of fact could have done so.”).

First, Smith-Gillespie makes basic scientific errors in a declaration submitted regarding the '142 Patent's parent: U.S. Patent No. 10,506,740 (the '740 Patent). The '740 Patent shares the same specification with the '142 Patent. In paragraphs 186 of his '740 Patent Declaration, Smith-Gillespie explains that claim 7 of the '740 Patent recites “a cooling device placed near an entrance to the open loop ambient air flow path for reducing the temperature of ambient air entering the

open loop ambient air flow path.” *Samsung Electronics Co., Ltd. v Mfg. Res. Int’l*,

IPR2023-00254, Ex. 1002 (Dec. 10, 2022). Smith-Gillespie then opines that the

fans 36 placed in the cooling space 20 of Karppanen are a ***cooling device for***

reducing the temperature of ambient air entering the open loop. Smith-Gillespie

Dec. at ¶ 189 (“The cooling fans 34 can reduce the temperature of ambient air

entering the open loop ambient air flow path.”). However, it is well known that a

fan does not ***reduce the temperature of ambient air***. See Ex. 2024 (Pokharna Dec.)

at ¶¶ 112-13. Instead, fans merely move air within an area. If persons are standing

pathway of air flowing out of the fan, they will feel cooler because additional air is

passing by the person and convecting away heat. *Id.* The fan itself, however, does

not ***reduce*** the temperature of the air that reaches the person within the fan’s

pathway. This simple error in physics highlights Petitioner’s improper level of skill

in the art and demonstrates Smith-Gillespie’s lack of knowledge and experience in

thermal management—especially thermal management of electronic displays.

Second, Smith-Gillespie’s testimony should be given less weight because he directly contradicted himself when pressed during deposition. In his declaration, Smith-Gillespie opines that the definition of a POSITA includes an industrial designer. See Smith-Gillespie Dec. ¶ 39. However, when deposed in February, two months after submitting his declaration, Smith-Gillespie stated that did not believe that an industrial designer fell within the scope of an ordinarily skilled artisan in

the field of art. *See* Ex. 2022, Smith-Gillespie Tr. (Feb. 10, 2023), at 73:3-7 (“Q.

Okay. So an industrial designer, as we just described, would not qualify based on that educational background as a person of ordinary skill in the art, under your definition; is that right? A. That's correct.”). Accordingly, it is unclear what standard of a POSITA Smith-Gillespie applied in the declaration submitted with this Petition, and whether Smith-Gillespie accounted for the additional creativity needed for the lower level of skill needed by an industrial designer needed to satisfy the motivation to combine element of an obviousness claim. Accordingly, Smith-Gillespie’s testimony is not reliable.

V. CLAIM CONSTRUCTION

The ITC construed certain relevant terms recited by the claims of the ’142 Patent. *See* Exhibit 1028 (*Certain Outdoor and Semi-Outdoor Electronic Displays*, Inv. No. 337-TA-1331, Order 13 (May 15, 2023) (“ITC Markman Order”). The ITC construed the claim term: closed loop. *Id.* at 42. There, Petitioner argued for the same construction as it argues for here “gas pathway within a display housing containing gas that is essentially isolated from external air.” *Id.* The Patent owner argued for a plain and ordinary meaning of the term.

The ITC rejected the Petitioner’s proposed construction, noting that the ’142 Patent specification specifically states that the closed loop and open loop need not be isolated from each other. *Id.* at 48. The ITC went on to “tentatively” construe

“closed loop” to mean “a gas pathway forming a complete loop, within a display housing.” *Id.* at 45.

In this Response, Patent Owner has analyzed Petitioner’s arguments based on the ITC construction. As the construction is “tentative,” Patent Owner has also applied Petitioner’s proposed construction in the alternative.

VI. PETITIONER MISREADS THE CHALLENGED PATENT

Petitioner and its expert misread the disclosures of the ’142 Patent and apply an overly broad interpretation of “heat exchanger” that conflicts with the plain and ordinary meaning of that term to a POSITA. Petitioner attempts to invalidate the ’142 Patent by pointing to **any** thermal management device that transfers heat from one source to another. However, as Dr. Pokharna testified, a “heat exchanger” is a term of art that POSITA would recognize refers to a known type of thermal management device. Ex. 2024 (Pokharna Dec.), ¶¶ 61-64.

A POSITA in 2008 would read the ’142 Patent claims and specification and understand that the patentee was not trying to claim **anything that exchanges heat**. Rather, a POSITA would understand “heat exchanger” refers to the “heat exchangers” used in thermal management schemes.

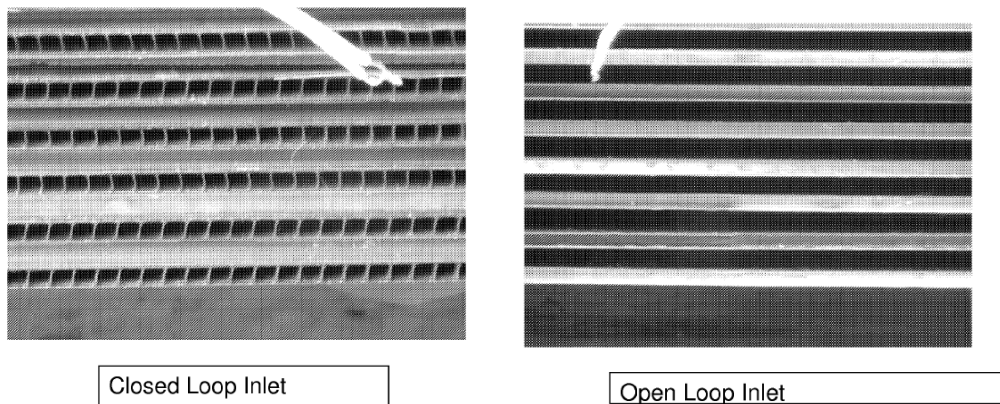
A. The proper plain and ordinary meaning of “heat exchanger” is the known device in the art of thermal management referred to as a “heat exchanger”

“Heat exchanger” has its plain and ordinary meaning. Petitioner does not offer the term “heat exchanger” for construction and instead states that it applies the plain and ordinary meaning of that term. Petition at 10 (“[F]or the purposes of this Petition, all other claim terms for the ’142 patent should be given their plain and ordinary meaning.”). Patent Owner agrees with the Petitioner that the term “heat exchanger” should be given its plain and ordinary meaning. The plain and ordinary meaning of heat exchanger as understood by one skilled in the art is the specific type of thermal management devices referred to as a “heat exchanger.” Ex. 2024 (Pokharna Dec.), ¶¶ 61-64. *Norian Corp. v. Stryker Corp.*, 363 F.3d 1321, 1326 (Fed. Cir. 2004) (“The meaning of a technical term in a patent claim is determined in accordance with its usage in the specification, elaborated if appropriate by the prosecution history and with due consideration to usage in the field of the invention.”).

The ’142 Patent specification describes a heat exchanger consistent with the understanding of a POSITA as a device that uses alternating, enclosed channels or tubes of fluid. ’142 Patent, 4:27-42. One fluid stream contains hotter fluid, and the other fluid stream contains cooler fluid. *Id.*, 4:58-60. As the fluids pass through the channels of the heat exchanger, heat is conducted from the hotter fluid stream

through the channel walls to the cooler fluid stream. *Id.* These devices are described in the '142 Patent specification and U.S. Provisional Application No. 61/138,736 (the "'736 Provisional"), incorporated by reference. *Id.* 4:27-5:15; Ex. 2010 ('736 Provisional) at [0017]-[0018], Ex. 2024 (Pokharna Dec.), ¶¶ 44-46, 61-64.

The '736 Provisional is entitled "Heat Exchanger for an Electronic Display," and is the first application in the '142 Patent's chain of priority to disclose and teach the integration of a heat exchanger. The '736 Provisional describes the materials that the heat exchanger may be constructed from, and includes images of its configuration to form part of the pathway of the closed and open loops. *See* Ex. 2010 ('736 Provisional) at [0017]-[0018], page 4 and 5 of the images.



See also Ex. 2024 (Pokharna Dec.) at ¶¶ 44-46.

The '736 Provisional's disclosure of a heat exchanger provides extra cooling from the finned plates described in U.S. Provisional Application No. 61/033,064 (the "'064 Provisional")—the first provisional application in the '142 Patent chain

of priority. The '064 Provisional teaches transferring heat from the closed loop to the open loop with a finned wall that it refers to as “surface features 150.” Ex. 2011 ('064 Provisional), [0042], Fig. 7,

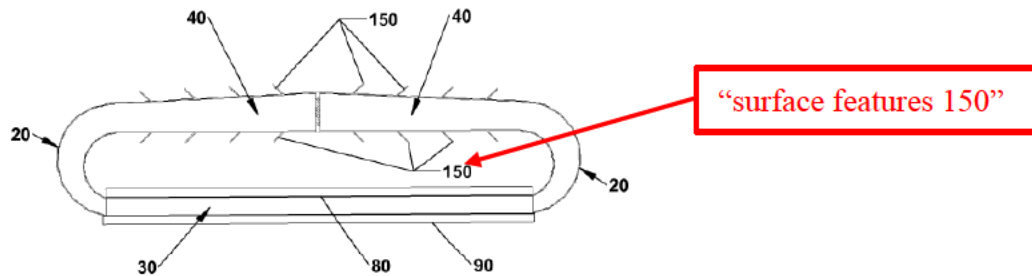


Fig. 7

The '064 Provisional does not mention the word “heat exchanger” or anywhere describe a structure that resembles the heat exchanger device. Petitioner’s expert agrees that the '064 Provisional Application does not describe a heat exchanger. *See* Ex. 2021 (Smith-Gillespie Tr. (April 26, 2023)) at 73:13-74:8 (explaining the surface features 150 in the '064 Provisional “[m]ore likely, defines a heat sink,” not a heat exchanger).

In its overview of the prior art, the '142 Patent makes it clear that the plain and ordinary meaning of “heat exchanger” does not sweep in every thermal management device that transfers heat. Ex. 2024 (Pokharna Dec.), ¶¶ 60-61. In the Background section, the '142 Patent describes prior electronic image assembly cooling systems transferred heat through walls of the enclosure using conduction and convection. '142 Patent, 1:54-2:2. Such systems may have moved “heated air .

. . . into convectively thermal communication with fins.” *Id.* 2:1-2. In other words, these systems were able to transfer heat. These systems, however, could not sufficiently cool the electronic image assembly as the size of the assembly increased and the assembly was placed outdoors in direct sunlight. *Id.* 2:7-29. As part of the solution, the ’142 Patent describes the integration of a heat exchanger, a known thermal management device. *Id.* at 2:44-46, 4:27-5:15.

As Dr. Pokharna testifies, the plain meaning of “heat exchanger” to a POSITA is confirmed by thermal management texts from the time of the invention. *See generally* Ex. 1020 (Steinberg) (distinguishing a heat sink (chapter 3 on conduction) and plates with fins (chapter 5) from a heat exchanger which contains channels for airflow (chapter 6)); Ex. 1019 (Scott) (distinguishing forced air cooling over fins in chapter four from heat exchangers in chapter 5)); Ex. 2024 (Pokharna Dec.), ¶¶ 61-64, 96. Heat exchangers are more specifically described in the dominant thermal management text used at the time of the invention. *See* Ex. 2017 (Incropera); Ex. 2015 (Hearing Tr.) 1251:7-23 (Dr. Pokharna explaining that Incropera—the most popular thermal management text at the time of the invention—confirmed heat exchangers were known thermal management devices that had specific structural features of closed tubes or channels).

So the heat exchanger it describes first as exchanging heat between two fluid streams that are not mixed together. And it goes on to explain various kinds of heat exchangers in the introduction itself. That is what is called a shell-and-tube heat exchanger. \

You have a bank of tubes that have one fluid going through it, something, let's say, that you need to cool. And around there is the other fluid that is going around it to enhance the heat transfer without mixing these two fluids.

But of particular interest here I want to mention are these two kinds of configurations that are shown here at the bottom, which are curiously similar to the structures that we saw in the '740 and '142 application.

Finally, Dr. Pokharna explained that commercial sources for thermal management devices also classify heat exchangers separately from other devices such as heat sinks, heat pipes and finned surfaces. Ex. 2024 (Pokharna Dec.), ¶ 61.

B. Petitioner improperly attempts to transform a heat exchanger into anything that exchanges heat in order to sweep in prior art.

Petitioner attempts to expand the meaning of “heat exchanger” to sweep in every thermal management device in existence at the time of the invention. In so doing, Petitioner ignores the disclosures of the '142 Patent specification and incorporated applications. In its overview of the '142 Patent, Petitioner states that “[a] heat exchanger can be used to ‘transfer heat’ from the closed loop to the open loop” and points to the rectangular casing of the heat exchanger 201 in Figure 2b and internal multiple channel structure of the heat exchanger in Figure 4. Petition at 13-15. Petitioner entirely omits the discussion of the heat exchanger in the '142 Patent specification. See '142 Patent at 4:22-5:15. Nor does Petitioner address any disclosure of heat exchanger in the applications cited to and incorporated by reference in the '142 Patent—including the '736 Provisional. By ignoring these

additional disclosures, Petitioner introduces ambiguity to the term where none exists.

In his Declaration, Petitioner's expert appears to understand the plain and ordinary meaning of "heat exchanger" in his overview of the field. *See* Ex. 1002 (Smith-Gillespie Dec.) ¶ 61-62. There, Smith-Gillespie states that "[a]ir-to-air heat exchangers are well known both for their use in heat recovery systems in process industries and heating and cooling systems." *Id.*, ¶ 61. Smith-Gillespie describes heat exchangers as "devices [that] pass two separate air streams across opposite sides of a convoluted set of plates formed of thermally conductive material so that heat from the high-temperature air stream may be conducted across the separator material and absorbed by the lower temperature air stream on the other side of the separator." *Id.*, ¶ 62. Smith-Gillespie then goes on to identify three references that each describe heat exchangers that make use of alternating channels or tubes of fluids to transfer heat from one fluid to another. *Id.*, ¶ 61 (citing Ex. 1016 (Muellejeans), Ex. 1017 (Olmstead), and Ex. 1018 (Bergh)).

Despite this understanding of heat exchanger, Petitioner and its expert then assert that *any* device that transfers heat from one body of air to another body is a "heat exchanger" as recited in the claims. In his Declaration, Smith-Gillespie maps a heat exchanger to heat sinks, finned plates, and Peltier elements. Ex. 1002 (Smith-Gillespie Dec.) at ¶¶ 184-193; *see* Ex. 2024 (Pokharna Dec.), ¶¶ 84-97,

165. At one point, in an apparent attempt to reconcile his testimony regarding the prior art with his testimony of how one of skill in the art would understand the term “heat exchanger,” Smith-Gillespie simply changes the definition of a heat exchanger to include **anything** that exchanges heat. *See also id.*, ¶ 185

(“Karppanen also states that the ‘task of the cooling elements is to **transfer excess thermal energy from the display casing [10] to the cooling space [20]**, from which it is further conducted by the air flow produced by cooling fans 36 out from the entire device. . . Thus the cooling space element **32** is a ‘**heat exchanger.**’”) (emphasis in original). This is similar to the testimony Smith-Gillespie offered at the 1331 Investigation hearing. Ex. 2014 (Hearing Tr.), 998:12-18 (“Q. What would a person of ordinary skill in the art in the 2008 time frame have understood the ’740 patent to mean by ‘heat exchanger’? A. I would understand it to mean a device that transfers heat from a hot source to another cold sink, if you will.”).

As Patent Owner’s expert, Dr. Pokharna, explained during that hearing, this interpretation is overly broad and would improperly sweep in items such as windows within the scope of a “heat exchanger.” *See* Ex. 2015 (Hearing Tr.) 1252:4-18; Ex. 2024 (Pokharna Dec.), ¶ 94.

Essentially, Petitioner and its expert treat “heat exchanger” as a means-plus-function limitation—a means for transferring heat—which would be governed by Section 112(6) of the Patent Act. However, Petitioner and its expert ignore the

presumption that absent the language—“means for”—Paragraph 6 of Section 112 does not apply. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). Even **if** Paragraph 6 applies, the Board’s rules require that Petitioner say so and “identify the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function.” 37 C.F.R. § 42.104(b)(3). Petitioner provided no such analysis. And even if Petitioner had, the structure for “heat exchanger” would be limited to the structures described in the specification. *Lockheed Martin Corp. v. Space Sys./Loral, Inc.*, 324 F.3d 1308, 1319 (Fed. Cir. 2003). As described above, the specification only describes the structure of the specific thermal management device referred to as a “heat exchanger,” which is absent from the cited prior art.

Petitioner misreads the Challenged Patent and redefines terms in an attempt to find and apply prior art. As a result, Petitioner fails to properly analyze the differences between the claimed invention and the prior art. Petitioner’s attempt to broaden the term “heat exchanger” should be rejected, and the understanding of “heat exchanger” as confirmed by the intrinsic evidence demonstrates that “heat exchanger” refers to a specific device as explained above.

VII. PETITIONER FAILS TO SHOW THE ASSERTED PATENTS ARE OBVIOUS

The burden remains on Petitioner to demonstrate unpatentability. Petitioner fails to meet this burden because several claim elements are not obvious in view of either Karppanen or Yare, alone or in combination with Larson.

A. Karppanen in view of the knowledge of a POSITA does not render the Challenged Claims obvious.

1. Claims 1, 3, 6, 12, and 15: Karppanen does not render obvious a “closed loop” under Petitioner’s Proposed Construction

Each challenged independent claim requires a “closed loop.” Petitioner proposes a construction that “closed loop” means “essentially isolated from ambient air.” The ’142 Patent describes the closed loop gas “isolated” to the extent that the “gas which travels through the closed loop” is “substantially free of contaminants and/or particulate (ex. dust, dirt, pollen, water vapor, smoke, etc.) in order to prevent an adverse effect on the image quality and damages to the internal electrical components.” ’142 Patent at 5:29-34. Karppanen does not teach a closed loop about the display that is essentially isolated from ambient air—or substantially free of contaminants and/or particulate. Ex. 2024 (Pokharna Dec.), ¶¶ 77-83, 163.

Karppanen is silent as to the extent to which the display casing 12—which contains the display—must be sealed against particulates and water. *Id.*, ¶¶ 79-82, 163. A POSITA would look to the Ingress Protection (“IP”) rating of an outdoor

enclosure to understand the extent to which it is—or should be—isolated from dust and water. *Id.*, ¶¶ 78, 163. *See* Ex. 2023 (*IP ratings, Int’l Electrotechnical Comm’n*, <https://www.iec.ch/ip-ratings> (last visited Aug. 29, 2023)). IP ratings are the industry standard for measuring and determining the amount of seal in a system. Ex. 2024 (Pokharna Dec.), ¶¶ 78, 163; IEC Standards.

The IP rating is comprised of two numbers. Ex. 2024 (Pokharna Dec.), ¶¶ 78, 163; Ex. 2023 (IEC Standards). The first number represents the extent to which dust can enter the system, and the second number represents the extent to which water can enter the system. Ex. 2024 (Pokharna Dec.), ¶¶ 78, 163; Ex. 2023 (IEC Standards). A POSITA would look to an enclosure that meets at least the level 5 for the first and second digits to know it is sealed to the extent that it is “substantially free” or dust and contaminates. Ex. 2024 (Pokharna Dec.), ¶¶ 78, 163; Ex. 2023 (IEC Standards). Absent a disclosure that an enclosure is rated to a level 5 IP rating, a POSITA would look for explicit statements that the enclosure is sealed from dust or sealed from water. Ex. 2024 (Pokharna Dec.), ¶¶ 78, 163.

Karppanen is silent as to the IP rating of the enclosure or whether dust and water can enter the system. Ex. 2024 (Pokharna Dec.), ¶¶ 79, 163. At most, Karppanen makes reference to a “waterproof” display casing. Ex. 2024 (Pokharna Dec.), ¶¶ 79, 163; Karppanen at Abstract. However, this disclosure alone is not sufficient as “waterproof” merely refers to the lower scale of the IP rating system

(levels 2-3). Ex. 2024 (Pokharna Dec.), ¶¶ 79-80, 163. In fact, there are

“weatherproof” rated devices—such as outdoor outlet protectors—that only protect against falling rain and are designed to be opened to the atmosphere, dust, and particulates. *Id.*

In one sentence, Karppanen states that it the transparent front plate may be fastened to the rest of the housing by a “vibration attenuating sealing elements 50.” Ex. 2024 (Pokharna Dec.), ¶¶ 81, 163; Ex. 1004 (Karppanen) at 7:35-39. However, as a POSITA would know, this is material used to protect the front transparent plate (glass) from physical force that it may encounter in outdoor settings, e.g., vibrations. Ex. 2024 (Pokharna Dec.), ¶¶ 81, 163. The vibration attenuating elements do not, by themselves, indicate whether or to what extent the display enclosure in Karppanen is sealed against, for example, dust or ambient air.

Petitioner again misreads the prior art and states that Karppanen discloses a “closed” display casing. Petition at 36. When Karppanen uses the term “closed,” it refers to the position of the casing being shut, i.e., not open for maintenance. *See, e.g.*, Ex. 1004 (Karppanen) at 7:7-11 (“In normal use, the display casing and the device are turning against each other to a **closed** position and locked to each other by locking means 18 on one side of the casings. In the **closed** position, there remains a cooling space 20 . . . “).

Because Karppanen does not discuss the extent to which the display casing 10 is sealed from external air, Karppanen does not teach a closed loop under Petitioner's construction of "closed loop." Thus, the Petition fails with respect to each of the Challenged Claims.

2. Claims 3, 6, and 15: Karppanen does not render obvious a "heat exchanger"

Independent claim 6, and dependent claims 3 and 15 require a "heat exchanger." This claim element is not disclosed by Karppanen. Ex. 2024 (Pokharna Dec.), ¶¶ 84-97, 165. As explained above, the claim language and specification of the '142 Patent confirm that a POSITA would understand that the claim term "heat exchanger" refers to a specific device that one of skill in the art would understand to be a "heat exchanger" and does not encompass *any* device that moves heat.

i. Karppanen does not describe a heat exchanger

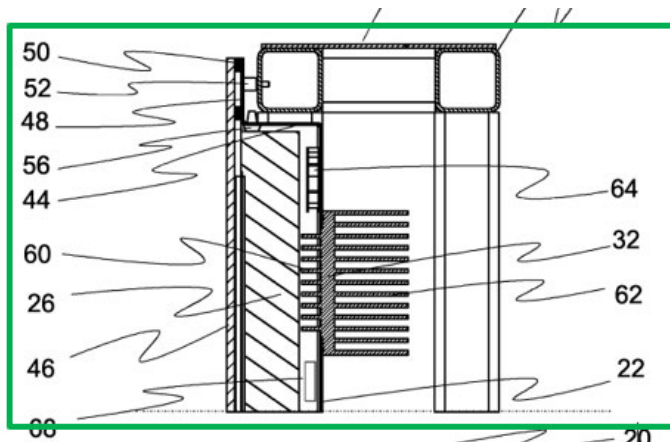
Karppanen provides three possible thermal management devices that may be used within its enclosure to facilitate cooling: (1) a finned plate, (2) a heat sink, or (3) a thermoelectric device called a "Peltier element." *Id.*, ¶¶ 85-93, 165.

Karppanen generally refers to these three options as the "cooling elements 32" that span the wall 22 that separates display casing 10 from the cooling space 20. See Ex. 1004 (Karppanen) at Fig. 2; Ex. 2024 (Pokharna Dec.), ¶¶ 85-93, 165. The cooling elements 32 have two ends, one extending into the display casing (first

heat transfer part 60) and one end extending into the cooling space 20 (second transfer part 62). Ex. 1004 (Karppanen) at Fig. 2; Ex. 2024 (Pokharna Dec.), ¶ 68.

a) Cooling Elements 32 Are a Finned Wall

Karppanen suggests that one such configuration of the cooling elements 32 is to have two sets of fins extending into each space. Ex. 1004 (Karppanen) at 8:16-22; Ex. 2024 (Pokharna Dec.), ¶¶ 86-88, 165. This configuration is seen in the top portion of Figure 2, excerpted below.



This wall with fins closely resembles the finned wall of the '064 Provisional to which the application that led to the '142 Patent claims priority. In particular, as shown below in Figure 7 of the '064 Patent side by side with Figure 2 from Karppanen, the Karppanen finned wall is the same thermal transfer mechanism as the finned plate separating the closed and open loops in the '064 Provisional. Ex. 2024 (Pokharna Dec.), ¶¶ 87-88.

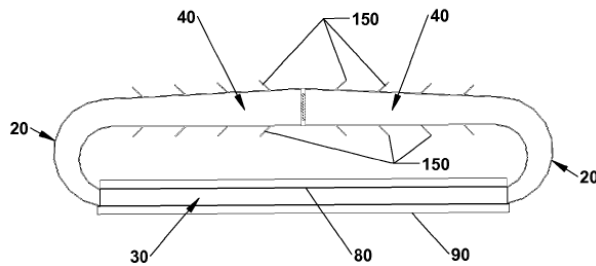
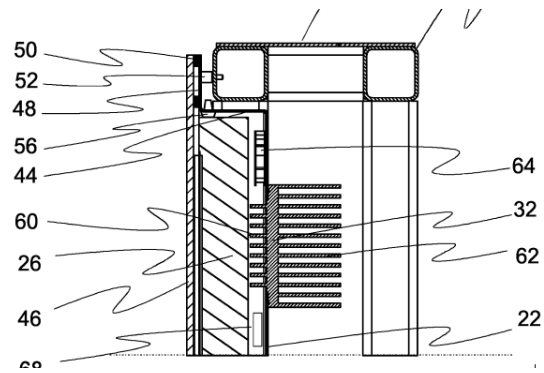


Fig. 7

Ex. 2011 ('064 Provisional)

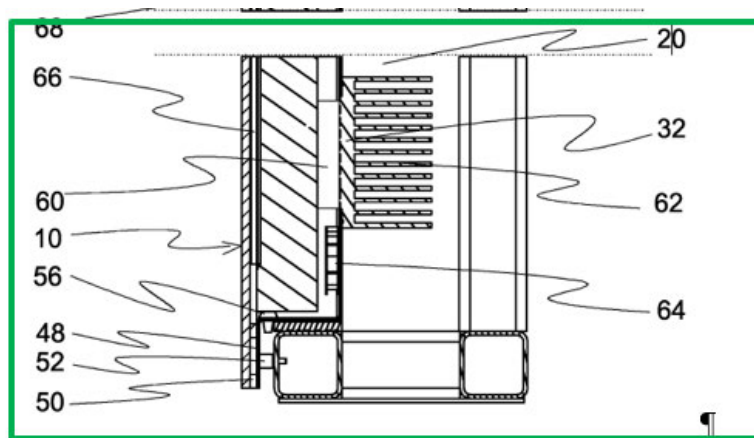


Ex. 1004 (Karppanen) at Figure 2

Petitioner's expert agrees that the finned plate at 150 in the '064 Provisional is not a heat exchanger. See Part VI, Ex. 2021 (Smith-Gillespie Tr. (Apr. 26, 2020)), 73:13-74:11. When confronted with the similarity between the finned wall in Karppanen with the finned wall in the '064 Provisional, Petitioner's expert attempted to explain away the difference—saying that because there are not fins (150) on both sides of the plate dividing the open loop (found in the space between the backlight 80 and wall of rear cooling chamber 40) and closed loop (found in rear cooling chamber 40) shown above, there is no heat exchanger. *Id.* 74:13-3. This arbitrary distinction, which is not supported by any intrinsic evidence, is not how a POSITA would understand a heat exchanger. Instead a POSITA would understand that Karppanen's disclosure to be similar to the finned walls described in the Background section of the '142 Patent. However, this—the finned wall in Karppanen and the '064 Provisional—is not a heat exchanger as both the specification and claim language make clear.

b) Cooling Elements 32 Area a Heat Sink

Karppanen describes a second embodiment where the cooling elements 32 are a heat sink. Ex. 2024 (Pokharna Dec.), ¶¶ 89-90, 165. In this embodiment, the first heat transfer part 60 is attached to rear portion of the display, directly conducting heat from the display to the cooling space 20. *Id.*, ¶¶ 90, 165; Ex. 1004 (Karppanen) at 8:30-32. This embodiment is depicted in the bottom portion of Figure 2, excerpted below.



Heat sinks are thermal management devices that are distinct from heat exchangers. These two separate types of devices operate according to different principles and have different manufacturing considerations. Ex. 2024 (Pokharna Dec.) at ¶¶ 52, 61-62, 103, 165, *see also* Ex. 1020 (Steinberg (distinguishing a heat sink (chapter 3 on conduction) and plates with fins (chapter 5) from a heat exchanger which contains channels for airflow (chapter 6))); Ex. 1019 (Scott) (distinguishing forced air cooling over fins in chapter four from heat exchangers in chapter 5)). Even Petitioner's expert believes that a heat sink and heat exchanger

are different devices within the understanding of the '142 Patent. Ex. 2021 (Smith-Gillespie Tr. (Apr. 26, 2020)), 73:22-74:4 (“Does this paragraph 42 [of the '064 Provisional] describe a heat exchanger? . . . A. More likely, defines a heat sink.”). Thus, this embodiment of Karppanen is not a heat exchanger.

c) Cooling Elements 32 Are a Peltier Device

Karppanen describes a third embodiment where the cooling elements 32 are Peltier devices. Ex. 2024 (Pokharna Dec.), ¶¶ 91, 165. A Peltier device is an active heat transfer device that pumps heat from lower temperatures to higher temperatures. *Id.* A heat exchanger, by contrast, is a passive device that conducts heat from a hotter fluid stream to a cooler fluid stream. *Id.*

Because none of the embodiments disclosed in Karppanen describe a heat exchanger device, Karppanen fails to teach a heat exchanger.

ii. ***Petitioner and Its Expert Argue for an Insupportably Broad Meaning of Heat Exchanger***

Petitioner and its expert ask the Board to conclude that any device which transfers heat constitutes a heat exchanger. See Part VI; Petition at 31 (“The ‘task of cooling elements is to **transfer excess thermal energy from the display casing [10] to the cooling space [20]**, from which it is further conducted by the cooling fans 36 out of the entire device. . . . Thus, the cooling element 32 is ‘**a heat exchanger.**’”) (emphasis in original). As explained by Dr. Pokharna, skilled artisans may colloquially refer to an object that is exchanging heat as a heat

exchanger. Ex. 2024 (Pokharna Dec.) ¶ 96. However, the patent specification, claim language, and description of failed devices from the past make it clear that the heat exchanger claimed by the patent is more specific than a device that simply moves heat.

Further, modifying Karppanen to include a heat exchanger would neither be an obvious nor a straightforward modification—especially for an industrial designer. *Id.*, ¶ 97. As explained by another reference cited on the face of the '142 Patent and describing a cooling system for outdoor electronic displays: “[S]tandard heat exchangers that work according to the air/air principle have proven to be unsuitable [for such products] due to the inflexible design of the cooling surface.”). Ex. 2018 (Wellhofer) at [0005]. Wellhofer, like Karppanen, teaches the use of a finned wall to transfer energy from a display casing to a cooling space. Ex. 2024 (Pokharna Dec.) ¶ 91; Ex. 2018 (Wellhofer) at [0003], [0008]. In Wellhofer, this device is referred to not as a heat exchanger, but as a heat sink. Ex. 2018 (Wellhofer) at [0008].

Because Karppanen does not disclose heat exchangers or describe the structural aspects of a heat exchanger (requiring a complicated set of channels or tubes) to directly exchange heat from one hotter fluid stream to another, Karppanen does not teach the integration of a heat exchanger into a closed and open loop

system for an electronic display. Thus, the Petition fails with respect to each of the Challenged Claims.

3. Claims 3, 6, and 15: Karppanen does not disclose a heat exchanger that “forms part of said open loop airflow pathway” and “forms part of said closed loop gas circulation pathway”

Independent claim 6 recites “a heat exchanger” wherein “a first portion of said heat exchanger forms part of said open loop airflow pathway, and wherein a second portion of said heat exchanger forms a part of said closed loop gas circulation pathway.” Dependent claim 3 and dependent claim 15 recite substantially the same language. Petition at 59. Karppanen does not disclose a heat exchanger, wherein a part of the heat exchanger forms part of the open loop pathway and second part of the heat exchanger forms a part of the closed loop pathway.

The additional claim language “wherein the first portion of said heat exchanger **forms part of said open loop airflow pathway**, and wherein a second portion of said heat exchanger **forms part of said heat exchangers forms part of said closed loop airflow pathway**” describes the structure of the heat exchanger. The heat exchanger itself, with its channels or tubes, must actually form part of each airflow pathway... it cannot merely be *in* the same pathway. As discussed above in Part VII.A.2, Karppanen’s cooling elements 32 at best comprise a wall with finned structures on each side. These cooling elements 32 are merely *in* the

pathway of air within the display casing 10 and cooling space 20. The fins of cooling elements 32 do not form the pathway itself, let alone the recited channels or tubes of a heat exchanger. Instead, it is the rear wall 22, ducting 66, and external housing elements that form all of the purported closed loop pathway and cooling space 20. *See*, Ex. 1004 (Karppanen) at Fig. 2 (annotated).

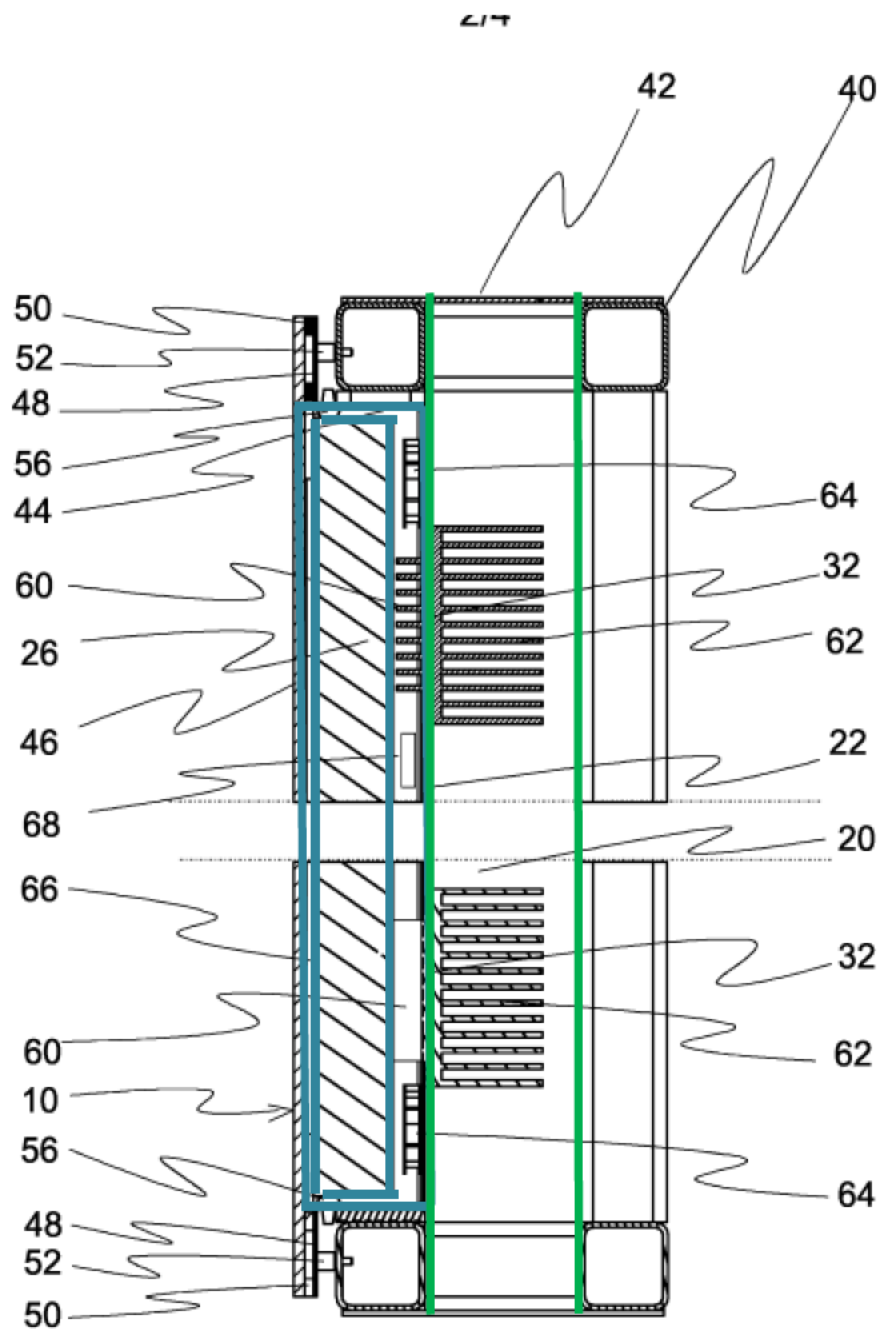


Fig. 2

Thus, the Petition fails with respect to Claims 3, 6, and 15 for this additional reason.

B. Yare in view of the knowledge of a POSITA does not render the Challenged Claims obvious.

- 1. Claims 1, 6, and 12: Yare does not render obvious a “closed loop gas circulation pathway contained within the housing wherein a portion of said closed loop gas circulation pathway passes between said transparent cover panel and said electronic image assembly”**

Independent claim 6 recites “a closed loop gas circulation pathway contained within the housing, wherein a portion of said closed loop gas circulation pathway passes between said transparent cover panel and said electronic image assembly.” Independent claim 1[c] and independent claim 12[b] recite substantially the same language. Petition at 108, 120.

Yare does not disclose any information regarding the electronic display from which a POSITA could conclude there is an airflow pathway within the product that travels fully around the electronic image assembly—including between any front cover glass of the display 20 and whatever electronic image assembly is located within. Further, in all Figures, Yare shows the electronic display abutting the front cover of cabinet 10. Thus, there **cannot** be airflow traveling between the electronic display 20 and the front cover of cabinet 10. Accordingly, Yare fails to disclose a closed loop gas circulation path that travels between a transparent cover panel and the electronic image assembly. In an attempt to reach the claim limitations of the ’142 Patent, Petitioner misreads Yare and draws in missing elements in self-serving locations. The Board should reject Petitioner’s

interpretation as it is based on a faulty analysis of Yare and hindsight rationalization.

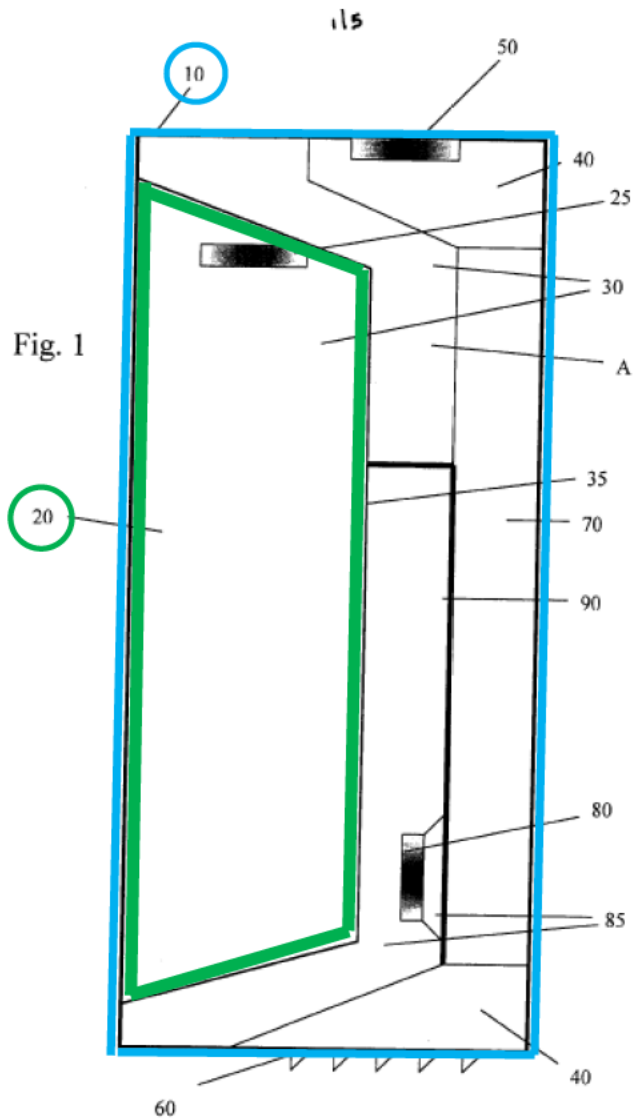
i. Yare Is Silent as to the Form of Electronic Image Assembly Cooling System Within the Electronic Display

The '142 Patent refers to a fully formed display product—including its housing and internal cooling system as an “electronic display.” *See, e.g.*, '142 Patent at 3:20-22 (“FIG. 1 shows the rear of an embodiment for an electronic display 100, where the rear cover for the display housing has been removed in order to show the internal components.”). The '142 Patent refers to the flat panel within the electronic display and the “electronic image assembly.” *Id.*, 5:56-61 (“As discussed above, the image assembly 220 may comprise any form of electronic image assembly for generating an image, including but not limited to: LCD, light emitting diode (LED), organic light emitting polymers (OLED), field emitting diode (LED), light emitting polymers (LEP), plasma displays, and any other flat/thin panel displays.”). This hierarchy of structure with the electronic image assembly being located within the housing of an electronic image assembly is recited in the claims of the '142 Patent. *See, e.g.*, claim 1 (“A cooling system for an ***electronic image assembly***, the cooling system comprising: ***a housing for the electronic image assembly***; . . .”) (emphasis added).

The Yare cabinet is intended to hold a fully configured electronic display 20 product in a manner that would allow that display to survive in public locations

without being harmed by dust or contaminates. Ex. 2024 (Pokharna Dec.), ¶ 69, Ex. 1006 (Yare) 1:8-23; 5:17-27. Yare is not specific as to what kind of electronic display is to be used in the cabinet—and states it could be any form of electronic display. *Id.* at 3:17-20 (naming as examples “a plasma display, an LCD, a TFT display, a CRT display, a LED display, a projector or a rear projection display”). Each of the kinds of electronic display products named by Yare contain a different and unique configuration and cooling system. Ex. 2024 (Pokharna Dec.), ¶¶ 130, 177. In fact, the configuration of just one type of display, such as an LCD display, can vary from brand to brand, and even model to model within that brand. *Id.* Yare is silent as to the electronic display product configuration, or whether that display has a front cover glass, or whether that cover glass is located forward of the display panel in order to facilitate air flow between the two. *Id.*

Further, in all Figures, Yare shows that electronic display 20 (shown in green) abuts the front of cabinet 10 (shown in blue). *See, e.g.*, Ex. 1006 (Yare), Fig. 4 (annotated).



See also id., Figs. 2-4, 6 (Figure 5 does not depict the display 20 or cabinet 10, and only depicts a zoomed depiction of heat exchanger 70). Thus, cooling closed loop air cannot be traveling between the front of the electronic display and the front of cabinet 10. Ex. 2024 (Pokharna Dec.), ¶¶ 127-29, 177. Further, the claim language requires the closed loop to be traveling between the **electronic**

image assembly and transparent cover panel, not the **electronic display** and the transparent cover panel.

Yare does not describe any details regarding where the electronic image assembly may be located within the display 20, if an electronic image assembly is present at all (Yare describes the display may also be electronic products that do not contain an electronic image assembly—such as a light projector). Ex. 1006 (Yare), 3:17-20; Ex. 2024 (Pokharna Dec.) ¶¶ 129-32, 177. As discussed above, the location of the electronic image assembly, and its orientation to the front of the display, will be different from panel type to panel type, brand to brand, and model to model. Ex. 2024 (Pokharna Dec.) ¶ 130. Yare does not concern or describe the unique cooling systems for any of those displays. *Id.* Instead, Yare merely states that the display 20 is located within the sealed zone 30, and that air within the sealed zone cools the display 20 by “[v]ents or other ventilation means (not shown) [that] allow air to travel through the rear portion 35 of the display 30.” Ex. 1006 (Yare) at 4:4-9.

ii. Petitioner and Its Expert Misread Yare

Petitioner and its expert confuse the display system 20—which is an electronic display—with an electronic image assembly. Both Petitioner and its expert arbitrarily add a blue rectangle to the images of Yare, which purport to show a position of the display 20. But no such rectangle is found in Yare’s figures.

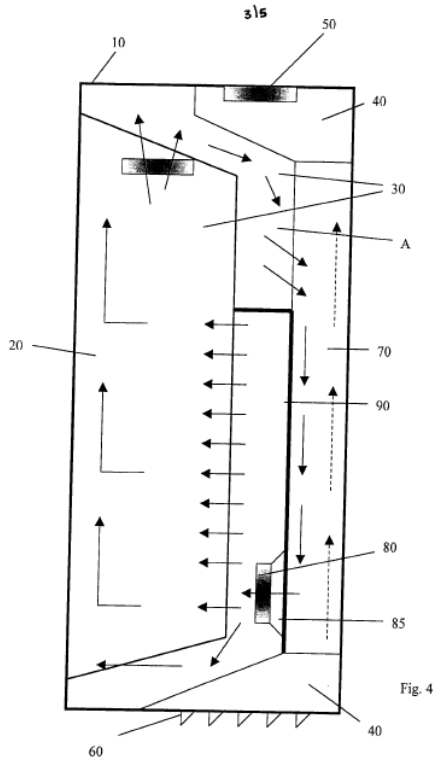


Figure 4 in Yare

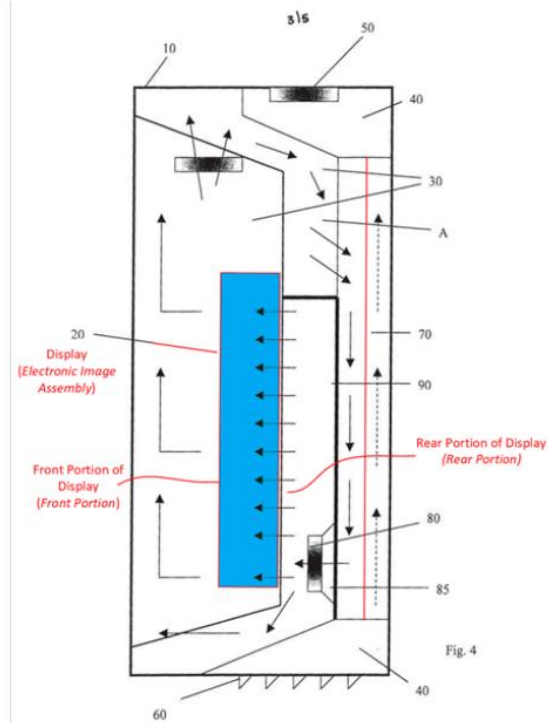


Figure 4 as Annotated by Petitioner

There is thus no support for Petitioner's faulty conclusion that the arrows show a closed loop channel between a front glass surface and the electronic image assembly. Petition at 85, Ex. 1002 (Smith-Gillespie Dec.), ¶ 292. Yare itself shows no such front panel, and to place one in Petitioner's self-serving location, the Petitioner is forced to modify Yare without any support or explanation for why a POSITA would place the display in that position.

Petitioner's statement that "Yare's figures do not show the location of the display" is incorrect. See Petition at 85. All Figures, except for Figure 5 which only shows a zoomed in perspective of the heat exchanger, show the display 20 with an arrow indicated that area that it occupies within sealed zone 30. See Ex. 1006

(Yare), Figs. 1-4, 6. Petitioner misreads Yare, confusing display 20 with an LCD—a form of electronic image assembly—and draws in an electronic image assembly in self-serving location. *Id.* Petitioner then argues that this is “seemingly the best, if not the only” place where the LCD module would be located. *Id.* To support this statement, Petitioner points to the L-shaped arrows and Larson. *Id.* at 85-87.

First, the L-shaped arrows only show that the sealed zone air is forced by fans and pressure gradients through the electronic display 20’s built in cooling system. Ex. 2024 (Pokharna Dec.), ¶¶ 129, 177; Ex. 1006 (Yare), 4:24-27. The L-shaped arrows do not convey any information regarding the actual cooling system’s configuration, or whether air travels around the electronic display in that system.

Second, Larson describes multiple “conventional” configurations of an LCD stack and front cover glass—some of which have the LCD stack bonded to the front cover glass or configured to have an index matching medium—such as oils—in the space between the front glass and the LCD stack. See Ex. 2024 (Pokharna Dec.), ¶ 133, 177, Ex. 1005 (Larson) 1:39-46; 3:61-4:8.

Finally, Petitioner offers no motivation to make this change to the Yare cabinet 10 and/or electronic image assembly location (if any) inside of display 20. For this reason alone, Petitioner’s argument that it would have been obvious to

create such a cooling channel between any front transparent cover of the display 20 and the electronic image assembly within fails.

Petitioner's confused analysis of Yare renders its analysis of this claim limitation, and all other analysis of airflows within the cabinet 10, flawed and unreliable. A proper reading of Yare makes it clear that there is no information regarding how air flows within the electronic display 20 in the sealed zone, and whether the display 20 is configured to allow sealed zone 30 air to travel between any front transparent cover panel and the electronic image assembly.

2. Claims 3, 6, and 15: Yare does not render obvious a heat exchanger that “forms part of said open loop airflow pathway” and “forms part of said closed loop gas circulation pathway”

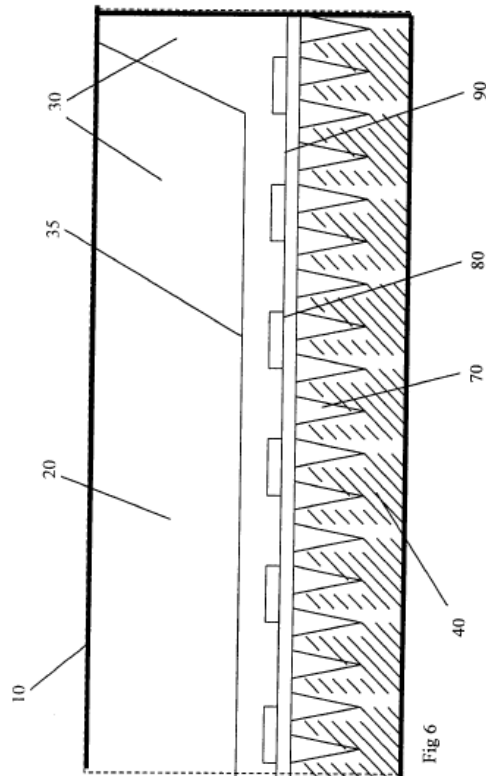
Independent claim 6 recites “a heat exchanger” wherein “a first portion of said heat exchanger forms part of said open loop airflow pathway, and wherein a second portion of said heat exchanger forms a part of said closed loop gas circulation pathway.” Dependent claim 3 and dependent claim 15 recites substantially the same language. Petition at 59. Yare does not disclose a heat exchanger, wherein a part of the heat exchanger forms part of the open loop pathway and second part of the heat exchanger forms a part of the closed loop pathway.

The claim language “wherein the first portion of said heat exchanger **forms part of said open loop airflow pathway**, and wherein a second portion of said

heat exchanger **forms part of said heat exchangers forms part of said closed**

loop airflow pathway” describes the structure of the heat exchanger. The heat exchanger itself, with its channels or tubes, must actually form part of each airflow pathway... it cannot merely be *in* the same pathway.

At most, Yare only discloses a heat exchanger forming part of the sealed zone 30 pathway. Ex. 2024 (Pokharna Dec.), ¶¶ 137-142, 179. Accordingly, Yare does not disclose a heat exchanger that forms part of **both** the open loop and closed loop pathway. *Id.* Yare discusses a heat exchanger 70 located at the boundary of the sealed zone 30 and atmospheric zone 40. *Id.*, ¶¶ 138, 179; Yare at Fig. 6. That heat exchanger is a corrugated structure that is mounted to a baffle plate 90. See Ex. 1006 (Yare), Fig. 6.



Baffle plates are structures typically found in heat exchangers that hold channels of tubes together. Ex. 2024 (Pokharna Dec.), ¶ 140. Baffle plates do not create the channels or tubes of the heat exchanger themselves. *Id.* Even *if* the baffle plate 90 was coextensive with the entire sealed zone 30, creating channels with the corrugated structure of heat exchanger 70, the channels are only on the sealed zone 40 side of the heat exchanger. *Id.* ¶¶ 138-39, 179. There are no channels or pipes created on the atmospheric size of the heat exchanger—as required by the claim language. *Id.* ¶¶ 137-39, 179.

VIII. NO MOTIVATION TO COMBINE KARPPANEN OR YARE WITH LARSON

Karppanen and Yare are directed to different fields of the art than Larson—and a POSITA would not look to a reference discussing optical phenomena to solve the solution of heating. Larson relates to methods and apparatuses for reducing unwanted reflections in LCD displays. Ex. 1005 (Larson), 1:5-9. Karppanen, by contrast, “relates to an electronic information board . . . used by advertisers to pass on information.” Ex. 1004 (Karppanen) 1:3-8. Though Karppanen makes a cursory reference that the display in the display casing may be an LCD panel, Karppanen does not discuss the LCDs at issue by those panels at length. Karppanen also does not discuss any details regarding the front cover glass and its composition.

Similarly, Yare does not discuss polarizers or the composition of the front of the display cabinet or any display system that may be placed in that cabinet. Nor does Yare discuss placing screens outside or the issue of solar thermal loading. Instead, Yare’s system provides cooling because the intended size of the screens are large. *See*, Ex. 1006 (Yare), 1:9-10. Thus, a person of skill in the art would not read Yare and recognize a problem with solar loading and the advantage of incorporating additional solar energy reduction layers—such as a polarizer—in the system.

The motivations offered by Petitioner’s expert provide nothing more than hindsight rationalization. Each of the justifications point to a benefit claimed by the ’142 Patent as a reason a person of skill in the art would have been motivated to combine Larson with Karppanen. *See Ex. 1002 (Smith-Gillespie Dec.)* ¶ 178 (“assisting with the cooling of air in the cooling duct of the closed loop system”); ¶ 136 (“A POSITA would have also recognized that an absorbing polarizer absorbs at least some polarizations of the ambient light, such as sunlight, which can help improve the contrast and reduce the heating of the display caused by the sunlight.”). These motivations do not point to any disclosure within Karppanen or Yare that would prompt a person of ordinary skill to look to the optical reflectance field of LCD displays, rather than the cooling systems field, for an additional cooling solution. In particular where Karppanen and Yare already provide a solution to the problem of cooling.

Furthermore, Larson is silent as to the location of the LCD display and does not discuss issues faced by moving electronic displays to outdoor environments. If anything, Larson teaches away from using its system to prevent thermal energy from entering its system. Larson teaches that its polarizers **absorb** solar radiation. *Ex. 1005 (Larson) 3:19-20, 3:59-60*. A POSITA would read this disclosure and be discouraged from using polarizers on the front glass in order to **prevent** radiation from entering the display system.

IX. OBJECTIVE INDICIA SHOW THE NON-OBVIOUSNESS OF THE CHALLENGED CLAIMS

“The objective indicia analysis is . . . a fundamental part of the overall § 103 inquiry.” *Liqwd, Inc.*, 941 F.3d at 1137 (Fed. Cir. 2019) (citation omitted). It is an essential safeguard that protects against hindsight bias. *In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Pat. Litig.*, 676 F.3d at 1079. Objective evidence “may often establish that an invention appearing to have been obvious in light of the prior art was not.” *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012). In fact, “[i]t is the secondary considerations that are often most probative and determinative of the ultimate conclusion of obviousness or nonobviousness.” *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573 (Fed. Cir. 1996).

Samsung asserts that the challenged claims would have been obvious in 2008, but the real-world evidence shows that, despite its expertise and enormous resources, Samsung was not able to develop a successful outdoor LCD display for over **ten years** and then achieved remarkable commercial success immediately after adopting MRI’s innovative approach.

A. There is a Nexus to Both Samsung and MRI Products

“For objective evidence ... to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention.” *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (emphasis & citation

omitted). In an *inter partes* review, when the patent owner shows the claimed invention is embodied in a particular product, nexus between the secondary considerations associated with that product and the patent claims is presumed. *PPC Broadband, Inc. v. Corning Optical Commc'ns RF, LLC*, 815 F.3d 734, 747 (Fed. Cir. 2016) (“Because the evidence shows that the SignalTight connectors 61 are the invention disclosed and claimed in the patent, we presume that any commercial success of these products is due to the patented invention” (internal quotation marks omitted)); *see also Omron Oilfield & Marine Inc. v. MD/TOTCO*, IPR2013–00265, Paper 11 at 12 (PTAB Oct. 31, 2013) (“A prima facie case of nexus is established when the patentee shows both that there is commercial success, and that the product that is commercially successful is the invention disclosed and claimed in the patent.”).

Such nexus is established here, as discussed below, because both the MRI displays and the Samsung’s copy-cat design, practice the claims of the ’142 Patent.

B. Samsung’s Long Felt Need, Failure, and Copying

Around the early 2000s, larger LCDs of 32-inches and above began to appear in the market. Those larger display screens faced new thermal challenges, particularly when used in an outdoor environment. *See, e.g.*, Exs. 2026, 2038, 2047. Samsung itself explains that companies had “wanted their messages outdoors” but “were challenged by a variety of issues during the early years.” Ex.

2025, at 3, 6 (touting the benefits of digital outdoor displays); *see* Ex. 2026

(publication of white paper in 2015). “The biggest obstacle was heat—from inside and from the sun. Direct sunlight and its amplified heat could alter the properties of LCD crystals—the display layer of screens—and discolor or cause black blotches.”

Ex. 2025, at 3. Samsung admits that the harsh outdoor environment posed

“***enormous engineering challenges.***” Ex. 2025, at 2 (emphasis added).

Years of research efforts were undertaken by Samsung and others in the electronic display industry to address the enormous thermal challenge. Despite these efforts, Samsung failed to identify an effective solution. Samsung holds itself out as a “Leader in Innovation,” with “\$15.6B Invested in R&D” and as the “#2 Patent Holder in US.” Ex. 2028, at 4 (Samsung marketing touting its “History of Success” manufacturing “top-of-the-line” displays and expertise in advancing the field of digital signage). Samsung is undoubtedly an industry leader, yet failed repeatedly in its effort to develop outdoor LCD displays. *See In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1081 (Fed. Cir. 2012) (“Evidence that others tried but failed to develop a claimed invention may carry significant weight in an obviousness inquiry.”).

Samsung [REDACTED]

[REDACTED] and filed numerous patent applications on thermal management systems between 2004 and 2008. Ex. 2029

(Sung Ki Kim Dep. Tr.), 45:22-46:11; Ex. 2033; Ex. 2034; Ex. 2035; Ex. 2036;

Ex. 2037; see Ex. 2027 (Samsung's ITC listing of 13 pages of prior art). [REDACTED]

[REDACTED]
[REDACTED] Ex. 2029 (Sung Ki Kim Dep. Tr.), 46:7-15.

Former Samsung engineer Sung Ki Kim testified that Samsung's first outdoor display [REDACTED]

[REDACTED] Ex. 2029 (Sung Ki Kim Dep. Tr.), 46:16-47:22. [REDACTED]

[REDACTED]
Ex. 2029 (Sung Ki Kim Dep. Tr.), 49:9-17. [REDACTED]

[REDACTED] Ex. 2029 (Sung Ki Kim Dep. Tr.), 51:1-9. [REDACTED]

[REDACTED] Ex. 2029 (Sung Ki Kim Dep.

Tr.), 53:1-4. Samsung's 75- and 85-inch OHF and subsequent products practice claims 1, 6, and 10 of the '142 PatentEx. 2024, ¶¶186-87. These Large-Sized

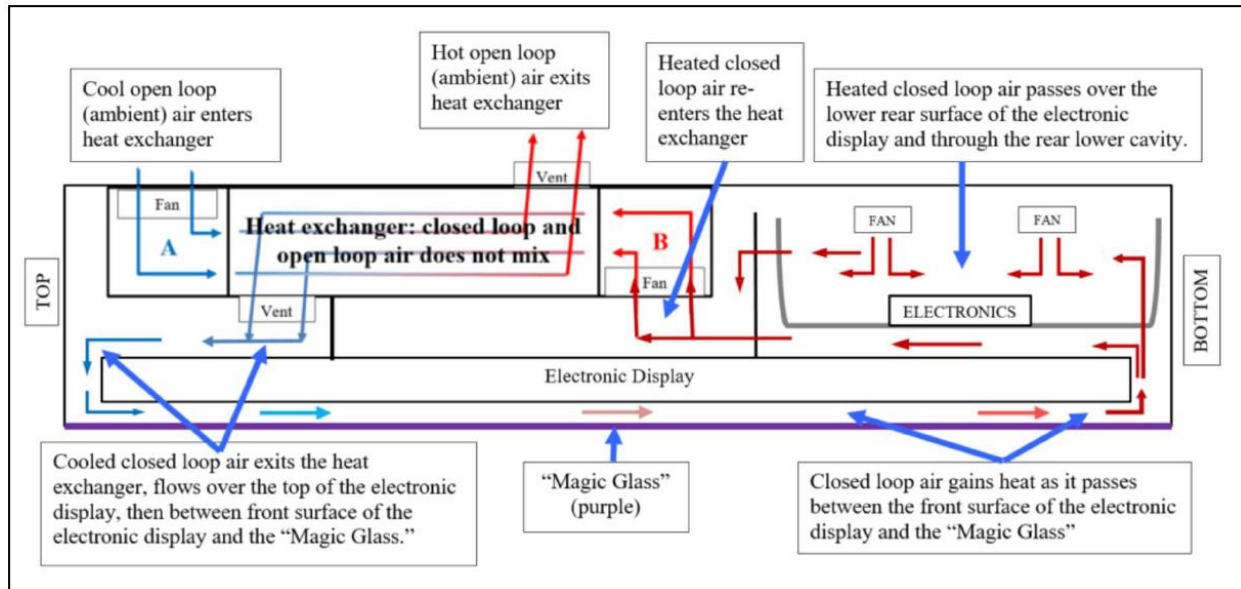
Products were shown to infringe in the co-pending ITC investigation, as set forth

in the claim charts. Ex. 2036. The schematic below shows the configuration and air

flow paths of Samsung's Large-Format products. The products include an electronic image assembly (an LCD) having a front and a rear side. An open loop of ambient air passes through a heat exchanger located behind the rear of the display. A closed loop of gas circulates around the display, passing through the heat exchanger, then over the top of the display, then through a channel between the front of the display and the cover glass, then around the bottom of the LCD, and finally along the rear surface of the display back to the heat exchanger. A common heat exchanger is located in the pathway of both the closed and open loops. The heat exchanger has fans (including motors) that force the open loop and the closed loop through the heat exchanger where the ambient air in the open loop cools the heated air in the closed loop. Ex. 2024 (Pokharna Dec.) ¶¶ 186-87.

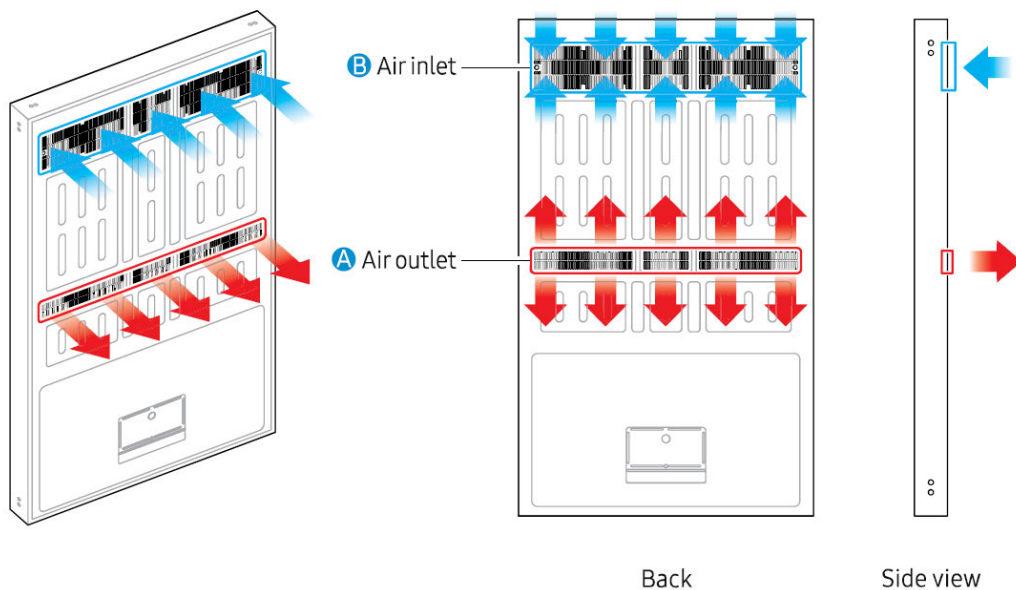
Additionally, the Large-Format Displays include a front cover glass which Samsung refers to as "Magic Glass." The "Magic Glass" contains both an anti-reflective film and front polarizer that prevent a portion of solar radiation from thermally interacting with the closed loop gas or LCD stack. Ex. 2024 (Pokharna Dec.) ¶¶ 186-87.

Accordingly, the Large-Format Displays both practice and are coextensive with the claims of the '142 Patent.

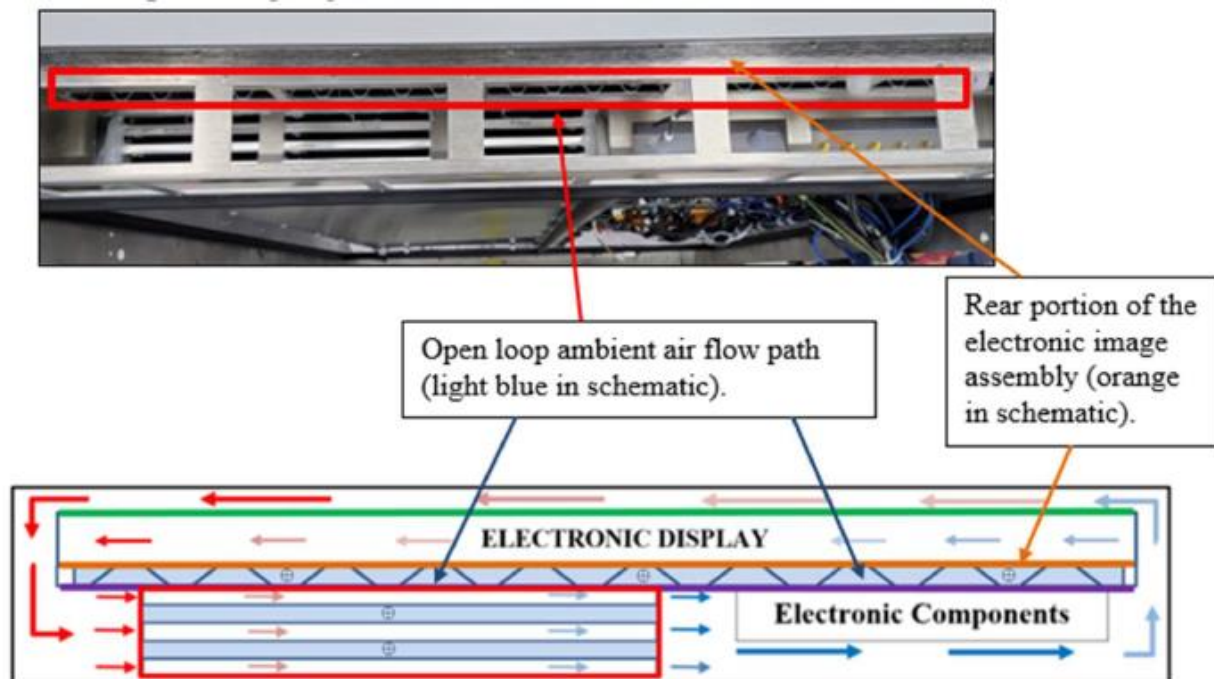


Samsung's manuals confirm the ambient air flow through the heat exchangers, entering at the top of the unit and exiting near the center of the unit. Ex. 2053 (Samsung Outdoor Installation Guide) ("The outdoor unit uses cooling fans to take in outside air to lower the internal temperature and discharge the hot air").

OH75A/OH75F/OH85F



MRI's 75- and 86-inch large-format displays likewise practice and are coextensive with the '142 Patent. As set forth in MRI's domestic industry claim charts in the ITC investigation, MRI's products contain the recited closed loop airflow pathway and open loop of ambient air, both of which are forced by fans through a common heat exchanger in which the open loop air cools the heated closed loop air. Ex. 2054. The open and closed loops and heat exchanger are labeled in the schematic below. Additionally, each MRI product contains a double layer of bonded glass that contains anti-reflective film—located forward of the LCD stack. Samsung did not dispute that MRI's products practice the '142 Patent during the ITC hearing.



Revealingly, during its development of these copycat OHF products,
Samsung [REDACTED]

Windsurfing Int'l Inc. v. AMF, Inc., 782 F.2d 995, 1000 (Fed. Cir. 1986); *WBIP*, 829 F.3d at 1336-37 (“The fact that a competitor copied technology suggests it would not have been obvious.”). [REDACTED]

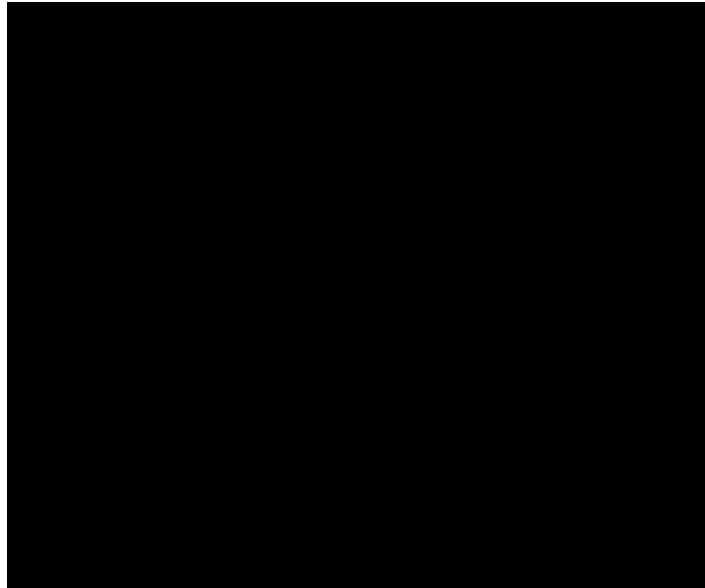
2042, 2043; *see* Ex. 2030 (Sungsu Lee transcript), at 184:15-191:8; Ex. 2031 (Wunkil Lee transcript), 77:13-81:16 (

([REDACTED]). Thereafter, Samsung released these new versions of its outdoor displays, the OHF series. The OHF series infringes the challenged claims and are able to function outside and in full sunlight because of their cooling system. Indeed, but for their effective cooling system, these products would not be capable of outdoor use.

MRI's pioneering invention established the market for outdoor LCD displays and MRI has achieved significant success. Indeed, MRI's own sales increased in mid- to late-2008—shortly after the claimed priority date of the '142 Patent—confirming the commercial success is tied to the novel aspects of the '142 Patent. Ex. 2044. MRI's commercial success has continued to the present, with

sales of its large-format products alone totaling over [REDACTED] million between 2018 and 2022. Exs. 2045, 2046. Federal Circuit precedent holds sales of this magnitude alone show commercial success. *See e.g., J.T. Eaton & Co. v. Atlantic Paste & Glue Co.*, 106 F.3d 1563, 1566, 1572, (Fed. Cir. 1997) (affirming a finding that “sales evidence...shows [strong commercial] success,” where the “sales evidence” consisted solely of the patentee’s “\$17 million of sales from 1979 through 1984, and its \$4 million of annual sales from 1985 through 1989.”).

Samsung also has achieved significant success with its outdoor electronic displays. The integration of the effective cooling system first developed by MRI—which was available to Samsung through [REDACTED] and disclosures in patents named on the MRI label on the product Samsung tore down—led to success of the OHF series. All other models of Samsung’s outdoor displays also use the same cooling system copied from MRI and claimed in the ’142 Patent. Ex. 2039. Samsung’s market share grew from [REDACTED] (before entering the outdoor display market) to [REDACTED] (in 2017 after launch of the Accused Products) to [REDACTED] (by 2020). Ex. 2041, at 29-30. But for the effective thermal management system invented by MRI, there would be no outdoor LCD market, and Samsung thus would not have achieved its commercial success. Exs. 2001, 2025.



The fact that Samsung developed its commercially successful designs only after experiencing failures with other designs—despite extensive research efforts—and only after MRI’s own successful product was in the market, is compelling real-world evidence that MRI’s design was not obvious at the time.

D. Industry Praise and Willingness of Others to License the ’142 Patent

MRI departed from the established approaches taken by others. Proceeding against the prevailing wisdom, Bill Dunn and Tim Hubbard were able to achieve what others were not by providing a closed loop gas circulation path about the electronic display, an open loop ambient air flow path, and a common heat exchanger in the pathway of both the closed loop and the open loop. This innovative design in which the inventors directed flow paths through a common heat exchanger allowed for greater cooling than the conventional approaches. This

innovative solution enabled the use of large format displays in full sun and high ambient temperatures. *See supra* Part II.

Mr. Dunn's background made him uniquely qualified to make this advancement in the art. After receiving an electrical engineering degree from Georgia Tech, Mr. Dunn embarked on a career dedicated to pioneering display technologies in challenging environments. Ex. 2013, 44:8-13. By 2004 when he founded MRI, Mr. Dunn had over a decade of experience focused on developing LCD technology for use in harsh environments, including developing LCD displays for military aircraft and ground vehicles through his prior companies, Avionic Displays Corporation and American Panel Corporation. Ex. 2013, 42:24-46:14. Mr. Dunn recognized the demand for digital outdoor signage and founded MRI to pursue that opportunity. Ex. 2013, 47:1-14. Direct sunlight proved to be a formidable challenge, as Mr. Dunn learned by observing thermal failures of outdoor LCD displays even in freezing temperatures. Ex. 2013, 58:14-60:25. Mr. Dunn's engineering advances, as claimed in his patent, made it possible to effectively use LCD displays outdoors in the elements.

Samsung itself has recognized these advances. Ex. 2025, at 2. In its 2015 white paper, Samsung observed that "[t]he many barriers that limited how digital screens could be used outdoors and in direct sunlight have all come down." *Id.* "Many early adopters" saw failures "because the components and engineering...

weren't up to the task of working in heat and blazing sun." *Id.* But "years of insights and experience" and "engineering advances" made putting screens in the elements "entirely possible." *Id.*

Samsung recognized that it was MRI that conquered the "enormous engineering challenges of keeping displays running no matter what Mother Nature threw at them." *Id.*; *see also id.* at 3 (acknowledging that "outdoor displays reflect **years of engineering** designed to make running an LCD in harsh environments as crisp and reliable as running an LCD on the reception wall of a law office"). In correspondence to Mr. Dunn from Romulus Stoian, Samsung's DOOH Leader (i.e., digital out-of-home leader), Samsung sought to "embrace the MRI technology," calling it "impressive and unique." Ex. 2001. Samsung praised Mr. Dunn for "entering into a virgin space" and "pioneer[ing] a new business model." *Id.*, *see also* Ex. 2048 (Vertigo, a competitor, calling MRI a "technology leader").

Bill,

Good afternoon and many thanks for taking the time talking to me.

What you've done at MRI it's impressive and unique; I bet was not easy entering into a virgin space and then shortly after being able to pioneer a new business model based on turnkey solutions for DOOH, raising the bar for high quality standards.

Per our conversation, I see loads of opportunities for collaboration in the outdoor space (smart city, transit, rail, etc) where we can embrace the MRI technology and blended in with Samsung displays. Our customers will benefit from quality products and executions.

See attached our MNDA. Kindly review and add comments if needed too.
Thank you. Again, a real pleasure talking to you Sir.

Romulus Stoian
Director, DOOH Leader
Digital Innovation Solutions
Display B2B Team

Samsung SDS America

“Evidence that the industry praised a claimed invention or a product that embodies the patent claims weighs against an assertion that the same claimed invention would have been obvious. Industry participants, especially competitors, are not likely to praise an obvious advance over the known art. Thus, if there is evidence of industry praise of the claimed invention in the record, it weighs in favor of the non-obviousness of the claimed invention.” *Apple Inc. v. Samsung Electronics Co., Ltd.*, 839 F.3d 1034, 1053-54 (Fed. Cir. 2016) (en banc).

Other third parties have also recognized MRI’s innovations by licensing the ’142 Patent and paying royalties for use of the claimed inventions. Indeed,

[REDACTED]

[REDACTED]

[REDACTED]. Ex. 2049 ([REDACTED]); Ex. 2050 ([REDACTED]

[REDACTED]). Others in addition to [REDACTED] have taken licenses. Ex. 2051

([REDACTED]); Ex. 2052 ([REDACTED]). The willingness of others to license the patent is

additional evidence that others in the industry appreciated the validity and value of

MRI’s ’142 patent, thereby supporting the non-obviousness of the invention.

MRI’s patented cooling technology is also a critical feature of Samsung’s products [REDACTED]

[REDACTED] and without which the products would not work. Ex. 2038, at 99-102

([REDACTED])

[REDACTED]
[REDACTED]
[REDACTED]). John Palmer, who is a Samsung customer and integrator of the Samsung OH displays for end users, testified that [REDACTED]
[REDACTED]

[REDACTED] Ex. 2032 (Palmer transcript), 118:6-119:8.

The foregoing real-world facts show that the claimed inventions would not have been obvious to a person of ordinary skill in the art in 2008. Despite the demand for outdoor displays, no one (including Samsung, despite having begun attempting to develop outdoor displays at least by 2005) was successful until Mr. Dunn and Mr. Hubbard conceived of their invention. Only after MRI's pioneering design and Samsung's own failures with other designs, was Samsung ultimately able to achieve success by infringing.

X. CONCLUSION

For the forgoing reasons, Patent Owner respectfully asserts that the Petition fails to establish by a preponderance of evidence that any of the Challenged Claims is obviousness in view of the two combinations of prior art.

Dated: September 26, 2023

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that this Preliminary Response contains 11,649 words according to the word-processing program used to prepare this paper. The foregoing word count complies with the 14,000 word type-volume limit specified by 37 C.F.R. § 42.24(b)(2).

Dated: September 26, 2023

Respectfully submitted,

/s/ John C. Alemanni

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing **PATENT OWNER'S RESPONSE** has been served electronically via email upon the following:

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