

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 IPR2023-00254
Patent 10,506,740

Case IPR2023-00221
Patent: 11,013,142

EXPERT DECLARATION OF DR. HIMANSHU POKHARNA

I declare (or certify, verify, or state) under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

9/26/2023

Date



Himanshu Pokharna

Contents

I. INTRODUCTION	4
II. SUMMARY OF OPINIONS	5
III. MATERIALS RELIED UPON.....	5
IV. BACKGROUND AND QUALIFICATIONS	8
V. LEGAL STANDARDS	11
A. Obviousness	11
B. Claim Construction	14
VI. PERSON OF ORDINARY SKILL IN THE ART.....	15
VII. CLAIM CONSTRUCTION.....	17
A. “closed loop”	17
VIII.OVERVIEW OF THE CHALLENGED PATENTS.....	18
IX. BACKGROUND OF THE TECHNOLOGY	26
X. OVERVIEW OF THE ASSERTED ART	37
A. Karppanen	37
B. Yare	40
C. Larson.....	43
XI. Non-Obviousness of the ’740 Patent	45
A. Karppanen in view of the knowledge of a person of ordinary skill in the art does not render any of the Challenged Claims obvious.	45
1. Claim 1	45
2. Claim 2	63
3. Claim 7	65
4. Claim 8	66
5. Claim 9	67
6. Claim 11	67
7. Claim 12	68
8. Claim 17	69
9. No Motivation to Modify Karppanen.....	71
B. Yare in view of the knowledge of a person of ordinary skill in the art.....	71
1. Claim 1	72
2. Claim 2	80
3. Claim 5	83

4.	Claim 8	86
5.	Claim 9	87
6.	Claim 11	87
7.	Claim 12	88
8.	Claim 17	89
9.	No Motivation to Modify or Combine with Larson, Bundza, or Knowledge of a POSITA.....	90
XII.	Non-Obviousness of the '142 Patent	90
A.	Karppanen in view of Larson does not render any of the Challenged Claims obvious.	90
1.	Claim 1	90
2.	Claim 3	91
3.	Claim 6	91
4.	Claim 12	92
5.	Claim 15	92
6.	No Motivation to Modify or Combine with Larson	92
B.	Yare in view of Larson does not render any of the Challenged Claims obvious.	94
1.	Claim 1	95
2.	Claim 3	96
3.	Claim 6	97
4.	Claim 12	97
5.	No Motivation to Modify or Combine with Larson	98
XIII.	SAMSUNG'S PRODUCTS PRACTICE THE '740 AND '142 PATENTS	99
XIV.	MRI's PRODUCTS PRACTICE THE '740 AND '142 PATENTS.....	102

I, Dr. Himanshu Pokharna, declare as follows:

I. INTRODUCTION

1. I have been retained on behalf of Manufacturing Resources International, Inc. (“Patent Owner” or “MRI”) in the above-captioned *Inter Partes* Review Proceedings, to testify as a technical expert regarding the issues raised in the declarations of Robert Smith-Gillespie (collectively the “Smith-Gillespie Declarations”) regarding U.S. Patent No. 10,506,740 (the “’740 Patent”) and U.S. Patent No. 11,013,142 (the “’142 Patent”) filed by Petitioners.

2. The Smith-Gillespie Declarations addressed the alleged invalidity of the following claims (collectively the “Challenged Claims”).

Patent No.	Challenged Claims
10,506,740	1-3, 5-9, 11-13, 15-18, and 20
11,013,142	1-15

3. It is my understanding that Petitioner does not contend any of the Challenged Claims are anticipated by the prior art. Petitioner instead contends that the Challenged Claims would have been obvious in view of the following combinations:

Patent No.	Challenged Claims	Grounds
10,506,740	1-3, 5-9, 11-13, 15-18, and 20	Obvious over WO2007116116A1 (“Karppanen”)
10,506,740	1-3, 5-9, 11-13, 15-18, and 20	UK Application No. GB 2402205A (“Yare”)
11,013,142	1-15	Obviousness over Karppanen in view of 6,392,727

		("Larson")
11,013,142	1-15	Obviousness over Yare in view of Larson

4. As explained in detail below, it is my opinion that none of the Challenged Claims are invalid.

II. SUMMARY OF OPINIONS

5. As explained in further detail below, each prior art reference (or combination of prior art references) lacks at least one element of the Challenged Claims, and a person of ordinary skill in the art would not have been motivated to modify or combine the prior art at the time of the invention in the ways asserted by Petitioner.

III. MATERIALS RELIED UPON

6. In forming my opinions, in addition to my knowledge and experience, I have considered the following documents and things that I have obtained, or that have been provided to me: Unless otherwise noted, my citations in this declaration cite to the numbers using in the '740 Petition,

Exhibits to 740 Petition	Exhibits to 142 Petition	Description
NA	Ex. 1001	U.S. Patent No. 11,013,142 ("the '142 patent")
Ex. 1001	NA	U.S. Patent No. 10,506,740 ("the '740 patent")
	Ex. 1002	Declaration of Robert Smith-Gillespie addressing the '142 Patent
Ex. 1002		Declaration of Robert Smith-Gillespie addressing the '740 Patent

Ex. 1004	Ex. 1004	International Patent Application No. PCT/FI2006/050145 with Publication No. WO2007116116A1 (“Karppanen”)
Ex. 1005	Ex. 1006	United Kingdom Patent Application No. GB 2402205A (“Yare”)
Ex. 1006		U.S. Patent App. Pub. No. 2009/0145581 (“Hoffman”)
Ex. 1007		U.S. Patent No. 8,758,144 (“Williams”)
Ex. 1008		U.S. Patent App. Pub. No. 2008/0083527 (“Horng”)
Ex. 1009		U.S. Patent No. 4,488,193 (“Davis”)
Ex. 1010	Ex. 1005	U.S. Patent No. 6,392,727 (“Larson”)
Ex. 1011		U.S. Patent No. 7,312,993 (“Bundza”)
Ex. 1012		U.S. Patent No. 6,504,713 (“Pandolfi”)
Ex. 1013		U.S. Patent No. 5,991,153 (“Heady”)
Ex. 1014	Ex. 1007	U.S. Patent No. 6,825,828 (“Burke”)
Ex. 1015	Ex. 1008	E. Fred Schubert & Jong Kyu Kim, <i>Solid-State Light Sources Getting Smart</i> , 308 <i>Science</i> 1274 (2005) (“Schubert”)
Ex. 1016	Ex. 1009	Military Handbook: Reliability Prediction of Electronic Equipment, DEPARTMENT OF DEFENSE, MIL-HDBK-217F (1991) (“MIL-HDBK-217F”)
Ex. 1017	Ex. 1010	Allan Webber, <i>Calculating Useful Lifetimes of Embedded Processors</i> , TEXAS INSTRUMENTS INCORPORATED, SPRABX4 (Nov. 2014) (“Webber”)
Ex. 1018	Ex. 1011	LIAN-TUU YEH & RICHARD C. CHU, THERMAL MANAGEMENT OF MICROELECTRONIC EQUIPMENT: HEAT TRANSFER THEORY, ANALYSIS METHODS, AND DESIGN PRACTICES (Dereje Agonafer ed., 2002) (“Yeh & Chu”)
Ex. 1019	Ex. 1012	ALLAN W. SCOTT, COOLING OF ELECTRONIC EQUIPMENT (John Wiley & Sons, 1974) (“Scott”)
Ex. 1020	Ex. 1013	DAVE S. STEINBERG, COOLING TECHNIQUES FOR ELECTRONIC EQUIPMENT (John Wiley & Sons, 1980) (“Steinberg”)
Ex. 1021	Ex. 1014	U.S. Patent No. 5,748,269 to Harris et al. (“Harris”)

Ex. 1022	Ex. 1015	U.S. Patent No. 6,504,713 to Pandolfi et al. (“Pandolfi”)
Ex. 1023	Ex. 1016	U.S. Patent No. 4,327,803 to Mullejeans et al. (“Mullejeans”)
Ex. 1024	Ex. 1017	U.S. Patent No. 5,002,118 to Olmstead et al. (“Olmstead”)
Ex. 1025	Ex. 1018	U.S. Patent No. 6,244,333 to Bergh et al. (“Bergh”)
Ex. 1026	Ex. 1023	Claim Construction Order, <i>Mfg. Resource Intl., Inc. v. Civiq Smartscales, LLC</i> , Civil Action No. 17-269-RGA (D. Del. Oct. 3, 2018)
Ex. 1027	Ex. 1024	U.S. Patent No. 8,854,572 to Dunn (the “’572 patent”)
Ex. 1028	Ex. 1025	U.S. Patent No. 9,629,287 to Dunn (the “’287 patent”)
Ex. 1029	Ex. 1026	U.S. Patent No. 9,173,325 to Dunn (the “’325 patent”)
Ex. 1030		U.S. Patent Application Publication No. 2004/0135482 (“Thielemans”)
Ex. 1031		File History for U.S. Patent Application No. 15/789,331
Ex. 1033	Ex. 1028	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Order No. 13 (May 15, 2023) (the “1331 Investigation”)

Exhibits to Patent Owner Responses	Description
Ex. 2009	Curriculum Vitae of Dr. Himanshu Pokharna
Ex. 2010	U.S. Provisional Application No. 61/138,736 (the “’736 Application”)
Ex. 2011	U.S. Provisional Application 61/033,064 (the “’064 Application”)
Ex. 2012	MRI-ITC-1331_0000092739 (Article)
Ex. 2013	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Day 1 Public Hearing Tr. (June 26, 2023)
Ex. 2014	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Day 4 Public Hearing Tr. (June 29, 2023)
Ex. 2015	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Day 5 Public Hearing Tr. (June 30, 2023)

Ex. 2016	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Transcript, Deposition of Chris Bolton (Feb. 23, 2023)
Ex. 2017	Frank Incropera et al., FUNDAMENTALS OF HEAT AND MASS TRANSFER, at 670 (2006).
Ex. 2018	European Patent Application No. 1 951 020 A210(“Wellhofer”)
Ex. 2019	Certified translation of Japanese Patent No. 3118907 to Ohta (“Ohta”)
Ex. 2020	U.S. Patent No. 6,798,655 to Nagashima, et al. (“Nagashima”)
Ex. 2021	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Transcript, Deposition of Robert Smith-Gillespie (April 26, 2023)
Ex. 2022	<i>Certain Outdoor and Semi-Outdoor Electronic Displays</i> , Inv. No. 337-TA-1331, Transcript, Deposition of Robert Smith-Gillespie (Feb. 20, 2023)
Ex. 2023	<i>See IP ratings, Int’l Electrotechnical Comm’n</i> , https://www.iec.ch/ip-ratings (last visited Aug. 29, 2023) (“IEC Standards”)
Ex. 2039	Infringement Claim Chart for U.S. Patent No. 10,506,740, Samsung OH75 / OH85
Ex. 2054	Claim Chart for U.S. Patent No. 810,506,740, MRI 75” & 86” Units

7. In addition to the documents above, in forming the opinions expressed below, I have also considered my own knowledge and experience based upon my education and work in the field, as described above and in my *curriculum vitae* (Ex. 2009).

IV. BACKGROUND AND QUALIFICATIONS

8. The following is a brief summary of my background and qualifications. My background and qualifications are more fully set out in my CV, which includes a list of publications I have authored, as well as a list of the patents on which I am a named inventor.

9. I am an engineer with over 25 years of global experience in a variety of leadership roles. My educational, research and work experience has revolved primarily around energy, materials, and thermal technologies, and my areas of expertise include thermal management of electronics, electronic displays—including liquid crystal displays (“LCD”), and energy systems.

10. I have expertise in creating product strategy by mapping technology competencies to emerging market opportunities. My background allows me to be comfortable in deep technical discussions with engineers to broad, board-level business deliberations. I have a proven track record of successfully introducing new mechanical, energy and thermal technologies across a broad array of computing elements, electronic displays—including liquid crystal displays (“LCD”), energy and military/aerospace products. I am experienced in building and leading teams of engineers, technicians and businesspeople across geographies.

11. I am the Founder and currently Director of Deep Materials Inc., a company devoted to developing thermal management components such as thermal interface materials and heat sinks for computing and consumer electronic systems. In addition, I serve as a founder and board member of Inficold India Pvt. Ltd. which is developing thermal energy storage systems for refrigeration and air-conditioning equipment with emphasis on cold storage and milk cooling. I am also

a principal of Deeia Inc., a consulting business providing thermal strategy support to clients such as Google, Facebook, and various startup companies.

12. I received a Bachelor of Technology and a Master of Technology (equivalent to a B.S. and an M.S. in the United States, respectively) in Mechanical Engineering from the Indian Institute of Technology, Bombay. I also earned a Ph.D. in Nuclear Energy Engineering from Purdue University in 1997. My Ph.D. thesis focused on modeling of two-phase flow dynamics in heat transfer systems and specifically developed analytical models for the simultaneous flows of water and water vapor in a system during heat absorption. Examples of such systems are boiling water reactors. In addition, I have an MBA from the Wharton School at the University of Pennsylvania.

13. I have published more than 15 peer-reviewed scientific articles and have given numerous presentations at scientific and industrial conferences, including several keynote addresses at industry forums such as the Taiwan Thermal Management Association (“TTMA”) annual meetings, with the primary emphasis being heat-pipe development. I have over 60 issued or pending patents.

14. I have worked in various capacities in the electronics industry since 1997. My experience includes leading a team of over 25 engineers at Intel Corporation in the development of thermal management technology for laptop computers, including their electronic display screens.

15. Prior to my management responsibility at Intel, I worked on innovative fans, heat sinks, and liquid cooling of computing systems and demonstrated two-phase liquid cooling pumped loop coolers in a thin and light laptop computer. This work resulted in a keynote address to the Second International Conference on Microchannel and Minichannels held in Rochester, New York in 2004.

16. I have worked extensively on system level air cooling of various electronic products including laptops, all-in-one PCs, desktop PCs, Servers, avionic systems, among others.

V. LEGAL STANDARDS

17. I am not an attorney and offer no opinions on the law. I am, however, informed on several legal principles, summarized below, which I have used in reaching my opinions.

A. Obviousness

18. First, I understand that for an invention claimed in a patent to be found patentable, it must be, among other things, new and not obvious from what was known before the invention was made. I understand the information that is used to evaluate whether an invention is new and not obvious is generally referred to as “prior art” and generally includes patents and printed publications (e.g., books, articles, product manuals, company publications, etc.). I understand that in

this proceeding the Petitioner bears the burden of establishing invalidity by a preponderance of the evidence.

19. I understand that to establish a claim is obvious, a Petitioner must establish by a preponderance of the evidence that the differences between the subject matter of the patent and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. I also understand that the question of obviousness requires consideration of (a) the scope and content of the prior art; (b) the level of ordinary skill in the art; (c) the differences between the claimed invention and the prior art; and (d) secondary considerations of non-obviousness. I also understand that the scope and content of the prior art must be viewed through the perspective of a person of ordinary skill in the art at the time of the invention.

20. Because the test for obviousness is what would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains, I understand that analyses that rely on hindsight to establish obviousness are improper.

21. I understand that in forming an opinion regarding obviousness, one must consider so-called “secondary considerations” or “objective indicia” of non-obviousness, which include, for example:

- a. Whether the invention was commercially successful as a result of the merits of the claimed invention (rather than the result of design needs or market-pressure advertising or similar activities);
 - b. Whether the invention satisfied a long-felt need;
 - c. Whether others had tried and failed to make the invention;
 - d. Whether others invented the invention at roughly the same time;
 - e. Whether others copied the invention;
 - f. Whether there were changes or related technologies or market needs contemporaneous with the invention;
 - g. Whether the invention achieved unexpected results;
 - h. Whether others in the field praised the invention;
 - i. Whether persons having ordinary skill in the art of the invention expressed surprise or disbelief regarding the invention;
 - j. Whether others sought or obtained rights to the patent from the patent holder; and
 - k. Whether the inventor proceeded contrary to accepted wisdom in the field.
22. I understand that any secondary considerations must have some relationship or nexus to the invention claimed in the patents at issue.

B. Claim Construction

23. I understand that in this proceeding claim terms given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art (“POSITA”) in question at the time of the invention and in light of that patent specification and prosecution history. I understand that, generally, the time of the invention is the effective filing date of the patent application.

24. I understand that a POSITA reads a claim term in the context of the particular claim in which it appears, the other claims of the patent, the patent specification, and the patent’s prosecution history (i.e., “intrinsic evidence”). I further understand that not all intrinsic evidence is given the same weight. The claim language itself is given the most significant weight when construing terms. The specification and then the prosecution history can aid in determining the meaning of the term when the claim language itself is not clear on its face.

25. I understand that “extrinsic evidence”—such as treatise, dictionaries, and expert testimony—may also be helpful in ascertaining the meaning of a claim term. However, I understand that this evidence is given less weight when determining the meaning of a claim term. Further, I understand extrinsic evidence is typically considered during claim construction only where, after considering the intrinsic evidence, the meaning of the claim limitation is still not apparent.

VI. PERSON OF ORDINARY SKILL IN THE ART

26. I understand that the '740 and '142 Patents are to be viewed from the perspective of one of ordinary skill in the art. I understand that the perspective of one of ordinary skill in the art means the level of skill of an ordinarily skilled person in the art in question at the time of the claimed invention. I am informed that the Petition treats the time of the claimed invention as March 3, 2008, and I apply the same date in my analysis below.

27. I understand that several factors are considered in determining the level of ordinary skill in the art. These factors include (i) the educational level of active workers in the field; (ii) the types of problems encountered in the art; (iii) the nature of prior art solutions to those problems; (iv) prior art patents and publications; (v) the activities of others; (vi) the sophistication of the technology involved; and (vii) the rapidity of innovations in the field.

28. In my opinion a POSITA would have the following qualifications: “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.”

29. I understand the Petitioner contends that a POSITA “would have possessed a bachelor’s degree in a pertinent discipline, such as mechanical engineering, physics, product design, or a related field. Such a person would also have 2-4 years of experience in working with electronic displays and have an understanding of product design issues and failure modes associated with electronic displays. Alternatively, a POSITA would have had 5–7 years of experience in the field working with electronic displays and have a similar understanding of product design issues and failure modes associated with electronic displays.”

30. I disagree with Petitioner’s proposed definition of an ordinarily skilled artisan. A person skilled only in product design would not be a person skilled in the art to understand issues of thermal management in a display system. For example, even Smith-Gillespie indicated he did not agree with his definition of a POSITA during a deposition in a related International Trade Commission Investigation. *See* Ex. 2022, Smith-Gillespie Feb. 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.”).

31. Despite my disagreement with Petitioner’s proposed definitions, I meet both parties definitions of a person of skill in the art given my educational

background and work experience. Under either party's definition of a POSITA, my opinions, analysis, and conclusions are the same. I am offering my opinion in this investigation based on my experience as one of at least ordinary skill in the art of the Challenged Patents at the time of the invention.

VII. CLAIM CONSTRUCTION

32. I understand that the International Trade Commission has issued a claim construction order concerning the phrase “closed loop” as recited in the Challenged Claims. *See* Ex. 1033, *Certain Outdoor and Semi-Outdoor Electronic Displays*, Inv. No. 337-TA-1331, Order No. 13 (May 15, 2023) (the “1331 Investigation”). For all other terms, I have applied the plain and ordinary meaning of the term as it would be commonly understood by one skilled in the art at the time of the invention.

A. “closed loop”

33. I understand that MRI argued “closed loop” should be construed according to its plain and ordinary meaning. *See*, Ex. 1033 at 42. By contrast, I understand that the Respondents (including the Petitioner in this action) argue “closed loop” should be construed as “gas pathway within a display housing containing gas that is essentially isolated from ambient air.”

34. I understand that the ALJ rejected both parties' proposed constructions, and provided a “tentative” construction of “closed loop”: “a gas

pathway, forming a complete loop, within a display housing. Ex. 1033 at 45. I have applied the ALJ's construction of the term in this declaration. However, because the ALJ's construction is "tentative," I have also applied the plain and ordinary meaning and Petitioner's proposed construction in the alternative.

VIII. OVERVIEW OF THE CHALLENGED PATENTS

35. The '740 Patent is entitled a "Electronic Display with Cooling," issued December 10, 2019, and names Tim Hubbard and William Dunn as co-inventors. The '142 Patent is entitled "Electronic Display with Cooling," issued May 18, 2021, and names Tim Hubbard and William Dunn as co-inventors. Both of the Challenged Patents share the same specification and Figures.

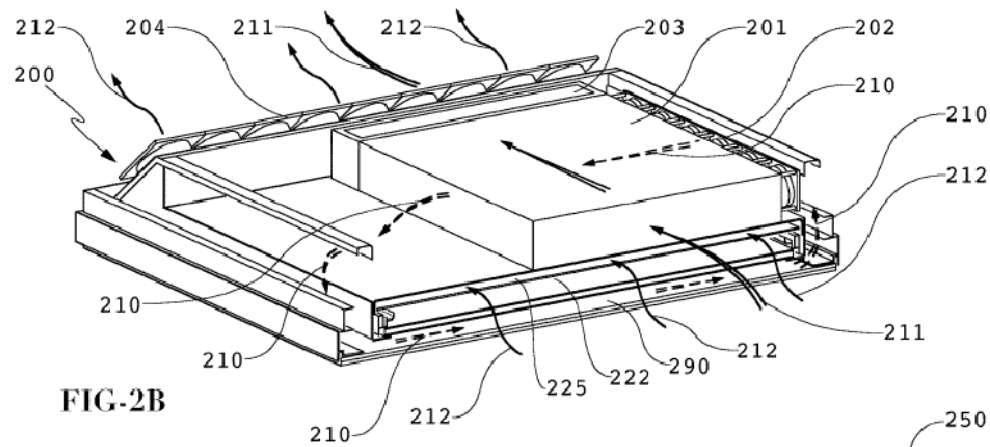
36. The Challenged Patents describe cooling systems for electronic displays (termed "electronic image assembly" in the Challenged Claims) within an overall display product (termed "electronic display" in the Challenged Claims)—including the external structural support elements of the display product ("housing") and the electronics and electrical components used to operate the electronic image assembly.

37. Prior to the inventions disclosed in the Challenged Patents, systems for cooling electronic displays operated by removing heat from the non-display sides and electrical components of the system through the sidewalls or fins on heat sinks. *See* Exhibit 1001, '740 Patent at 1:61-2:2. However, such systems could not

sufficiently cool an electronic display which is placed in high heat environments, such as outdoor settings in direct sunlight. '740 Patent at 2:6-9; 2:12-16. Further, the larger size of electronic displays used as information boards produce increased heat from the electronic image assembly surfaces themselves. '740 Patent at 2:19-20. As a result, the cooling systems prior to the inventions claimed in the Challenged Patents failed to adequately cool such displays, and the electrical components and display would suffer damage as a result of this inadequate cooling. '740 Patent at 2:26-34.

38. The Challenged Patents solve the problem of adequately cooling a larger format electronic display in locations of high thermal stress using two airflow pathways: a closed loop around the electronic display and open loop behind the electronic display. *See, e.g.*, '740 Patent at claim 1. Additionally, the problem of cooling a larger format display is solved by adding a heat exchanger as part of the closed loop and open loop pathways to directly transfer heat from the hotter closed loop to the cooler ambient air open loop. '740 Patent at 2:39-48. Finally, the Challenged Patents recognized that certain materials could be applied to the front cover glass in order to prevent the introduction of heat to the system, thereby decreasing the stress placed on the internal cooling structures. '740 Patent 5:60-6:12.

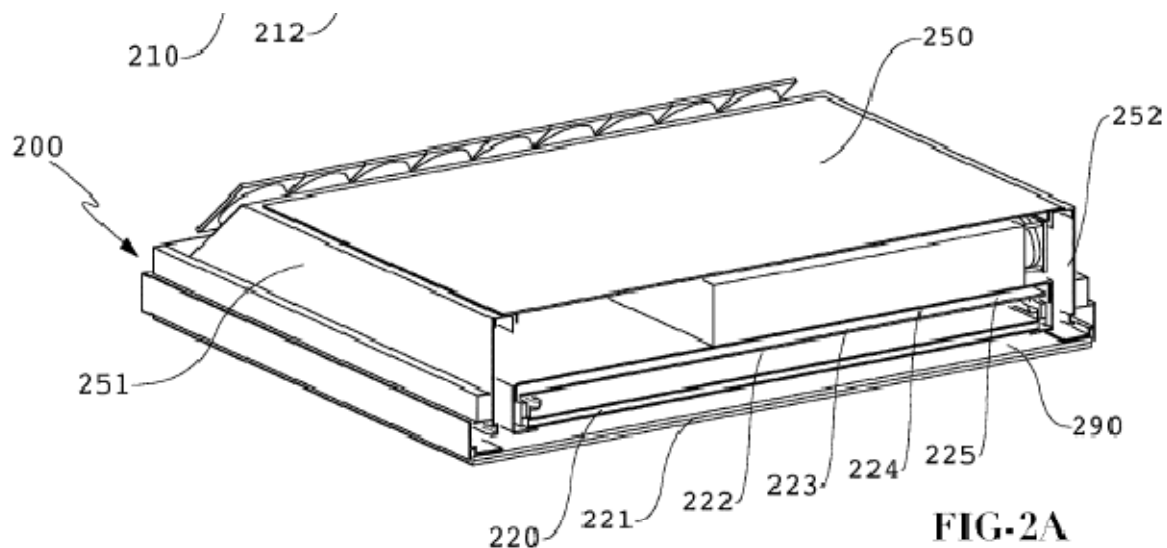
39. Figure 2B shows an embodiment of the claimed invention with the rear cover and side panels of the housing removed to better visualize to air pathways within the display system. '740 Patent at 6:31-42. In Figure 2B, the overall display system is laid flat on its face (glass front cover), and a cross-section taken through the display system to reveal the closed loop and open loop airflow pathways.



40. As seen in Figure 2B, the cooling system includes a closed loop gas path shown by dotted lines flowing through the electronic display 200, and around

the electronic image assembly 220. '740 Patent at 6:34-35. The closed loop gas path extends between the front surface of the electronic image assembly 220 (not labeled in Figure 2B) and the front surface of the overall display housing (glass front cover) to form a closed loop channel 290. '740 Patent at 7:21-34. As the closed loop gas passes through the closed loop channel in front of the electronic image assembly, it contacts the assembly and absorbs heat from the front surface of the assembly. '740 Patent at 3:47-52. As the closed loop gas passes behind the electronic image assembly, it passes into the channels of the heat exchanger 201. '740 Patent at 3:52-54. After passing through the heat exchanger, the closed loop gas exits the heat exchanger and again continues through the loop, passing in front of the electronic image assembly. '740 Patent at 3:55-57.

41. In Figure 2B, the open loop air path shown in solid lines flows through two possible pathways. '740 Patent at 6:35-44. The first open loop pathway passes through the heat exchanger 201, located behind the electronic image assembly. '740 Patent at 6:35-37. The second open loop pathway flows through an “additional optional” channel 225 for cooling the backlight assembly 222 of the electronic image assembly 220. '740 Patent at 6:37-41. This second “additional optional” open loop channel is defined by the rear surface of the backlight 223 and a second surface 224 that is placed behind the backlight. '740 Patent at 6:23-20. *See Fig. 2A.*



42. In order to facilitate increased heat transfer between two the airflow systems, a heat exchanger 201 is used. '740 Patent 4:18-38. Figure 3 and Figure 4 show two exemplary airflow pathways through the heat exchanger 201.

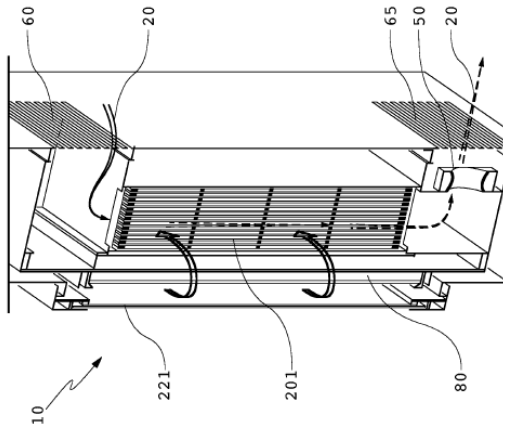


Figure 3

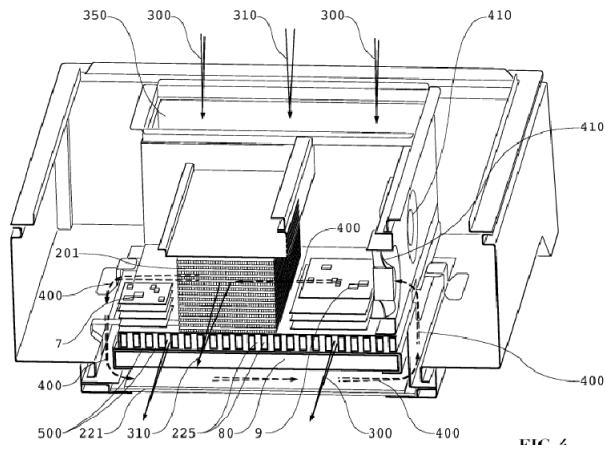
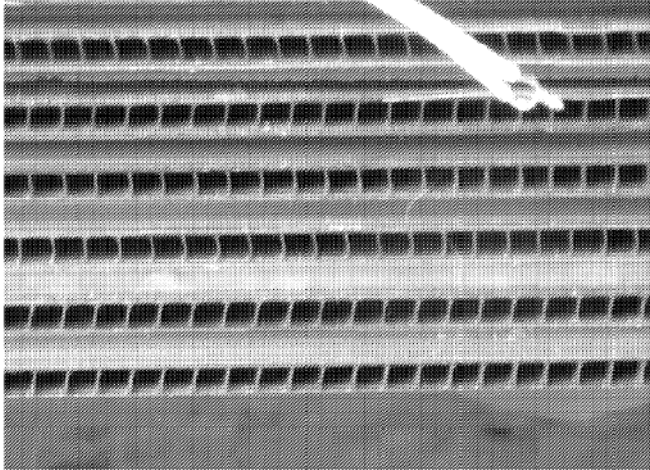


Figure 4

43. The Challenged Patents figures and specification describe fluid-to-fluid heat exchangers that use multiple alternative channels for two different fluid flow paths (here an open loop air pathway and a closed loop gas pathway). *See*, '740 Patent 4:18-38. Both Figure 3 and Figure 4 show a cross-flow heat exchanger, where the two fluid pathways travel in perpendicular planes through separate channels/tubes. '740 Patent 4:16-20. However, the Challenged Patents' shared specification also states the "many types of heat exchangers are known and can be used with any of the embodiments herein." '740 Patent 4:20-21. The Challenged Patents then go on to name parallel flow (airflows travel in parallel in the same direction) and counter-flow heat (airflows travel in parallel in opposite directions) exchangers as additional examples of heat exchangers that may be used in the

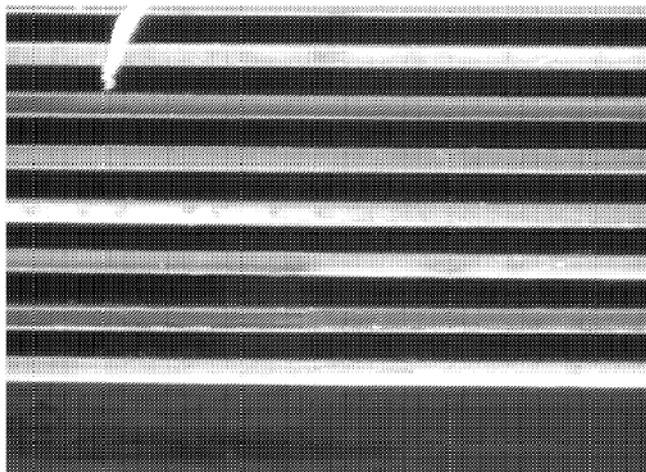
claimed inventions. '740 Patent 4:23. In all heat exchangers, including those specifically named in the Challenged Patents, at least two air pathways flow through the alternating channels, facilitating heat transfer through the walls of the channels from one air system to the other. '740 Patent 4:22-5:11.

44. The Challenged Patents teach multiple methods for constructing a heat exchanger. '740 Patent 4:39-5:11. One embodiment involves using corrugated plates placed spaced apart from each other to create one airflow channel between the corrugated plates, and one airflow channel through the internal space of the corrugated structure of the plates themselves. '740 Patent 4:39-51. This structure is more clearly seen in the figures of U.S. Provisional Application No. 61/138,736, to which the Challenged Patents cite and claim priority. The '736 Application is entitled "Heat Exchanger for an Electronic Display" and names the same two inventors as the Challenged Patents. *See* Ex. 2010. On page 4 of 7 of the images submitted to the USPTO in the '736 Application, the inventors show an image for the closed loop channels of the heat exchanger traveling through the corrugated structure of the plates.



Closed Loop Inlet

45. On page 5 of 7 of the images submitted to the USPTO in the '736 Application, the inventors show an image for the open loop channels of the heat exchanger formed between the alternating plates.



Open Loop Inlet

46. The Challenged Patents describe other materials may be used to create the enclosed channels of the heat exchanger, including tubes, metal, and plastics such as polypropylene. '740 Patent, at 4:52-5:11.

IX. BACKGROUND OF THE TECHNOLOGY

47. Digital displays were new to the outdoor signage market in early 2000s. Prior to the early 2000s, outdoor signs were largely made of illuminated posters. However, the paper posters contained static content and had to be changed out each time new information needed to be displayed. Electronic displays, by contrast, allowed the sign to be dynamic. The content of the outdoor sign could be

changed, easily edited, and updated without requiring labor intensive changing of paper in each outdoor signage display.¹

48. Because of the advantages offered by electronic displays, the outdoor signage market began experimenting with housings that could hold electronic image assemblies instead of paper. However, the integration of electronic image assemblies into an outdoor signage housing could not be done by simply replacing the illuminated paper with the electronic image assembly or moving an indoor electronic display outside. Three new environmental stressors had to be considered in order to effectively design an electronic display that allowed that display to function properly outside: (1) additional thermal load from ambient temperature and the sun, (2) additional thermal load from the face of the electronic image assembly as the size of the displays grew, and (3) the ingress of contaminants and dust.

49. Thermal load from the sun is a primary concern in outdoor electronic displays. For example, even on cold days, the sun's radiation can cause the temperature of the liquid crystals in an liquid crystal display to increase significantly, boil, and turn black. The result is a black spot within the visible area

¹ This history and problem in the art is additionally described in Karppanen.

of the LCD display that can no longer turn colors to show images. This effect is commonly referred to as solar clearing or black spotting.²

50. Additionally, because the electronic displays were being placed in outdoor environments, there is an increased exposure to dust, water, and contaminants. Cooling systems for electronic displays at the time were not designed to handle the increased presence of those contaminants because they used external air to cool the display and electronic components. *See generally*, Nagashima. When moving the electronic displays outdoors and in areas of high thermal stress, the front surface of the display and the electrical components had to be located in areas needing greater protection from water and dust.

51. In the early 2000s, some entities were experimenting with ways to cool the larger sized electronic display in outdoor settings, but those designs were not effective or desirable for several different reasons. Systems that convected heat away from the display and conducted heat out through the housing walls or over finned plates were not able to transfer enough heat out of the system. '740 Patent, 1:62-2:4; '142 Patent, 1:66-2:7. One example of such a configuration is in Karppanen, where circulating air around the electronic display is dissipated through the walls of the housing and over a heat sink or finned plate. *See* Ex. 1004, Karppanen at 9:4-11; 9:17-20.

² *See, e.g.*, Ex. 2012 (draft article on the MRI products and their unique method of avoiding solar clearing).

52. Heat sinks and finned plates were known thermal management devices at that time of the invention. *See* Ex. 1019. A heat sink is a thermal management device that uses conduction. Scott at 1019.13. A portion of the heat sink is placed in contact with the device that needs to be cooled, which the other portions of the device contains fins that conduct the heat away from the heat source. Scott at 1019.13-14, Fig. 2.1-2.2.

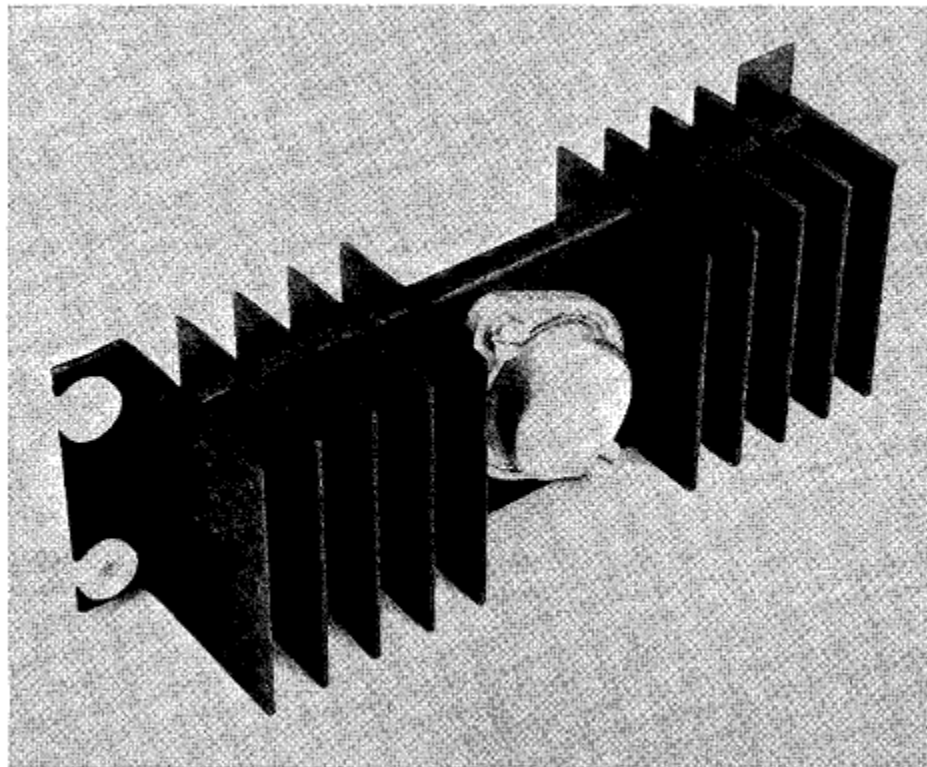


FIGURE 2.1
Transistor mounted on an aluminum heat sink (Photo courtesy of Wakefield Engineering, Inc.)

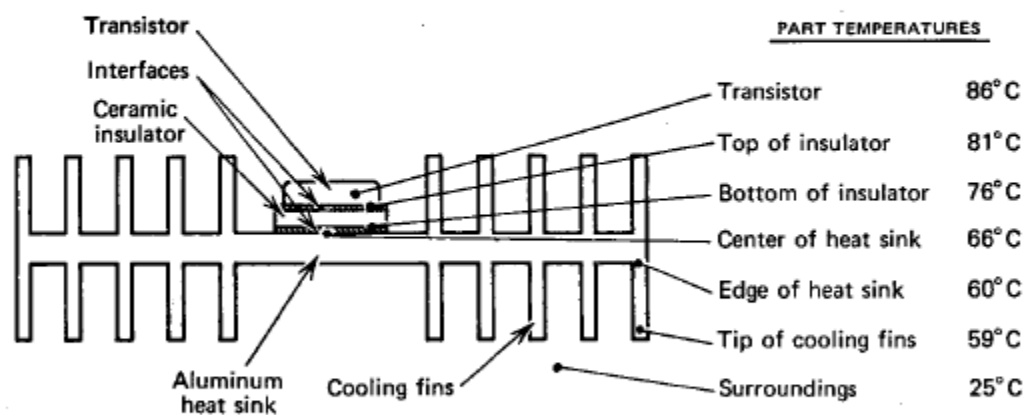


FIGURE 2.2
Cross section drawing of the transistor and heat sink of Figure 2.1 showing part temperatures

53. Air or liquid can then be naturally (without fans) or forcibly (with fans) passed over the fins to convect away the excess heat. Scott at 1019:14. However, the heat transfer from this system alone was not enough for large format outdoor electronic displays.

54. Karppanen recognized that “in particularly hot conditions, heat transfer based merely on cooling fins may not be sufficiently efficient.” Ex. 1004 8:25-26. In those conditions, Karppanen recommended using “liquid-cooled elements or components.” Ex. 1004 8:26-27. I understand that one of the inventors of the Challenged Patents additionally experimented with a liquid cooling system for the closed loop prior to the invention of the unique configuration of the closed and open loops that allowed the invention to effectively operate in the field. Ex. 2013 (David Williams testifying) at 170:9-14.

9 Q. What cooling systems were used in the 47-inch
0 car wash?
1 A. There were several iterations of the 47-inch car
2 wash. The one in 2007 when I came onboard, Mr. Dunn was
3 working on a liquid cooled version of the 47-inch display.
4 That's the one that I'm the most familiar with.

55. As a former MRI engineer explained, the liquid cooling of the electronic display presented problems related to the pressure of the liquid, bulging of the housing, and breaking of the cover glass. Ex. 2013, 170:15-25.

15 Q. Did the liquid cooling solution have any
16 problems?
17 A. It did. No doubt about it. There was -- I
18 remember Mr. Dunn -- I can still see him back there working
19 on the 47-inch. They had problems with having maybe too
20 much pressure of the fluid passing between the cover glass,
21 LCD cover glass, as well bulging, breaking the cover glass,
22 not having enough fluid going through the system. So they
23 had to go through quite a few iterations of getting it to
24 work, but eventually, yes, they did get that system to work
25 to prevent -- excuse me -- to prevent solar clearing of the

56. Other entities experimented with increasing the cooling needed for the larger format, outdoor electronic display by integrating an air conditioning unit into the housing. For example, I understand the first outdoor electronic display units designed by Chris Bolton and Vertigo used air-conditioned units. *See* Ex. 2016, Transcript, Deposition of Chris Bolton (Feb. 23, 2023) at 42:16-22; 103:5-13 (describing units for Phoenix and Las Vegas that utilized air-conditioning units). However, the use of air conditioning systems was not desirable as it increased condensation within the system, drew excessive energy, and could be noisier than desired. Additionally, the air-conditioning unit takes up space within an enclosure, foreclosing the use of a thinner, more desirable housing. *See* Ex. 2016, at 133:9-18.

57. The Challenged Patents improved upon the prior art by creating novel airflow pathways for a closed loop and open loop coupled by a heat exchanger that increased the overall cooling efficiency of the electronic display system without the need to add undesirable mechanisms such as air conditioning units.

58. First, the Challenged Patents described a novel pathway of open loop air that directed ambient air along the backlight of the LCD module. *See* Ex. 1001, '740 Patent, 6:35-44; Figs. 2A & 2B, claim 2, claim 3. The front surface of the LCD display needs to be isolated from ambient air that contains dust and contaminants as that dust can collect on the surface of the display and degrade the image. '740 Patent, 4:16-17; 5:22-25. Additionally, the electronic components for driving the display need to be separated from the ambient air so that the same dust and contaminants cannot interfere with their function. '740 Patent, 5:25-30.

59. The rear surface of the LCD module, by contrast, does not have to be isolated from ambient air and dust. The rear surface of the LCD module is made up of the backlight 222, and the rearmost surface of the backlight 223 is often a thermal plate for conducting heat away from the light sources. '740 Patent, 6:10-30. As an advancement over the prior art, the Challenged Patents direct ambient air along the backlight of the large format advertising displays, in a spaced defined between the backlight rear surface 223 and a second surface 224, in order to directly cool one of the hottest elements of the display. '740 Patent, 6:23-30. The

display front surface and/or electronic components, by contrast, were placed in a closed loop that traveled around the ambient air pathway along the backlight 225. *See* '740 Patent, Fig. 2B. This unique direction of closed loop and open loop airflow pathways was an entirely novel approach to cooling that had superior cooling capabilities from the prior art that used conduction and convection through the external housing and fins.

60. In addition to or alternatively to the ambient airflow along the backlight, the Challenged Patents additionally taught that another ambient airflow pathway can additionally be directed through a fluid-to-fluid heat exchanger to increase the heat transfer area between the closed and open loops. *See, e.g.*, '740 Patent, 1:64-2:26; 4:18-38 (distinguishing thermal management systems which conducted heat through the walls of the housing and heat fins with the thermal management device referred to as a heat exchanger). The integration of the heat exchanger device eliminated the need for an air conditioner to provide the additional cooling needed for large surface electronic image assemblies in outdoor environments.

61. As understood by a POSITA, a heat exchanger refers to a class of thermal management devices that are separate and distinct from other thermal management devices, such as heat sinks, thermal plates, and fins. For example, companies that sell thermal management devices categorize heat exchangers

separately from other devices. Heat exchangers facilitate the heat transfer between two non-mixing fluid streams (air or liquid) by creating adjacent channels through which each distinct fluid may flow. The Challenged Patents contrast this structure with the prior art which focused on conduction through walls of the structure and finned plates. '740 Patent, 1:62-2:4; '142 Patent, 1:66-2:7

62. The physical structure of heat exchangers is different from the physical structure of heat sinks, heat pipes, and finned plates. Heat exchangers are typically enclosed in a casing and contain separate channels for multiple fluid pathways. The simplest heat exchanger design consists of two concentric tubes, the inner tube containing one fluid stream and the outer tube containing the other. *See, e.g.*, Ex. 2017, Frank Incropera et al., FUNDAMENTALS OF HEAT AND MASS TRANSFER, at 670 (2006). Heat exchangers may become more complex in design and may consist of multiple tubes for fluid flow within a space (held in place by a baffle plate), or stacked plates to create alternating channels for fluid flow. *See* Ex. 1019, Scott at 138-39; Ex. 2017, Incropera at 669-672.

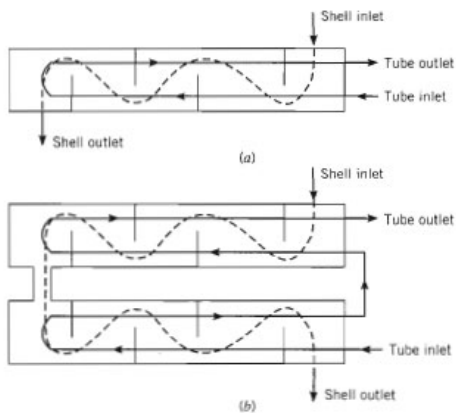


FIGURE 11.4 Shell-and-tube heat exchangers. (a) One shell pass and two tube passes. (b) Two shell passes and four tube passes.

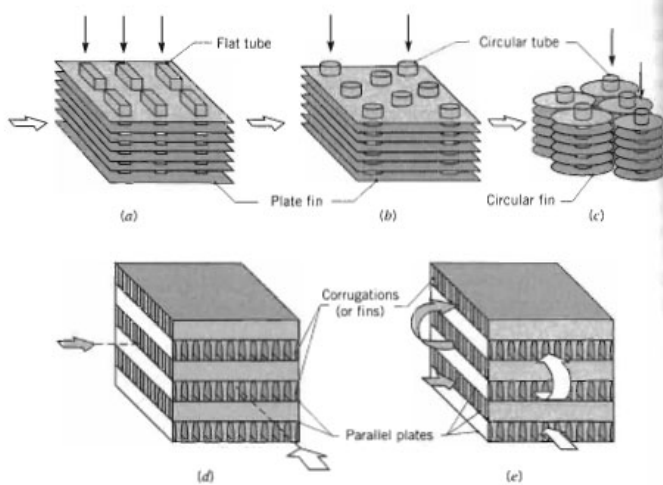


FIGURE 11.5 Compact heat exchanger cores. (a) Fin-tube (flat tubes, continuous plate fins). (b) Fin-tube (circular tubes, continuous plate fins). (c) Fin-tube (circular tubes, circular fins). (d) Plate-fin (single pass). (e) Plate-fin (multipass).

63. The structure of heat sinks, but contrast, is much simpler and comprises a plate with fins. *See* Ex. 1019, Scott, at 18.

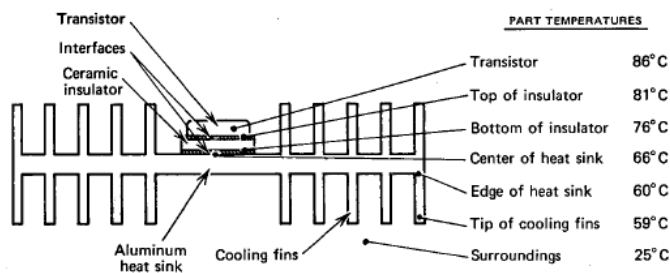


FIGURE 2.2
Cross section drawing of the transistor and heat sink of Figure 2.1 showing part temperatures

64. Heat exchanger design principles are different from those of heat sink and finned plates. For a heat sink or finned plates, thermal engineers look to fin efficiencies and thermal resistances. *See* Scott, 18-23. Whereas for heat exchangers, effectiveness (which is different from efficiencies), NTU, and log mean temperature differences drive the design of the heat exchanger. *See* Ex. 2017, Incorpora, at 669-672.

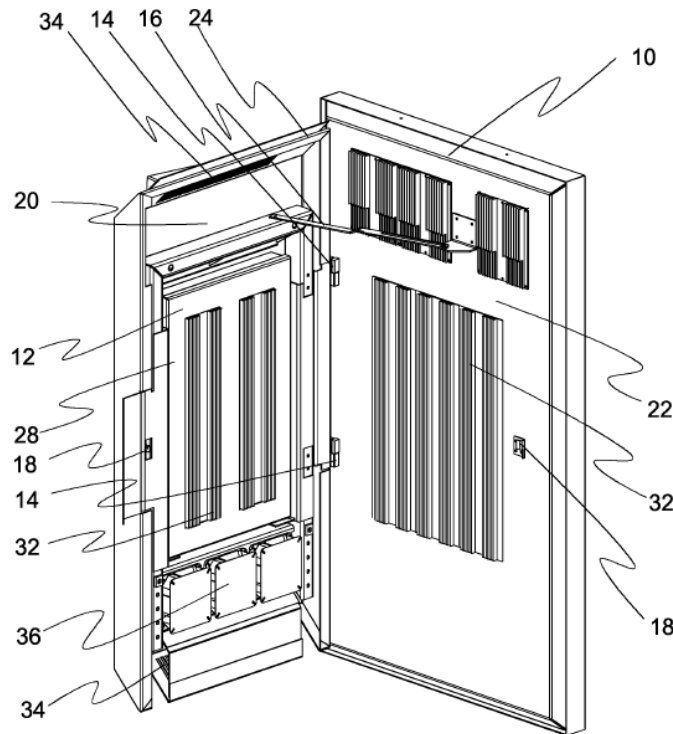
X. OVERVIEW OF THE ASSERTED ART

A. Karppanen

65. International Patent Application No. PCT/FI2006/050145 by Pasi Karppanen (“Karppanen”) filed on April 12, 2006 and published on October 18, 2007. Karppanen is directed to an “electronic information board” comprising a frame 4, display such as a TFT LCD or plasma display for presenting the information, and electronic equipment for controlling the display element. Ex. 1004, Karppanen, at Abstract. The electronic information board comprises three distinct compartments: (1) a “weatherproof” display casing 10 which contains the

display; (2) a “weatherproof” device casing which contains the electronic equipment needed for controlling the display 12, and a “common cooling space” 20 located between the display casing and device casing. Karppanen at Abstract, 3:38-30.

66. Karppanen describes one problem of cooling a large format electronic display is the heat generated by the surface area of the display in addition to the heat typically generated by the electronic components for driving the display. Karppanen at 2:18-29. In order to solve that problem, Karppanen separates the display from the electronic equipment in two separate, modular casings with a cooling chamber located between the two. Karppanen at 3:21-4:4. Figure 1 illustrates the separation of the electronic components in the closed device casing 12 from the electronic display in the closed display casing 10.



67. In Figure 1, the overall enclosure is opened at the cooling space between the two chambers. “Cooling elements 32” are located in the wall separating the display casing from the cooling space 20. Karppanen at 8:13-16.

68. Figure 2 of Karppanen shows a zoomed cross-sectional view of the cooling elements 32. The cooling elements are preferably Peltier elements—an active electrothermal device that pumps heat from a cooler surface to a warmer surface. Karppanen at 9:19-20. The part of the cooling element 32 that extends into the cooling space contains fins that transfer heat to the air traveling within the cooling space. Karppanen 8:16-27. The part of the cooling element that extends into the display casing may use either fins for convection or a solid surface touching the display for conduction. Karppanen at 8:29-36. Such conduction and

convection fins on either side of the Peltier element can be seen in Figure 2 (showing the conduction plate of cooling element 32 in the bottom cross-section and convection fins of cooling element 32 in the top cross-section). As also stated by Smith-Gillespie in his report, these cooling elements 32 also resemble typical heat sink configurations. *See* Smith-Gillespie '740 Declaration at ¶ 63 (“Karppanen also discloses an air-to-air heat exchanger comprising heat sinks 62 . . .”).

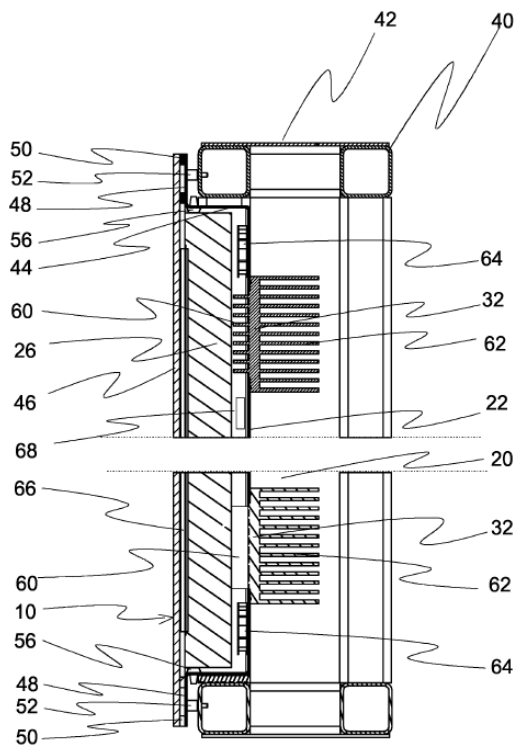
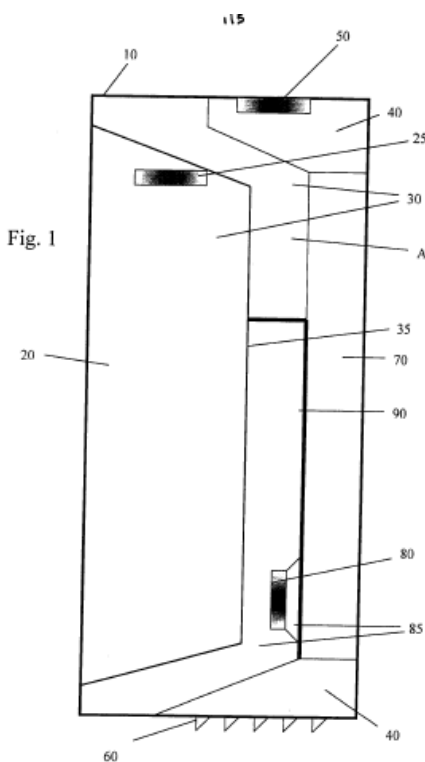


Fig. 2

B. Yare

69. United Kingdom Patent Application No. GB 2402205A by Leslie John Yare (“Yare”), published on December 1, 2004. Yare describes a display cabinet 10 for display system 20 such that a large scale display can be used in

public locations. Ex. 1005, Yare, Abstract, 1:4-6. The display system 20 may be a plasma display, an LCD display, or TFT display, a CRT display, an LED display, or a projection display. Yare, Abstract, 1:4-6. The cabinet 10 is intended to house any of these complete display system and is designed such that it can “co-operate with the existing internal cooling systems of the display.” Yare, 2:15-17. Figure 1 shows the overall configuration of the cabinet 10 containing the display system 20.

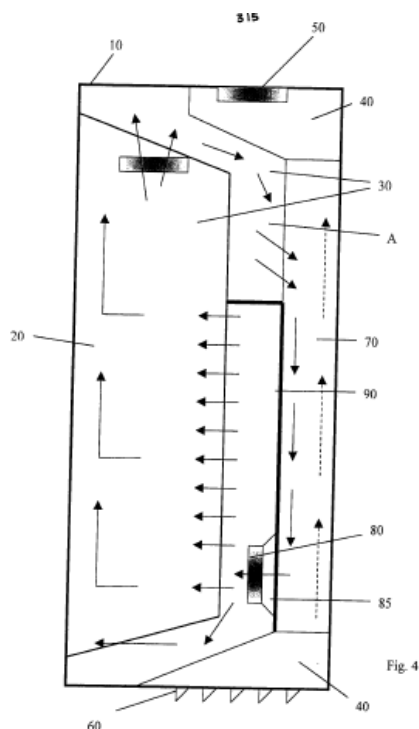


70. The cabinet contains two compartments: an atmospheric zone 40 and a sealed zone (30). Yare, Abstract. The display system 20 is mounted inside of the sealed zone 30. As the display system creates heat, vents within that display system 20 allow air within the sealed zone to travel through the rear portion 35 of the display system to cool the internal components. Yare, 5:15-27. As a result, the air

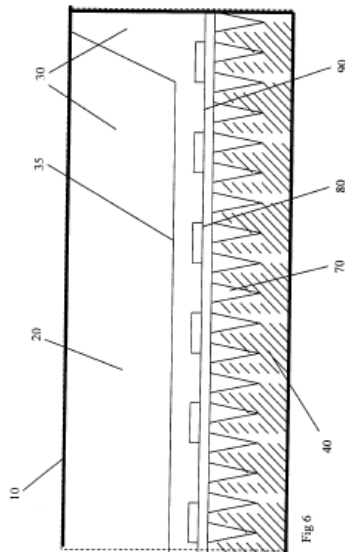
within the sealed zone makes use of the already existing internal cooling system of the display, which typically includes fans 25. Yare, 5:15-27. After air exits the display system 20, it travels to the rear portion 35 of the sealed zone to travel along the heat transfer means. Yare, 5:15-27.

71. The atmospheric zone 40 draws air from outside of the cabinet, through vents 60, and along a heat transfer means that may include a heat exchanger 70 mounted to a baffle plate 90. Yare, 4:29-34.

72. Figure 4 illustrates the movement of air through display system 20 in the sealed zone 30 and through the atmospheric zone 40. Yare, 4:24-25. Dotted arrows show the movement through the atmospheric zone while solid arrows show the movement of air through the sealed zone. Yare, 4:25-27.



73. The heat transfer means located between the sealed zone and atmospheric zone may be a corrugated metal which forms a heat exchanger. Yare, 6:7-10. As air passes through each zone, it passes along the channels of the corrugated heat exchanger. Yare, Abstract. Figure 6 shows a cross section of the corrugated heat exchanger.



C. Larson

74. U.S. Patent No. 6,392,727 by Brent D. Larson (“Larson”) issued on May 21, 2002. Larson describes an apparatus for reducing internal reflectance in an LCD system by placing a polarizer on the inside of a cover glass. *See* Ex. 1010, Larson, Abstract, 1:22-23. As seen in Figure 1, Larson describes a “conventional” LCD as having a cover glass 4, an antireflective coating 6, and an LCD stack that includes a front polarizer 8, a first substrate 1, a liquid crystal layer 12, a second substrate 14, and a rear polarizer 16. Larson, 1:22-27. The front polarizer 8 and the

cover glass 4 can be separated by a gap 9. Larson, 1:28. That gap 9 can be filled with air. Larson, 1:28. However, Larson also describes that the gap should be filled with an index matching material, that that material could be a gel, epoxy, oil, liquid, plastic, or gas. Larson, 4:3-8. Larson also describes that other displays applied adhesives between the cover glass 4 and the front polarizer 8 to eliminate the air gap 9 and reduce reflectances. Larson, 1:39-49. *See also* Larson at Figure 1.

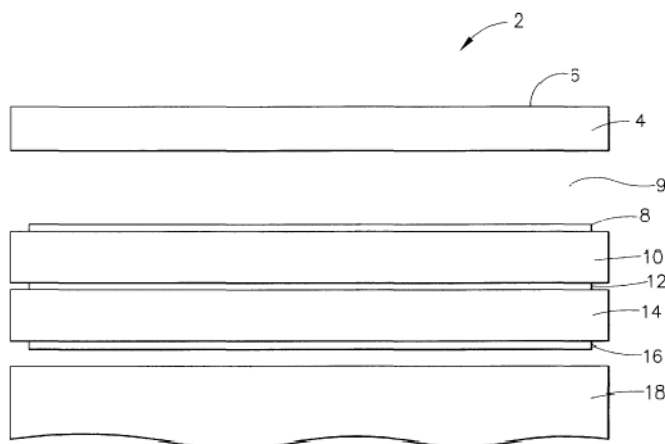


FIG. 1
(PRIOR ART)

75. In Figure 2 of Larson, there is an auxiliary polarizer 20 located on the cover glass 4. Larson, at 2:34-38. Larson also describes an antireflection coating located at the same location on the cover glass 4 for reducing reflection created at the boundary between the cover glass 4 and auxiliary polarizer 20. *See* Larson, 2:47-56. *See also* Larson, Figure 2.

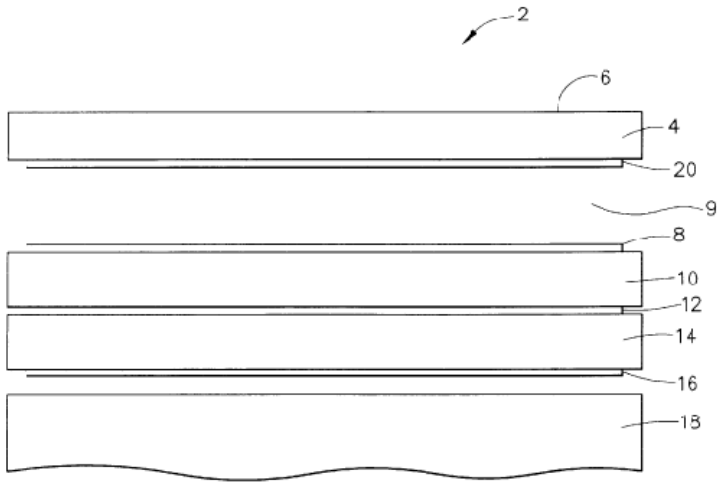


FIG. 2

XI. Non-Obviousness of the '740 Patent

A. Karppanen in view of the knowledge of a person of ordinary skill in the art does not render any of the Challenged Claims obvious.

76. The Petition argues that Karppanen in view of the knowledge of a POSITA renders obvious claims 1-3, 5-9, 11-13, 15-18, and 20 of the '740 Patent. For the reasons provided below, I disagree.

1. Claim 1

a) Karppanen does not disclose a “closed loop gas circulation path”

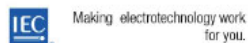
77. Karppanen does not disclose a “closed loop” gas circulation path under Petitioner’s construction. Petitioner construes “closed loop” to include the

limitation that the gas is “essentially isolated from ambient air.”³ Per the explicit disclosures of the ’740 Patent, “essentially isolated” means “gas which travels through the closed loop [that is] preferably . . . 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.” Ex. 1001, ’740 Patent, 5:25-30.

78. A POSITA would understand that the measurement of the ingress of “contaminates and/or particulate (ex. dust, dirt, pollen, water, vapor, smoke, etc.)” is determined according to the industry standard Ingress Protection (“IP”) ratings released by the International Electrotechnical Commission. *IP ratings*, *Int’l Electrotechnical Comm’n*, <https://www.iec.ch/ip-ratings> (last visited Aug. 29, 2023). The IP code is comprised of two numerals, the first represents the extent to which an electrical system is closed to solid contaminants, and the second represents the extent to which an electrical system is closed to water. A person of ordinary skill in the art would look to an enclosure meeting at least the level 5 for solids (“dust protected”) and level 5 for water (“protected against water jets”) to be “substantially free from contaminants and/or particulate.” Absent a disclosure of an

³ Though I disagree with Petition and believe the term “closed loop” should be construed according to its plain and ordinary meaning, I apply Petitioner’s construction in this Part to illustrate how Karppanen fails to meet the term should the Board adopt Petitioner’s construction.

IP rating, a POSITA would look for terms such as “sealed” or “dust-free” to know the enclosure meets the essentially isolated from ambient air requirement.



Ingress protection (IP) ratings guide

IP ratings are represented by combining the first and second digits of the below columns

1 st numeral - solid foreign objects			2 nd numeral - water		
0	No protection		0	No protection	
1	Protected against solid foreign objects of 50 mm Ø and greater		1	Protected against vertically falling water drops	 Vertically falling drops shall have no harmful effects
2	Protected against solid foreign objects of 12.5 mm Ø and greater		2	Protected against vertically falling water drops when enclosure tilted up to 15°	 Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3	Protected against solid foreign objects of 2.5 mm Ø and greater		3	Protected against spraying water	 Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects
4	Protected against solid foreign objects of 1.0 mm Ø and greater		4	Protected against splashing water	 Water splashed against the enclosure from any direction shall have no harmful effects
5	Dust-protected		5	Protected against water jets	 Water projected in jets against the enclosure from any directions shall have no harmful effects
6	Dust-tight		6	Protected against powerful water jets	 Water projected in powerful jets against the enclosure from any direction shall have no harmful effects
Example: + IP 65 → Protected against water jets → Dust-tight			7	Protected against the effects of temporary immersion in water	 Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time
			8	Protected against the effects of continuous immersion in water	 Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7
			9	Protected against high pressure and temperature water jets	 Water projected at high pressure and high temperature against the enclosure from any direction shall not have harmful effects

79. Karppanen does not provide sufficient disclosure as to the contents of either the display casing or device casing to teach and enable a person of ordinary skill in the art to create a seal sufficient to prevent substantial dust from entering the display. Instead, Karppanen makes only cursory reference to the casings being “weatherproof” and “closed.” *See* Ex. 1004, Karppanen, Abstract, 6:16-21. A person of ordinary skill in the art would not understand these disclosures as teaching Karppanen’s system as “essentially isolated from ambient air” as required.

80. For example, none of the IP ratings specially correspond to the concept of “weatherproof.” “Weatherproof” in the art is a generic term that refers to the ability to resist vertically falling water (rain). In the IP scale, this would refer at most to the 1-2 range of the second digit describing water ingress. Further, “weatherproof” is not informative at all regarding the first digit describing solid object ingress. There are many common objects that are considered “weatherproof” but are not rated to the extent that they prevent substantial dust and/or water from entering. For example, outdoor electrical socket protectors are marketed as “weatherproof” but only rated to the lower scale of the IP system.

81. Nor does Karppanen’s reference to “closed” casings provide any guidance regarding the composition of gas within the closed loop. 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.*, Karppanen, 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 . . .”). Nor does the statement that Karppanen includes “vibration attenuating sealing elements” meet the essentially isolated term because those elements merely protect the front glass from normal vibration stressors for outdoor environments.

82. Further, Karppanen consistently refers to the contents of the display casing, device casing, **and** the cooling space between the two as containing “air.” See Karppanen, 8:6-7 (“enabling the circulation of **air** between the walls of the display casing and the outer surface of the display element”), 8:19 (**air** of the cooling space), 10:20-30 (describing **air** as the cooling medium in the display casing). Because there is no different description as to the contents of the three airflow pathways, there is no disclosure sufficient to enable a person of ordinary skill to create a closed loop that is essentially isolated from ambient air under Petitioner’s construction or substantially free from dust, dirt, and water under the disclosures of the ’740 Patent.

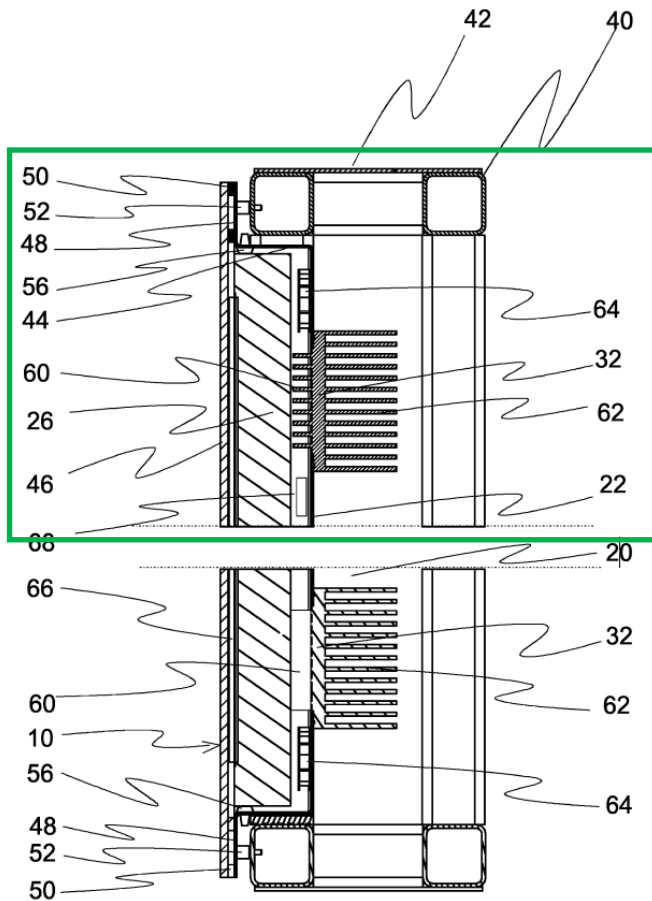
83. Neither Petitioner nor its expert provide analysis as to gas or “essentially isolated from ambient air.” Nor do they provide any explanation of how Karppanen might be modified under the knowledge of one of skill in the art or in combination with a secondary reference to disclose “closed loop gas circulation path.” Nor could they, as Karppanen has already claimed to have solved the problem of cooling a display in an outdoor environment. A person of skill in the art thus would not be motivated to modify Karppanen’s design as the problem allegedly solved by the modification has already been provided by Karppanen.

b) Karppanen does not disclose a “heat exchanger”

84. Nowhere in Karppanen is the term “heat exchanger” used or a fluid-to-fluid heat exchanger discussed or described. Thus, Karppanen does not disclose a heat exchanger as required by the ’740 Patent. The ’740 Patent describes a heat exchanger as a fluid-to-fluid heat transfer device that allows two fluid streams to directly exchange heat by the fluid passing through channels of the same structure. *See* Ex. 1001, ’740 Patent, 4:15-38. As previously explained, this structure was known in the art to be distinct from other thermal management devices such as heat sinks and finned plates. *See* Part IX.

85. Instead, the “cooling elements 32” of Karppanen describe the possible thermal management devices: (1) a finned plate, (2) a heat sink, or (3) a thermoelectric device called a “Peltier element.”

86. Karppanen describes one embodiment of cooling elements 32 that constitute a finned plate. In this embodiment, both ends of the cooling elements 32 (first heat transfer part 60 and second heat transfer part 62) constitute fins which span the wall separating the display casing 12 from the cooling space 20. This configuration of cooling elements 32 is shown in the top portion of Figure 2.



87. A finned plate makes use of convection to transfer heat from the moving air in the display casing to the moving air in the cooling space 20.

Karppanen, 8:16-22 (“The operation of the cooling fins is based on the phenomenon that when the cooling air flows between the fins, heat is transferred from the cooling fins to the air of the cooling space. The task of the cooling elements is to transfer excess thermal energy from the display casing to the cooling space, from which it is further conducted by the air flow produced by the cooling fans 36 out from the entire device.”). This configuration is similar to the finned surface features 150 that are discussed in the ’064 Provisional to which the

Challenged Patents claim priority. *Compare* Ex. 2011, '064 Provisional, [0042], Figure 7, *with* Ex. 1004, Karppanen, Figure

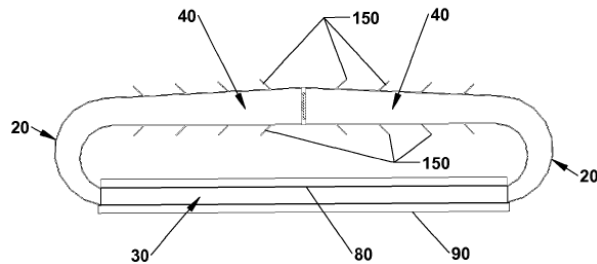
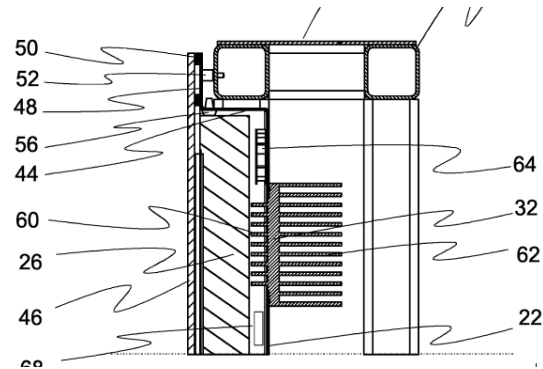


Fig. 7

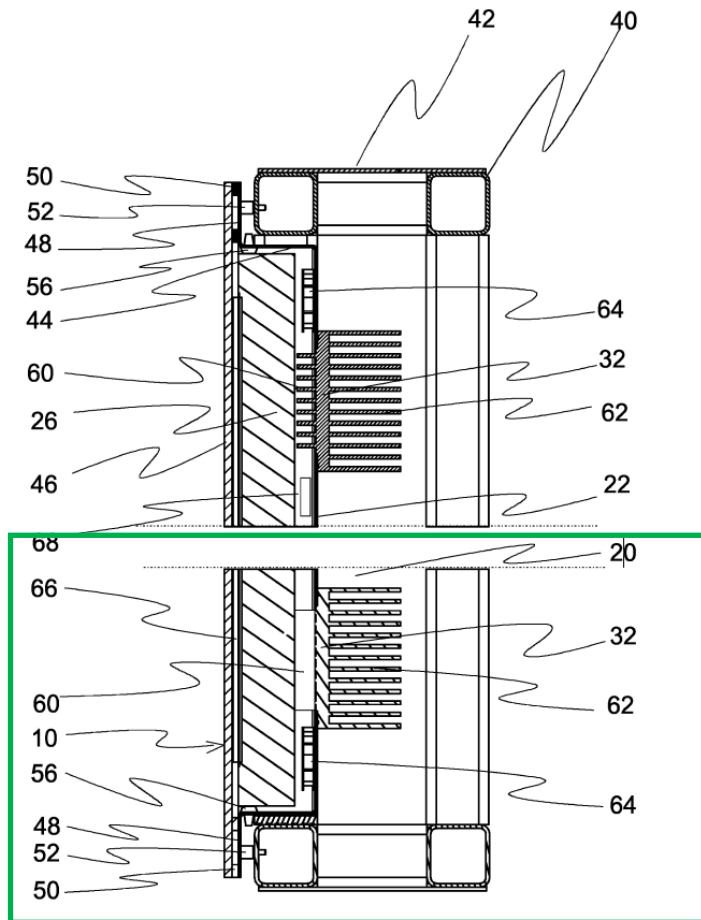
'064 Provisional at Figure 7



Karppanen at Figure 2

88. The finned plate surface feature of the '064 Provisional is not the thermal management device known as a heat exchanger. Rather, it is simply a finned plate. Likewise, in Karppanen, the convective finned plate embodiment of cooling elements 32 is not the thermal management device known as a heat exchanger.

89. Karppanen describes another embodiment of cooling elements 32 that constitute a heat sink. Karppanen, 8:29-36 ("The first heat transfer part may comprise cooling fins *or conduction elements* or both." (emphasis added)). This configuration of cooling elements 32 is shown in the bottom portion of Figure 2.



90. Karppanen describes the conduction element as a “fixed body conducting heat well, which is placed so that it touches the heat source, whereby the heat is transferred from the heat source to the cooling element by conduction.” Karppanen, 8:30-32. In Karppanen, the heat source is the rear portion of the display, and heat is conducted away from that heat source to the portion of cooling element that protrudes into the ambient air cooling space 20. Such a configuration is a classical example of the heat sinks described in the art. *See* Ex. 1019, Scott, 14-17.

91. Finally, Karppanen states that the cooling elements 32 are preferably a Peltier device. *See* Ex, 1004, Karppanen, 9:19-20. Such a device is an active heat

transfer device that uses electrical circuitry to function. A Peltier device is a solid-state heat pump that pumps heat from lower temperature to a higher temperature. A heat exchanger, by contrast, is a passive device using only convection and conduction to directly transfer heat between two fluid streams passing through the device.

92. Further, the cooling element (32) structure does not directly pass heat from one fluid stream to another as performed in a typical fluid-to-fluid exchanger. Instead, the heat from the electronic display is conducted the entire distance of the “cooling element 32”—passing over the entire distance from one end conducting heat from the display, over the wall separating the display casing from the cooling space, and into the air within the cooling space. Thus, the “cooling element 32” is not a heat exchanger within the meaning of the Challenged Patents as understood to a person of skill in the art—it is either a Peltier element (active transport device) or heat sink (passive transport device).

93. None of finned plates, heat sinks, nor Peltier devices are the same thing as a heat exchanger.

94. Further, Petitioner’s expert adopts contradicting definitions of a heat exchanger in his declaration. In Paragraph 123, Smith-Gillespie defines a heat exchanger as anything that “transfers heat from a relatively hotter body to a relatively cooler body.” *See also* Smith-Gillespie ’740 Declaration at ¶ 123 (“The

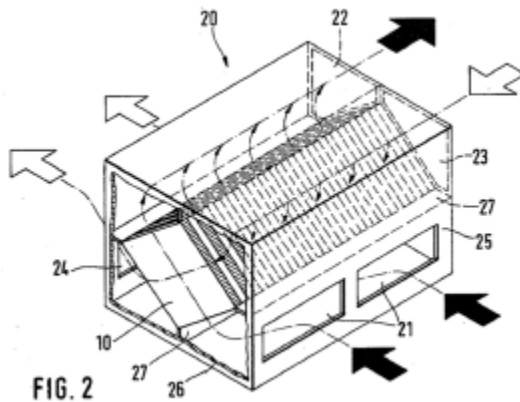
cooling element 32 is a ‘*common heat exchanger*’ because it is located in both the closed loop air path inside the display casing 10 . . . and also in the open cooling space 20 . . . , ***and transfers heat from the closed loop to the open loop.***”)

(emphasis added). This is consistent testimony I observed Smith-Gillespie offer concerning the same prior art and the same patent in front of the International Trade Commission. Ex. 2014, Hearing Tr., (“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 I explained during the 1331 Investigation hearing, this definition is overly broad and would sweep in every structure that that existed between a hotter air source and a cooler air source. *See* Ex. 2015, Hearing Tr. 1252:4-18.

4 Q. Turning to slide 29, do you agree with
5 Mr. Smith-Gillespie that in the context of these patents,
6 any device that transfers heat from one fluid stream to
7 another fluid stream is a heat exchanger?
8 A. No, absolutely not.
9 Q. Why not?
.0 A. Well, if that was the case, I mean, I will look
.1 at the window behind us. Inside it is cooler. Outside it
.2 is warmer. So that window is transferring heat outside.
.3 That's not a heat transfer. Nobody would call it as a heat
.4 transfer. So nobody would call it as a heat exchanger, I'm
.5 sorry.
.6 Heat exchanger is a specific device, a classic
.7 thermal management device that I just described on previous
.8 slide.

95. However, elsewhere, Smith-Gillespie appears to understand that a heat exchanger is not just any device that exchanges heat. In Paragraph 60 of his '740 Patent declaration, Smith-Gillespie points to three pieces of prior art that illustrate three heat exchanger devices. *See* Smith-Gillespie '740 Declaration at ¶ 60 (citing Mullejeans, Olmstead, and Bergh). Smith-Gillespie explains that in each of these devices, “two separate air streams across opposite sides of a convoluted set of plates formed of thermally conductive materials so that heat from the high-temperature air stream may be conducted across the separator material and absorbed by the low-temperature air stream on the other side of the separator.” Smith-Gillespie '740 Declaration at ¶ 61. Smith-Gillespie then points to Figure 2 of Mullejeans that illustrates the channels created by the “convoluted set of plates”

to create a cross-flow heat exchanger. Smith-Gillespie '740 Declaration at ¶ 61(citing Ex. 1023, Mullejeans).



96. I disagree with Smith-Gillespie's attempt to map any thermal management device that uses the basic laws of physics (heat travels from an area of high temperature to low temperature) as a "heat exchanger." Though persons of skill in the art will sometimes refer to a device that moves heat as a heat exchanger, "heat exchanger" also has a narrower meaning in the art to define direct and forced fluid-to-fluid thermal transfer systems that utilize channels of flowing fluid to transfer heat between two fluid streams. *See generally* Ex. 1020, Dave S. Steinberg, COOLING TECHNIQUES FOR ELECTRONIC EQUIPMENT (2d ed. 1991); (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). Smith-Gillespie describes these heat exchangers in

paragraphs 60-61 of his report. I agree with Smith-Gillespie that the meaning of “heat exchanger” within the context of the disclosures of the Challenged Patents refers to the thermal management device “heat exchanger” and not the mere act of “exchanging heat.”⁴

97. Finally, a person of ordinary skill in the art would not substitute heat sinks and finned surfaces with a heat exchanger because of the heat exchanger’s inflexible design of the cooling surface. *See* Ex. 2018, Wellhofer, [0005].

(“[S]tandard heat exchangers that work according to the air/air principle have proven to be unsuitable due to the inflexible design of the cooling surface.”).

Wellhofer is another reference concerning large format outdoor displays that is cited on the face of the ’740 Patent. Much like Karppanen, Wellhofer taught the transfer for heat through a finned wall which it referred to as a heat sink.

Wellhofer, [0003], [0008], Fig. 1. In discussing and distinguishing the prior art, Wellhofer taught that integrating an air-to-air heat exchanger were not easily

⁴ In yet another location, Smith-Gillespie appears to adopt a third construction that “heat exchanger” within the ’740 Patent is a synonym to “heat sink” because during prosecution the Applicant did not explicitly respond to the Examiner’s rejection of the claims under Thielman, a reference that referenced a heat sink. Smith-Gillespie ’740 Declaration at ¶ 135. I disagree that this overrides the clear disclosure of the ’740 Patent specification. I understand that if the prosecution history is to be used to define the scope of a term in a patent, there must be a clear statement or intent by the application in the history. There is no such thing here. During prosecution, the applicant did not respond to the Examiner’s statement on the heat exchanger element, and thus there are no statements by the applicant which can evidence the applicant’s own understanding of the term. *See* Ex. 1031.159-161. Instead, the applicant only challenged the presence of a closed and an open loop. Ex. 1031.159-161.

adaptable into existing housings and thermal management schemes because their design was inflexible.

c) Karppanen does not disclose “a gas circulation” or an “air circulation device” positioned to force ambient air or circulating gas through the common heat exchanger

98. As explained above, Karppanen does not disclose a gas circulation or circulation device positioned to force ambient air or circulating gas through a common heat exchanger because Karppanen does not disclose a heat exchanger. The language “through the common heat exchanger” refers to the channels of a heat exchanger that are formed by the multiple plates or tubes. Because there is no heat exchanger formed by plates or tubes, air or gas cannot travel through that structure of the heat exchanger.

99. Even *if* one of the Peltier elements, finned walls, or heat sinks described within Karppanen falls within the scope of a “heat exchanger,” as required by the claim, the gas and air does not travel *through* that “heat exchanger.” Instead, the gas or air travels along the fins of the cooling element (32) embedded in the wall. *See* Ex. 1004, Karppanen, 8:17-19. There are no channels through which air or gas can travel *through*.

100. Smith-Gillespie points to Steinberg to support his contention that air flowing between walled fins is the same as the “operational principle of heat exchangers.” Smith-Gillespie ’740 Declaration at ¶ 135 (citing Ex. 1020,

Steinberg). This section does not support the idea that air flowing between unbound fins is the same as finned plates of a heat exchanger. Instead, this section again describes heat exchangers as containing enclosed tubes through which air must flow. *See* Steinburg 1020.235 (When the fin density is high or when the surface finish on the fins is very rough, even more energy is required to ***force the air through the long, narrow tubes that are formed by the heat exchanger fins***” . . . “friction resulting from the flow ***through the multiple fin heat exchanger tubes***”) (emphasis added).

101. Smith-Gillespie argues that a person of ordinary skill in the art would be motivated to put a plate on top of the fins inside of both the display casing and the cooling space to allow air to travel *through* the cooling elements 32. First, the addition of a plate on top of each side of the cooling elements 32 would not transform these Peltier elements, finned wall, or heat sink into a heat exchanger. The heat exchanger requires sealed alternating channels in order to transfer thermal energy from fluid to fluid. Instead, the cooling element 32 would still have separated channels of fins, one in the display casing and one in the cooling space that would not be able to directly transfer heat from each fluid system through the walls of the channel.

102. Second, none of the references cited by Smith-Gillespie discloses a heat exchanger as required by the claim. Instead, Ex. 1006 U.S. Patent Application

Publication No. 2009/0145581 (“Hoffman”) describes a heat sink for conducting heat from a solid substrate, not a heat exchanger. Hoffman, ¶ 2. Similarly, Ex. 1008, U.S. Patent Application Publication No. 2008/0083527 (“Horng”) does not once mention the term heat exchanger or describe such fluid-to-fluid transfer systems. Instead, Horng merely describes ambient air pathways behind a backlight, where the backlight contains a heat dissipating plate with heat sinks (“fins”) attached thereto. *See, e.g.* Horng, [0033]-[0034].

103. Additionally, a person of skill in the art would see no added benefit of adding a plate to the fins of the cooling element 32. Such a configuration would only add to the cost of material and manufacturing of the display and add no additional cooling benefit to the air flowing through the sides of each cooling element 32 (or heat sink). Closed channels in a heat exchanger function to transfer because the air flow systems are located adjacently to each other in the exchanger. In the hypothetically closed fins of cooling element (32), the channel of the air in the display casing and cooling pathway are separated from each other by the display casing wall and no increased cooling would occur from merely capping the fins.

104. The addition of a plate to the cooling elements extending into the display casing and the cooling space would present new challenges to the airflow within the system. When air forced to travel through enclosed tubes, more force is

required in order to overcome the added restricted space for airflow and friction created by the enclosed tube. *See* Ex. 1020, Steinburg, 221. This would require additional re-working for the Karppanen enclosure to generate that force and maintain the desired airflow velocity necessary to provide cooling to the front side of the display. Such a re-design would be beyond the skill of an ordinarily skilled artisan in 2008.

105. Finally, modifying Karppanen by simply adding a plate to either side of the cooling element 32 would not create a heat exchanger. It would not be a simple task to replace the cooling elements 32 with a heat exchanger.

Transforming the airflow pathway in a wider format industrial enclosure to be suitable in a large format thinner display housing is not a modification that would not have been obvious to a person of ordinary skill at the time.

106. Further, Karppanen describes the back wall 22 which contains the cooling elements 32 is intended to open and close to create a modular system. Ex. 1004, Karppanen, 6:16-31. The inflexible design of a heat exchanger forming the channels of the air systems in the display casing 10 and cooling space 20 would not allow for such a modular design and defeat the purpose of Karppanen's system.

2. Claim 2

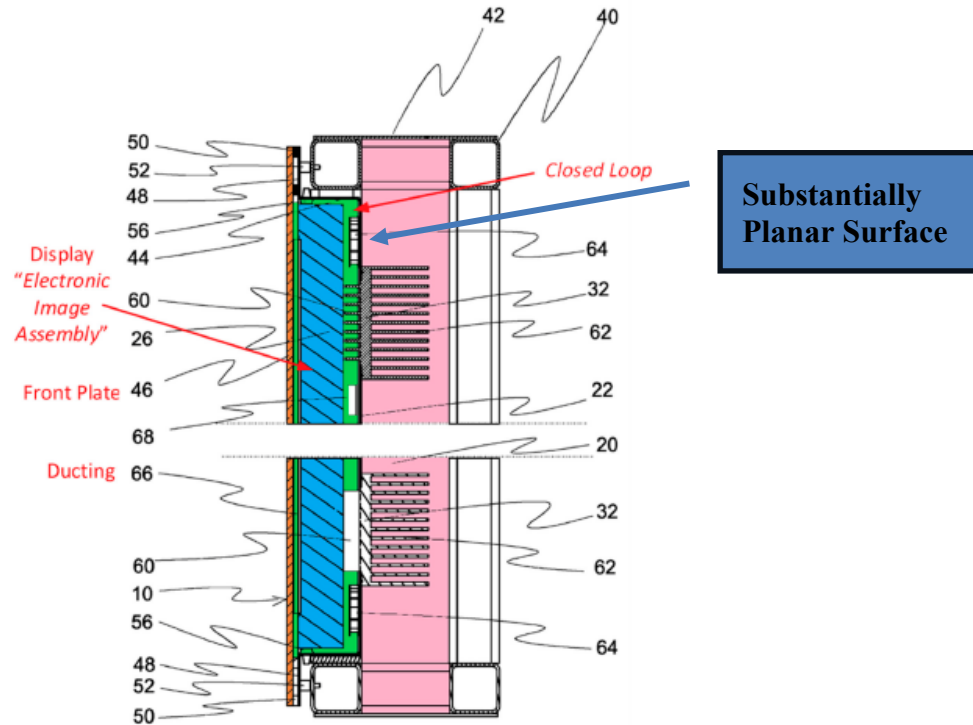
a) Karppanen does not disclose “a space defined between the rear portion of the electronic image assembly and the substantially planar surface, wherein the space is in gaseous communication with the open loop ambient air flow path”

107. Karppanen defines a space between the rear portion of the electronic image assembly and a substantially planar surface located behind that electronic image assembly. However, that space is in gaseous communication with the airflow through the display casing—the area mapped by Smith-Gillespie as the closed loop. The space is not in “gaseous communication with the *open loop ambient air* flow path.”

108. The plain language of claim 2 makes it clear that there must be a space between the rear surface of the electronic image assembly and a planar surface through which the open loop passes. “A space defined between” does not refer to *multiple separate spaces* that are formed between the rear surface of the electronic image assembly and a substantially planar surface somewhere remote in the enclosure. To think otherwise would mean the entire claim is meaningless and repetitive of the independent claim limitation that there exists *some* open loop pathway located behind the electronic image assembly. *See* Ex. 1001, ’740 Patent at claim 1 (“an open loop ambient air flow path behind the rear portion of the electronic image assembly;”).

109. Additionally, the '740 Patent confirms that claim 2 refers to the “additional optional” open loop pathway described in the '740 Patent as passing along the backlight of the electronic image assembly in order to directly cool the backlight. *See* '740 Patent at 6:23-30 (“A second surface 224 may be placed behind the rear surface 223 of the backlight assembly 22. The space between the rear surface 223 of the backlight and the second surface 24 may define an additional optional open loop channel 225 through which ambient gas may travel in order to cool the backlight assembly 22 (or image assembly 220 if no backlight is used.”). The second surface 224 is the “substantially planar surface” of claim 2, the rear surface 223 is the “rear portion of the electronic image assemble” of claim 2, and space between them for the additional open loop pathway is “a space defined between” the for the open loop air flow pathway of claim 2.

110. Petitioner annotates the rear surface of the display in blue. *See* Smith-Gillespie '740 Declaration at ¶ 121. Behind that rear surface is a wall 22. (annotation added to the Smith-Gillespie image). In the same image, Petitioner annotates the closed loop as encircling the display by a closed loop that Petitioner asserts is separate and isolated from the open loop located in cooling space 20.



(Id., FIG. 2 (annotated).)

111. That closed loop passes through the space defined between the rear surface of the electronic image assembly and the planar surface behind it. Thus, the space cannot be in gaseous communication with the ambient air in the cooling space 20 either under a plain reading of the claim language or with the additional understanding gained from the '740 Patent specification.

3. Claim 7

a) Karppanen does not disclose “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”

112. Karppanen does not disclose any device for reducing the temperature of the *ambient air* flowing throughout the system. To the contrary, Karppanen

describes transferring heat *to ambient air* using cooling elements 32—thereby increasing the temperature of the ambient air traveling through cooling space 20. Karppanen at 8:13-22.

113. Smith-Gillespie points to the “cooling fans 36” within the closed loop as a “cooling device” that lowers the temperature of ambient air entering the loop. Smith-Gillespie ’740 Declaration at ¶ 187. However, aside from the adjective “cooling” used to modify “fan 36,” Smith-Gillespie points to no other disclosure that these fans are *reducing the temperature of the ambient air* as it enters the open loop. Nor can he. Fans do not reduce the temperature of the air that they move, they merely increase the movement of air past hot sources to absorb and convect away heat. When a person stands in the pathway of a fan, they feel cooler not because the fan itself reduces the temperature of the air, but the increased movement of air transfers additional heat away from that person.

4. Claim 8

a) Karppanen does not disclose a “closed loop gas circulation path”

114. Claim 8 recites a “closed loop gas circulation path.” Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 1.

b) Karppanen does not disclose a “heat exchanger”

115. Claim 8 recites a “heat exchanger.” Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 1.

5. Claim 9

a) Karppanen does not disclose “wherein the open ambient air flow path is also in gaseous communication with the rear channel”

116. Claim 9 depends on claim 8, and claim 8 recites “[8d] a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assemble, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel.” Smith-Gillespie concludes that element [8d] and 9 are substantially the same as claim 2. *See* Smith-Gillespie ’740 Declaration at ¶¶ 197 -200; 214-216 (describing the difference between the claims as “insubstantial”). Smith-Gillespie then goes on to map the same cooling space 20 to the space defined between the rear surface of the electronic image assembly and a planar surface for ambient airflow. For the same reasons I stated with respect to claim 2, Karppanen does not disclose claim 9 and Smith-Gillespie’s interpretation is contrary to the plain language of the claim and inconsistent with the specification.

6. Claim 11

a) Karppanen does not disclose a “heat exchanger [that] includes first and second gas pathways, the first and second pathways being isolated from each other”

117. The language of claim 11, referring to “first and second gas pathways” of a heat exchanger that are isolated from each other refers to the internal channels or tubes of a heat exchanger. As discussed with regard to claim 1., Karppanen does not disclose a heat exchanger and does not describe any thermal management structure that includes channels or tubes for air to travel through. For the same reasons as in claim 1, Karppanen does not disclose claim 11.

118. Additionally, I note that Smith-Gillespie’s analysis of the language in this claim is again erroneous. Karppanen’s cooling elements 32 themselves do not “include a first and second gas pathway.” Instead, these finned plates or heat sinks sit between two separate airflow pathways that are contained by the display casing 12 and cooling space 20—not by the cooling elements 32.

7. Claim 12

a) Karppanen does not disclose the “first gas pathway” being in “gaseous communication with the open loop” and also in gaseous communication with the rear channel

119. The language of claim 11, referring to “first and second gas pathways” of a heat exchanger that are isolated from each other refers to the internal channels or tubes of a heat exchanger. As discussed with regard to claims 2 and 8, the rear channel defined between the rear portion of the electronic image assembly and the substantially planar surface is in communication with the gas

flowing through the display casing, not the ambient air flowing through the cooling space 20.

8. Claim 17

a) Karppanen does not disclose a “closed loop gas circulation path”

120. Claim 17 recites a “closed loop gas circulation path.” Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 1.

b) Karppanen does not disclose a “heat exchanger”

121. Claim 17 recites a “heat exchanger.” Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 1.

c) Karppanen does not disclose “a rear channel defined by a space between the rear portion of the electronic image assembly and a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the rear channel forming a part of the open loop ambient air flow path”

122. Smith-Gillespie concludes that element [8d] and [17e] are substantially the same. *See* Smith-Gillespie ’740 Declaration at ¶ 197 -200; 214-216 (describing the difference between the claims as “insubstantial”). I note, however, that claim [17e] is closer to claim 2 as claim 2 contains the limitation that the open loop ambient air flow path travel in the space defined between the rear portion of the electronic image assembly and the substantially planar surface.” Below is a table of the claims side-by-side showing the two claims claim the

location of an open loop airflow pathway through a channel/space directly between the rear surface of the electronic image assembly and another substantially planar surface.

Claim 2	Claim [17e]
2. The electronic display of claim 1, further comprising: ... <i>a space defined between the rear portion of the electronic image assembly and the substantially planar surface;</i> wherein the space is in gaseous communication <i>with the open loop ambient air flow path.</i>	<i>a rear channel defined by a space between the rear portion of the electronic image assembly and a substantially planar surface</i> located behind and spaced apart from the rear portion of the electronic image assembly, the rear channel <i>forming a part of the open loop ambient air flow path;</i>

123. Smith-Gillespie maps the same cooling space 20 to the space defined between the rear surface of the electronic image assembly and a planar surface for ambient airflow. For the same reasons I stated with regard to claim 2., Karppanen does not disclose claim [17e] and Smith-Gillespie’s interpretation is contrary to the plain language of the claim and inconsistent with the specification.

d) Karppanen does not disclose “at least one fan positioned to force” ambient air or circulating gas through the common heat exchanger

124. As explained above, Karppanen does not disclose a gas circulation or circulation device positioned to force ambient air or circulating gas through a

common heat exchanger because Karppanen does not disclose a heat exchanger. Additionally, Karppanen does not disclose this limitation for the same reason that Karppanen disclose a “a gas circulation” or an “air circulation device”—i.e. fans—“positioned to force ambient air or circulating gas **through** the common heat exchanger” in claim 17.

9. No Motivation to Modify Karppanen

125. Petitioner never attempts to combine a secondary reference to Karppanen. Additionally, and as discussed above, the cooling elements described in the secondary references named by Petitioner would not function as a heat exchanger within the Karppanen display according to the Challenged claims, which require two distinct airflow pathways to flow through the heat exchanger. Finally, a person of ordinary skill in the art would not have been motivated to modify Karppanen to include any additional airflow features not explicitly or inherently described therein because Karppanen states that it has already solved the issue of thermal regulation of the electronic information board. Karppanen at 3:8-19.

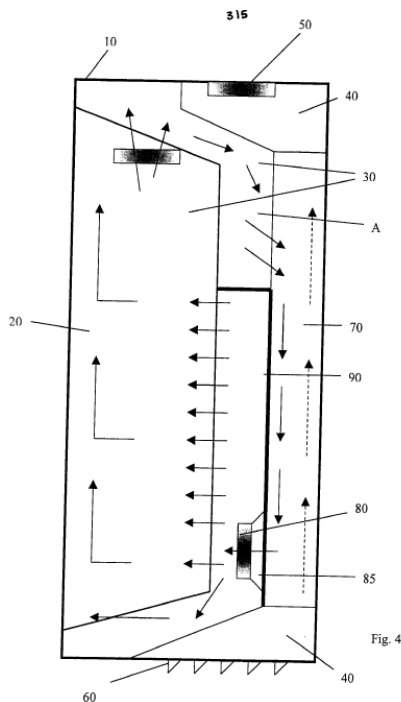
B. Yare in view of the knowledge of a person of ordinary skill in the art

126. Petitioner argues that Yare in view of the knowledge of a POSITA such as Bundza renders obvious claims 1, 3, 5, 6, 8, 9, 11-13, 15-18, and 20 of the '740 Patent. For the reasons provided below, I disagree.

1. Claim 1

a) Yare does not disclose “a closed loop gas circulation path about the electronic image assembly”

127. Yare does not disclose a closed loop gas circulation about, or around, the electronic display. The Yare cabinet is designed such that any fully configured display (LED, plasma, LCD, or projector) with its own internal cooling system can be operated in a public location without being damaged from the dust and contaminants that are typical in such locations. *See* Ex. 1005, Yare at 1:8-23; 5:17-27. In all Figures, Yare depicts that the display system 20 is located adjacent to the front of cabinet 10. *See, e.g.,* Yare, Figure 4.



128. Thus, if anything, Yare teaches there is no space between the display system 20 and front of the cabinet 10 for cooling gas to flow through as part of its

path “about” the display system 20. Instead, Yare merely teaches that the air in the sealed zone 30 travels through the display system 20’s built-in cooling system.

Yare, 5:25-26. Airflow through the display’s built-in cooling system is promoted by a pressure zone 85 that is created in the sealed zone 30 by a bank of fans 80 at the base of the baffle plate 90. Yare, 5:22-27. The pressurized air enters the display system’s cooling path through “vents and other venting means (not shown”)”

Yare, at 4:4-9 However, Yare does not discuss or describe the exact nature of the cooling system in the display system 20. Thus, there is no disclosure that air travels “around” the LCD, plasma, or LED panel in the display system 20. Instead, there is only a disclosure that air travels *through* the display’s cooling system.

129. Contrary to Smith-Gillespie’s assertion that the “L-shaped arrows” in Figure 4 show air traveling in front of the display 20 (Smith-Gillespie ’740 Declaration at ¶ 284), the arrows in Figure 4 are not helpful in disclosing the exact location of the panel in the display system 20 and the movement of air throughout that built-in cooling system. Instead, a person of ordinary skill in the art would know that these arrows merely illustrate Yare’s discussion of air traveling *through* the display’s built-in cooling system.

130. Each of the display systems 20 recited by Yare (“plasma display, and LCD, a TFT display, a CRT display, an LED display, a projector or a rear projection display”) has a different and unique configuration and internal cooling

system. Ex. 1005, Yare, at 3:17-20. Plasma displays typically focus on cooling the front surface of the display (*see e.g.*, Ex. 2019, Ohta, (0012)), whereas projector systems focus on cooling the light source. Where the display system makes use of a flat panel, some systems rarely provide for a gap between the display panel and front surface of the system (*see* Ex. 2020, Nagashima, 3:55-57, Figure 1), and other system intentionally provide a space between the front surface of the system and the display panel (*see* Ex. 2019, Ohta, (0012)). Yare provides no further detail as to where the panel—“electronic image assembly”—may be located within the display system 20 within any of the display system 20 options that may fit within its cabinet 10. Thus, there is no disclosure sufficient to conclude that there is a space between the front of the electronic image assembly and any front surface of the display system 20, *or* that there is cooling gas which flows through that space, if at all.

131. Smith-Gillespie draws an LCD panel—electronic image assembly—into Figure 4 of Yare. *See* Smith-Gillespie ’740 Declaration at ¶ 272.⁵ Smith-Gillespie then—apparently confusing Yare’s discussion of a fully formed product with an LCD panel within a larger electronic display product—and arbitrarily draws in a blue rectangle and extends the arrow pointing to “20” to the blue rectangle.

⁵ Smith-Gillespie draws the LCD panel at a different location when analyzing Yare for the ’142 Patent. *See* Smith-Gillespie ’142 Declaration at ¶ 291.

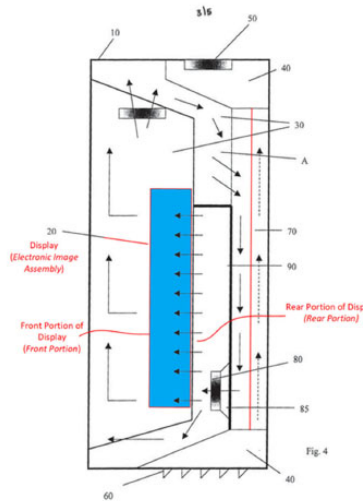
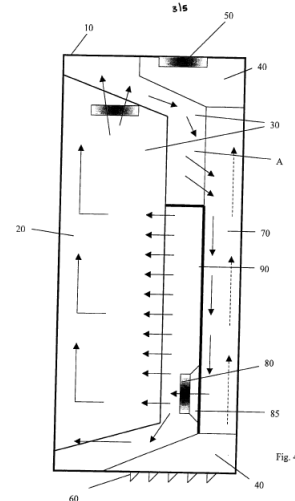


Figure 4 as Modified by Petitioner



Original Figure 4

132. Smith-Gillespie points to no disclosures in Yare to support his conclusion display system 20 would not be where it is drawn in all Figures and would instead be located at this spot within Figure 4. Similarly, Smith-Gillespie provides no citation to Yare for why the LCD module—electronic image assembly—would be located in this location *if* the display system 20 were selected to be an LCD display product. Instead, Smith-Gillespie asserts that a person of ordinary skill in the art would know the “display 20” *had* to be located in the place, in a spaced manner from the front glass. Smith-Gillespie ’740 Declaration at ¶ 282.

133. Smith-Gillespie points to Larson as allegedly supporting the proposition that a person of ordinary skill would know there is a gap between the “display 20” and the front glass. Smith-Gillespie ’740 Declaration at ¶ 285. However, Larson also discusses that LCD displays are also typically bonded to the front glass of the display in order to reduce reflectance. *See* Ex. 1010, Larson,

1:39-44. In fact, Larson notes this has an advantage over having a gap between the glass and LCD stack as it reduces reflection. Larson, 1:44-46. Thus, contrary to Smith-Gillespie's suggestion, Larson in fact would teach away from including a gap in front of the display without further additional modifications to the system, because doing so would not have the advantage of reducing reflection. There is insufficient disclosure in Larson to support the position that LCD modules are necessarily spaced apart from the front glass.

134. I also disagree with Smith-Gillespie that placing the panel at the location annotated by him in the Yare Figures is "seemingly the best, if not the only, location for the display." Smith-Gillespie '740 Declaration at ¶ 282. Again, Smith-Gillespie cites the advantages of the '740 Patent (cooling the front surface of the display by providing closed loop airflow) as support that a person of skill in the art would either know the LCD panel is located where he annotates in blue, or that it "would have been obvious to do so in view of the predictable results above." Again, this reasoning is circular and the mere application of hindsight.

135. Nor would a person of skill in the art be motivated to place the display system 20 apart from the front cover of the cabinet 10 (or panel within display system 20 from the front surface of that electronic display product) to accommodate a closed loop of gas because the "screen could fog." Fogging and humidity is a problem *created* by placing a screen apart from the front glass. For

example, Wellhofer described having to address fog issues created by placing the LCD module spaced apart from the front glass. *See* Ex. 2018, Wellhofer,[0033] (stating the solution was to add an additional plate 31 rear of the backlight in order to create a uniform flow of air that prevents fogging on the front surface).

136. As a result it is my opinion that Yare does not disclose sufficient information to determine if air is passing in front of whatever panel is located in display system 20. Additionally, the disclosures of Yare make it clear that there is no intended gap between display system 20 and the front cover of the cabinet 10.

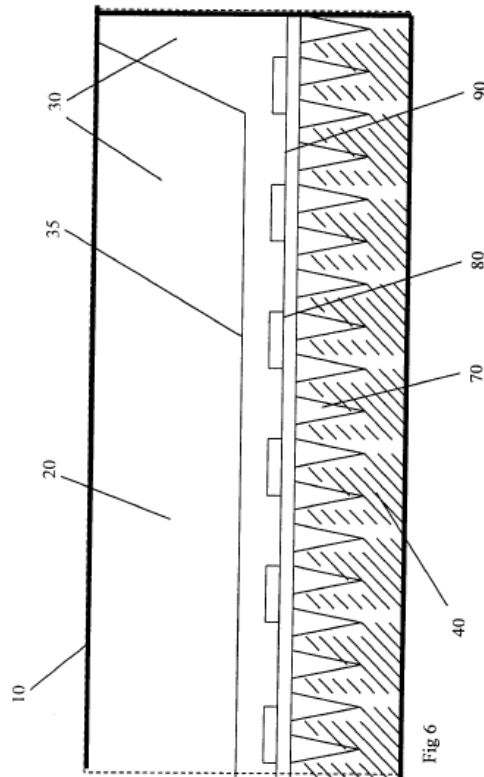
b) Yare does not disclose “a gas circulation” or an “air circulation device” positioned to force ambient air or circulating gas through the common heat exchanger

137. Yare does not disclose a forcing ambient air or circulating gas through a common heat exchanger as claimed by the '740 Patent. The '740 Patent teaches fluid-to-fluid heat exchangers that make use of alternating channels for the ambient air and closed loop gas. Ex. 1001, '740 Patent, 4:20-38. As explained with regard to Claim 1 in connection Karppanen, a person of ordinary skill in the art would read this disclosure and understand that air traveling *through* requires the use of a heat exchanger which contains a “plurality of channels/pathways/tubes” for the ambient air and for the closed loop air.

138. Yare’s heat exchanger, however, discloses a unique counter-flow heat exchanger 70, mounted on one side to baffle plate 90, that comprises one

corrugated plate separating air flow in the sealed zone 30 and atmospheric zone 40.

See, e.g., Ex. 1005, Yare, Figure 6.



139. Even if the baffle plate 90 is coextensive with the entire sealed zone 30 side of heat exchanger 70, there are channels along only *one* side of the heat exchanger. As air in the atmospheric zone passes the heat exchanger, it passes *along* the corrugated heat exchanger plate. There are no channels or pipes creating a pathway to flow *through enclosed channels or tubes* of the heat exchanger on at least the atmospheric side. Yare explicitly describes that air travels *along a plate* not *through enclosed channels or tubes* of the heat exchanger. Yare, 5:29-32 (“The baffle plate 90 on the side of the sealed zone 30 divides air expelled from the rear

portion 35 of the display 20 and ensures air flows *properly in the desired direction, along the heat exchanger* towards the fans 80.”).

140. I further note that Yare is not clear as to whether mounting baffle plate 90 creates a closed channel for air to flow through on the sealed zone side of the heat exchanger. A person of ordinary skill in the art would know that baffle plates are typically not co-extensive with the length of a heat exchanger, creating channels of the heat exchanger itself. Instead, the baffle plate is made of sturdier material for holding the thermally conducting surfaces of a heat exchanger and is not co-extensive with the length of the channels of a heat exchanger.

141. Nor would a person of ordinary skill in the art be motivated to modify Yare’s heat exchanger configuration. *See* Smith-Gillespie ’740 Declaration at ¶¶ 297-302. Smith-Gillespie appears to modify Yare based on a configuration purportedly described in Bundza. I disagree that a person of skill in the art would make this modification. First, Bundza does not support the proposition that an ordinarily skilled artisan would know a heat exchanger with channels or tubes for *two* airflow pathways (here the air within the sealed zone and atmospheric zone). Bundza concerns cooling systems for electrical cabinets—such as those used for outdoor telecommunications devices. Ex. 1011, Bundza, 1:10-13. Bundza does not concern electronic displays, and both the Petitioner and Patent Owner’s definition of a POSITA require experience and work with electronic displays. Bundza thus

does not represent the knowledge of an ordinarily skilled artisan within the context of the '740 Patent and does not support the conclusion that the Yare reference could be modified to use the heat exchanger integrated into structures within different fields.

142. Second, the modification suggested by Smith-Gillespie is outside of the scope of an ordinarily skilled artisan. As suggested by Wellhofer, substituting heat exchangers would not be a simple change because of the inflexible design of the cooling surface. *See* Ex. 2018, Wellhofer, [0005]. (“[S]tandard heat exchangers that work according to the air/air principle have proven to be unsuitable due to the inflexible design of the cooling surface.”).

2. Claim 2

a) Yare does not disclose “a space defined between the rear portion of the electronic image assembly and the substantially planar surface, wherein the space is in gaseous communication with the open loop ambient air flow path”

143. Yare defines a space between the rear portion of the display system 20 and a substantially planar surface located behind that electronic image assembly. As discussed before, Yare does not disclose any information regarding the location of whatever panel—electronic image assembly—may be located within the display 20. Thus, there is no information to conclude if there is a channel behind that electronic image assembly and substantially planar surface. Regardless, whatever space may be located behind the electronic image cannot be in gaseous

communication with an open loop ambient airways because the entire display system 20 is located within the sealed zone.

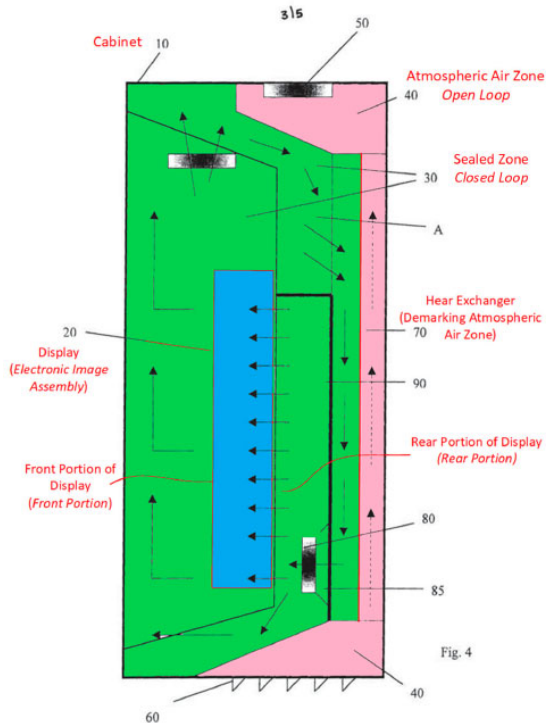
144. The plain language of claim 2 makes it clear that there must be a space between the rear surface of the electronic image assembly and a planar surface through which the open loop passes. “A space defined between” does not refer to *multiple separate spaces* that are formed between the rear surface of the electronic image assembly and a substantially planar surface somewhere remote in the enclosure. To think otherwise would mean the entire claim is meaningless and repetitive of the independent claim limitation that there exists *some* open loop pathway located behind the electronic image assembly. *See* Ex. 1001, ’740 Patent at claim 1 (“an open loop ambient air flow path behind the rear portion of the electronic image assembly;”).

145. Additionally, the ’740 Patent confirms that claim 2 refers to the “additional optional” open loop pathway described in the ’740 Patent as passing along the backlight of the electronic image assembly in order to directly cool the backlight. *See* ’740 Patent, 6:23-30 (“A second surface 224 may be placed behind the rear surface 223 of the backlight assembly 22. The space between the rear surface 223 of the backlight and the second surface 24 may define an additional optional open loop channel 225 through which ambient gas may travel in order to cool the backlight assembly 22 (or image assembly 220 if no backlight is used).”).

The second surface 224 is the “substantially planar surface” of claim 2, the rear surface 223 is the “rear portion of the electronic image assemble” of claim 2, and space between them for the additional open loop pathway is “a space defined between” for the open loop air flow pathway of claim 2.

146. Smith Gillespie annotates his modification of Yare’s Figure 4 to point to where he asserted the rear surface of the electronic display would be located within display 20.⁶ *See* Smith-Gillespie ’740 Declaration at ¶ 281. Behind that rear surface is a baffle plate 90. Behind that baffle plate 90, there is a heat exchanger 70 which is a corrugated structure. Smith-Gillespie ’740 Declaration at ¶ 281 (annotation added to the Smith-Gillespie image). In the same image, Smith-Gillespie annotates the closed loop as encircling the display by a closed loop that Smith-Gillespie asserts is separate and isolated from the open loop located in atmospheric zone 40.

⁶ However, as explained above, Yare does not describe where an electronic image assembly would be located within the electronic display 20. Regardless, even if there is a space defined between whatever electronic image assembly is located within the display and another substantially planar surface, that space could not be in communication with ambient/open loop air because the entire display 20 is located within cabinet 10.

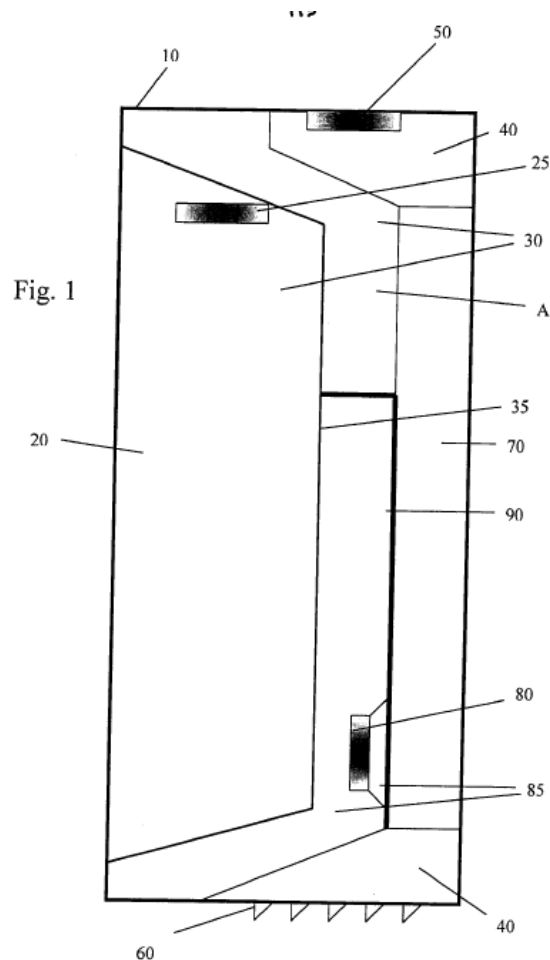


147. That closed loop passes through the space defined between the rear surface of the electronic image assembly baffle plate or heat exchanger (which is not planar but corrugated). Thus, the space cannot be in gaseous communication with the ambient air in atmospheric zone 40 either under a plain reading of the claim language or with the additional understanding gained from the '740 Patent specification.

3. Claim 5

a) Yare does not disclose “a front display surface spaced apart from the front portion of the electronic image assembly; and a front channel defined by the space between the front display surface and the front portion of the electronic image assembly, the front channel forming part of the closed loop gas circulation pathway”

148. As discussed above with regards to claim 1, Yare does not disclose the location of the panel—electronic image assembly—in the display system 20. Thus, Yare cannot disclose that there is a channel defined between the front glass and the electronic image assembly surface in the display system 20. To the extent that Smith-Gillespie argues that the display system 20 is placed spaced apart from the front cover glass of the cabinet, that too is incorrect. Again, Yare does not disclose or teach any channel located between the front cover glass and the display system 20 for air to travel through in the sealed zone. In fact all Figures in Yare show the display system 20 abuts the front cover of the cabinet 10. *See, e.g.*, Figure 1.



149. Again, Smith-Gillespie recites the knowledge of a person of skill in the art and Larson in order to assert that the LCD panel **must** be located in the place illustrated by him in Figures 1 and 4.⁷ For the same reasons discussed above in claim 1, I disagree.

150. Additionally, I disagree that the references cited by Smith-Gillespie support of his contention that it was well known the surface of an electronic

⁷ I note that this location where Smith-Gillespie asserts is “seemingly the best, if not the only, location for where the unpictured LCD would be placed” is in a different location than where he identifies the display to be located in the ’142 Patent. *See, e.g.*, Smith-Gillespie at ¶ 291.

display was separated from the front glass by a channel of circulating closed loop air. Smith-Gillespie '740 Declaration at ¶ 324.

151. First, Pandolfi describes the unique configuration of a touch screen display, not general electronic display configurations as alleged by Smith-Gillespie. Pandolfi at Abstract; Smith-Gillespie '740 Declaration at ¶ 327. Also, Smith-Gillespie is incorrect that the front gap 53 exists between the front of the display surface and the front glass cover. *See* Smith-Gillespie '740 Declaration at ¶¶ 144. Instead, the display in Pandolfi refers to an electronic image assembly *and its glass cover*. *See* Ex. 1012, Pandolfi, 2:34-39 (“The display may be implemented in any of a number of different technologies such as, for example, **Liquid Crystal Display (LCD)**, Electro-Luminescent (E/L) or plasma display technology. A “U” shaped display screen shock and vibration damper 26 holds a **glass display panel 10** against a circumferential lip 30 on the front piece 12 of the housing.”). The gap 53 exists between the glass display panel 10 and the touch screen panel 32. Pandolfi, 2:42-47. This is distinct from the gap being between the front of the LCD stack and the glass cover.

4. Claim 8

a) Yare does not disclose a “closed loop gas circulation path encircling the electronic image assembly”

152. Claim 8 recites a “closed loop gas circulation path encircling the electronic image assembly.” Yare does not disclose this limitation for the same

reason that claim 1 does not disclose a “closed loop gas circulation path *about* the electronic image assembly” as explained with regard to claim 1. *See also* Smith-Gillespie ’740 Declaration ¶ 340 (agreeing that the difference between “path about” and “path encircling” was insubstantial).

5. Claim 9

a) Yare does not disclose “wherein the open ambient air flow path is also in gaseous communication with the rear channel”

153. Claim 9 depends on claim 8, which recites “[8d] a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assemble, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel.” Smith-Gillespie concludes that element [8d] and 9 are substantially the same as claim 2. *See* Smith-Gillespie ’740 Declaration at ¶ 197 -200; 214-216 (describing the difference between the claims as “insubstantial”). Smith-Gillespie then goes on to map the same atmospheric zone 40 to the space defined between the rear surface of the arbitrarily drawn in electronic image assembly and the very rear surface of the cabinet 10 enclosure for ambient airflow. For the same reasons I stated with regard to claim 2, Yare does not disclose claim 9 and Smith-Gillespie’s interpretation is contrary to the plain language of the claim and inconsistent with the specification.

6. Claim 11

a) Yare does not disclose a “heat exchanger [that] includes first and second gas pathways, the first and second gas pathways being isolated from each other”

154. The language of claim 11, referring to “first and second gas pathways” of a heat exchanger that are isolated from each other refers to the internal channels or tubes of a heat exchanger. As discussed with respect to claim 1, Yare does not disclose a heat exchanger that has pathways for at least the open loop airflow path. For the same reasons as in claim 1, Yare does not disclose claim 11.

7. Claim 12

a) Yare does not disclose the “first gas pathway” being in “gaseous communication with the open loop” and also in gaseous communication with the rear channel

155. The language of claim 11, referring to “first and second gas pathways” of a heat exchanger that are isolated from each other refers to the internal channels or tubes of a heat exchanger. As discussed with respect to claims 2 and 8, the rear channel defined between the rear portion of any alleged electronic image assembly and the baffle plate or corrugated heat exchanger is in communication with the gas flowing through the sealed zone, not the ambient air flowing through the atmospheric zone.

8. Claim 17

a) Yare does not disclose a “closed loop gas circulation path encircling the electronic image assembly”

156. Claim 17 recites a “closed loop gas circulation path encircling the electronic image assembly.” I agree with Smith-Gillespie that this limitation is identical to claim element [8b]. Therefore, Yare does not disclose this limitation for the same reason that claim 1 and claim 3 does not disclose a “closed loop gas circulation path [about/]encircling the electronic image assembly.”

b) Yare does not disclose “a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of an spaced apart from the front potion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path”

157. I agree with Smith-Gillespie that the differences between this limitation and claim 5 are insubstantial. Yare does not disclose this element for the same reasons described with regard to claim 5.

c) Yare does not disclose “a rear channel defined by a space between the rear portion of the electronic image assembly and a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the rear channel forming a part of the open loop ambient air flow path”

158. For the same reasons I stated regarding claim 2, Yare does not disclose claim [17e] and Smith-Gillespie’s interpretation is contrary to the plain language of the claim and inconsistent with the specification.

d) Yare does not disclose “at least one fan positioned to force” ambient air or circulating gas through the common heat exchanger

159. Yare does not disclose this limitation for the same reason that claim 1 does not disclose at least an “air circulation device”—i.e. fans—“positioned to force ambient air **through** the common heat exchanger” as explained in with regards to claim 1.

9. No Motivation to Modify or Combine with Larson, Bundza, or Knowledge of a POSITA

160. First, a person of ordinary skill in the art would not have been motivated to modify Yare to include any additional positional features of the display not explicitly or inherently described therein because Yare already alleges to have solved the issue of placing the display within the cabinet. Yare, 1:32-2:3. Additionally, a person of ordinary skill in the art would not be motivated to modify Yare to include additional cooling features as Yare also affirmatively states that its cooling system is sufficient. *See, e.g.*, Yare, 2:14-2:17.

XII. Non-Obviousness of the ’142 Patent

A. Karppanen in view of Larson does not render any of the Challenged Claims obvious.

161. The Smith-Gillespie ’142 Declaration opines that Karppanen in view of Larson renders obvious claims 1-15. For the reasons provided below, I disagree.

1. Claim 1

a) Karppanen does not disclose a “closed loop”

162. Claim 1 of the '142 Patent recites a “a closed loop airflow pathway . . . configured to accommodate circulating gas,” claim 6 recites a “closed loop gas circulation pathway”, and claim 12 recites a “a closed loop airflow pathway.”

163. Karppanen does not disclose a “closed loop” under Petitioner’s construction for the same reasons discussed above in regard to the '740 Patent.

2. Claim 3

a) Karppanen does not disclose “a heat exchanger”

164. Nowhere in Karppanen is the term “heat exchanger” used or a fluid-to-fluid heat direct heat transfer discussed or described. Thus, Karppanen does not disclose a heat exchanger as understood by the '142 Patent. 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” additionally describes the structure of the heat exchanger. The heat exchanger itself, with its channels or tubes, not actually form part of each airflow pathway... it cannot merely be *in* the same pathway.

165. Karppanen does not disclose a “heat exchanger” for the same reasons discussed above in regard to the '740 Patent.

3. Claim 6

a) Karppanen does not disclose “a closed loop gas circulation pathway”

166. Claim 6 recites “a closed loop gas circulation pathway.” I agreed with Smith-Gillespie that the differences between claim limitation [1c] and [6d] are insubstantial. Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 1.

b) Karppanen does not disclose a “heat exchanger”

167. Claim 6 recites a “heat exchanger.” Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 3.

4. Claim 12

a) Karppanen does not disclose “a closed loop airflow pathway”

168. Claim 12 recites a “closed loop airflow pathway.” I agree with Smith-Gillespie that the differences between element [1b], [1c], [1e] and [12b] are insubstantial. Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 1.

5. Claim 15

a) Karppanen does not disclose a “heat exchanger”

169. Claim 6 recites a “heat exchanger.” Karppanen does not disclose this limitation for the same reason as discussed above with regard to claim 3.

6. No Motivation to Modify or Combine with Larson

170. A person of ordinary skill in the art would not have been motivated to combine Karppanen with Larson.

171. Karppanen is directed to a different field of art than Larson. Larson relates to methods and apparatuses for reducing unwanted reflections in electronic displays. Larson at 1:5-9. Karppanen, by contrast, relates to the thermal management of electronic information boards. Karppanen at 1:3-8. The two references address distinct problems: optical phenomena versus thermal regulation. Larson does not once mention the issue of heat stress and thermal management of display systems, and even describes its technology as “absorbing” solar energy—rather than deflecting and preventing that energy from entering the system. *See* Ex. 1006 to the ’142 Petition, 3:19-20. A person of ordinary skill in the art would not look to references addressing internal reflectance and index media in order to address the issues of thermal regulation in large format advertising displays.

172. Further, a person of ordinary skill in the art would not have been motivated to modify Karppanen to include any additional thermal regulation or airflow features not explicitly or inherently described therein because Karppanen already alleges to have solved the issue of thermal regulation of the electronic information board. Karppanen at 3:8-19. Further, Larson’s teaching of “absorbing” solar energy would teach away from combining it with a system like Karppanen that expressly teaches its purpose is to reduce thermal load.

173. The motivations offered by Smith-Gillespie offer nothing more than hindsight rationalization. Each of the justifications points 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* Smith-Gillespie '142 Declaration at ¶ 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 that would prompt a person of ordinary skill to look into the optical reflectance field of LCD displays, and not the cooling systems field, for an additional solution to cool the already allegedly solved problem of cooling in Karppanen.

174. The only motivation offered by Smith-Gillespie is the disclosure that the displays in Karppanen may be located outside. However, the problem solved by Karppanen relates to the cooling, and a person of skill in the art would not have seen an issue of internal reflection in Karppanen’s disclosure and sought out a reference in the optical field.

B. Yare in view of Larson does not render any of the Challenged Claims obvious.

175. The Smith-Gillespie '142 Declaration opines that Yare in view of Larson renders obvious claims 1-15. For the reasons provided below, I disagree.

1. Claim 1

a) Yare does not disclose “a closed loop airflow pathway passing through the housing, wherein said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and wherein at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel;”

176. Claim 1 of the '142 Patent recites a “a closed loop airflow pathway passing through the housing, wherein said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and wherein at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel.” The difference between this claim limitation and claim 1 and 5 of the '740 Patent are insubstantial. Below is a table of the claims side-by-side:

'142 Patent, claim 1[c]	'740 Patent, claim 1[c], claim 5
a closed loop airflow pathway passing through the housing, wherein said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and wherein at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel	Claim 1[c]: a closed loop gas circulation path about the electronic image assembly Claim 5: The electronic display of claim 1, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and a front channel defined by the space between the front display surface and

	the front portion of the electronic image assembly, the front channel forming part of the closed loop gas circulation path.
--	---

177. Yare does not disclose a closed loop of gas that passes around the electronic, and between the surface of the electronic image assembly and the front over glass for the same reasons discussed above in regard to the '740 Patent.

2. Claim 3

a) Yare does not disclose “a heat exchanger . . . wherein the first potion 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”

178. Yare does not disclosed a heat exchanger which forms part of both the open loop and closed loop pathway. The additional claim language “wherein the first potion 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” additionally describes the structure of the heat exchanger. The heat exchanger itself, with its channels or tubes, not actually form part of each airflow pathway... it cannot merely be *in* the same pathway. As discussed above in Part XI.B.1.b), the heat exchanger in Yare at most only forms part of the pathway for the sealed zone, not the atmospheric zone.

179. Yare does not disclose a heat exchanger that forms part of both the closed loop and open loop airflow pathways for the same reasons discussed above in regard to the '740 Patent.

3. Claim 6

a) Yare does not disclose “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”

180. I agree with Smith-Gillespie that the differences between element [1c] and 6[d] are insubstantial. As a result, Yare does not disclose this limitation for the same reason as discussed above with regard to claim 1.

b) Yare does not disclose “a heat exchanger . . . 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 closed loop airflow pathway”

181. Yare does not disclosed a heat exchanger which forms part of both the open loop and closed loop pathway. I agree with Smith-Gillespie that the differences between element [1c] and 6[d] are insubstantial. As a result, I conclude Yare does not disclose this element for the same reasons described with respect to Claim 6.

4. Claim 12

a) Yare does not disclose “forcing circulating air through a closed loop airflow pathway within said housing, wherein at least a portion of said closed loop airflow pathway extends between an electronic image assembly and a cover panel

forming a front portion of said housing and spaced apart from said electronic image assembly, wherein said cover panel is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;”

182. I agree with Smith-Gillespie that the differences between element [1b], [1c], [1e] and [12b] are insubstantial. Yare does not disclose this limitation for the same reason as discussed above with regard to claim 1.

5. No Motivation to Modify or Combine with Larson

183. Yare does not discuss polarizers or the composition of the front of the display cabinet. Nor does Yare specifically 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*, Yare at 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. As a result, a person of skill in the art would not have been motivated to modify Yare to provide additional space between the front of the screen and the front of the cabinet, and would not have been motivated to add additional solar energy reduction layers.

184. A person of ordinary skill in the art would not have been motivated to combine Yare with Larson. First, the references are directed to different fields of art. Larson relates to methods and apparatuses for reducing unwanted reflections in electronic displays. Larson at 1:5-9. Yare, by contrast, relates to a cabinet for

holding a display product of many different kinds. *See* Yare at 1:4-6. The two references address distinct problems: visibility versus thermal regulation. Larson does not once mention the issue of heat stress and thermal management of display systems, and even describes its technology as “absorbing” solar energy—rather than deflecting and preventing that energy from entering the system. *See* Ex. 1006 to the ’142 Petition, 3:19-20. A person of ordinary skill in the art would not look to references in addressing internal reflectance and index media in order to address the issues of thermal regulation in large format advertising displays.

185. Further, a person of ordinary skill in the art would not have been motivated to modify Yare to include any additional thermal regulation features of the display not explicitly or inherently described therein because Yare already alleges to have solved the issue with its configuration of placing the display within the cabinet. Yare at 1:32-2:3. Further, Larson’s teaching of “absorbing” solar energy would teach away from combining it with a system like Yare’s that expressly teaches its purpose is to reduce thermal load.

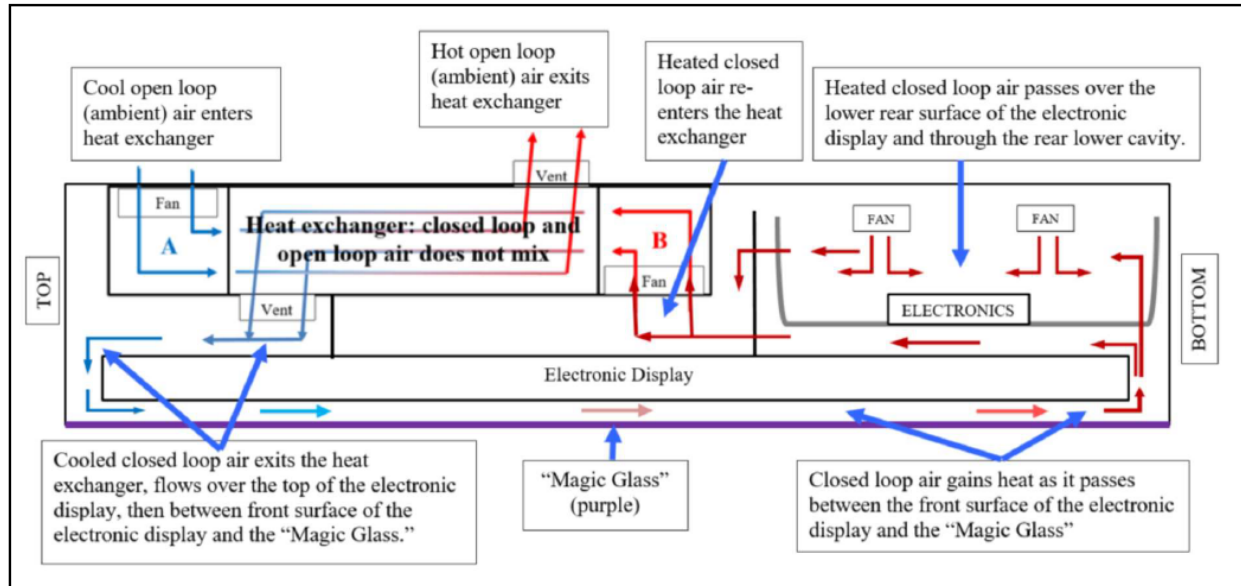
XIII. SAMSUNG’S PRODUCTS PRACTICE THE ’740 AND ’142 PATENTS

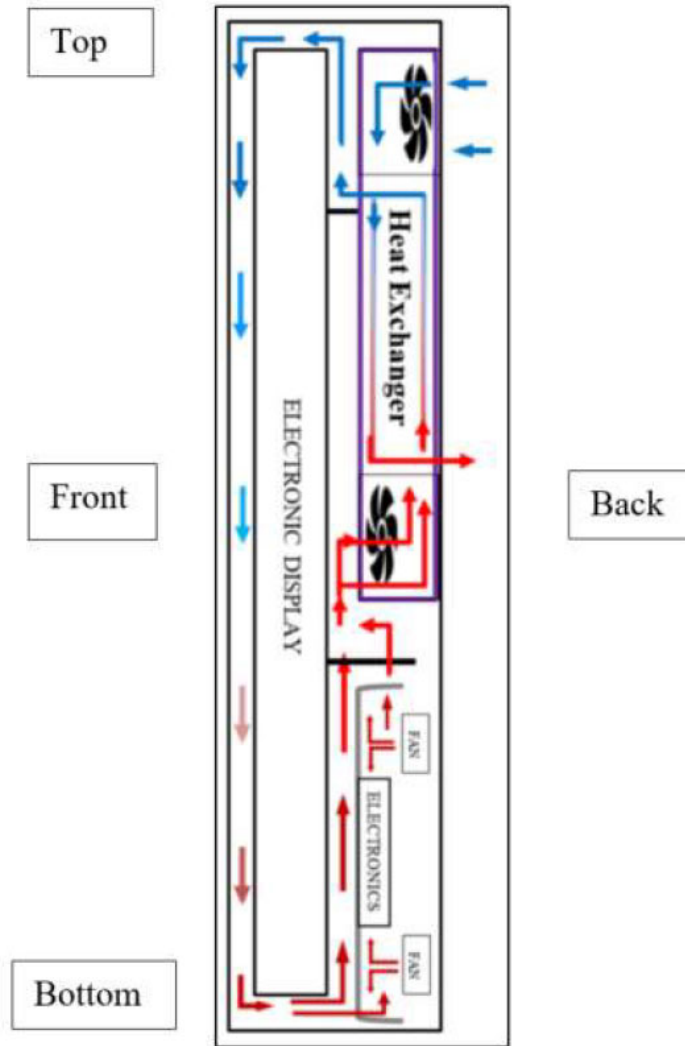
186. I have reviewed and analyzed Samsung’s 75- and 85-inch OH series outdoor LCD products that MRI has accused of infringing the ’740 and ’142 Patents in the related ITC matter. My review and analysis included inspecting the Accused Products and reviewing Samsung’s related technical documentation and

CAD files. I also have reviewed and analyzed photographs of the Accused Products taken during teardowns of those products. Set forth in Exhibit 2039 in IPR2023-00254 are claim charts demonstrating how those products practice the claims of the '740 Patent. Set forth in Exhibit 2039 in IPR2023-00221 are claim charts demonstrating how those products practice the claims of the '142 Patent. It is my opinion that these claim charts are accurate and that Samsung's large-format OH series displays practice the claims of the '740 and '142 Patents.

187. In particular, the schematic below demonstrates the operation of the cooling system of the large-format OH series displays. As shown in the schematic below, the Samsung products have a closed loop of air that passes between the front surface of the LCD display and the cover glass, which Samsung terms "Magic Glass" and which has a solar energy reduction layer on the surface of the glass. The closed loop of air heats as it passes through this channel. The heated air then passes around the bottom of the electronic display and then over the rear surface of the electronic display to reach a heat exchanger. A fan causes the closed loop of air to pass through the heat exchanger and then to exit at the top of the unit where it completes its loop. The heat exchanger also has an open loop of ambient air. Cooler ambient air enters the heat exchanger through a fan at the top of the heat exchanger and then passes through the heat exchanger and exits at the bottom.

Heat is exchanged from the closed loop of air to the open loop of ambient air within the heat exchanger, but the two flow paths do not mix.





XIV. MRI's PRODUCTS PRACTICE THE '740 AND '142 PATENTS

188. I have reviewed and analyzed MRI's 75- and 86-inch OH series outdoor LCD products that MRI has contended practice the '740 and '142 Patents in the related ITC matter. My review and analysis included inspecting MRI's products and reviewing MRI's related technical documentation and CAD file excerpts. Set forth in Exhibit 2054 in IPR2023-00254 are claim charts

demonstrating how those products practice the claims of the '740 Patent. Set forth in Exhibit 2054 in IPR2023-00221 are claim charts demonstrating how those products practice the claims of the '142 Patent. It is my opinion that these claim charts are accurate and that MRI's 75- and 86-inch large-format OH series displays practice the claims of the '740 and '142 Patents.

189. In particular, the schematic below demonstrates the operation of the cooling system of MRI's large-format OH series displays. As shown in the schematic below, the MRI products have a closed loop of air that passes between the front surface of the LCD display and the cover glass and which has a solar energy reduction layer on the surface of the glass. The closed loop of air heats as it passes through this channel. The heated air then passes around the end of the electronic display and then over the rear surface of the electronic display to reach a heat exchanger. A fan causes the closed loop of air to pass through the heat exchanger and then to exit behind the electronic display where it completes its loop. The heat exchanger also has an open loop of ambient air. A fan forces cooler ambient air through the heat exchanger perpendicular to the direction of the closed loop flow, as shown by the blue shading in the schematic below. Heat is exchanged from the closed loop of air to the open loop of ambient air within the heat exchanger, but the two flow paths do not mix.

