

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

MANUFACTURING RESOURCES INTERNATIONAL, INC.,
Patent Owner

IPR2023-00254

U.S. Patent No. 10,506,740

Issue Date: December 10, 2019

Title: ELECTRONIC DISPLAY WITH COOLING

**DECLARATION OF ROBERT SMITH-GILLESPIE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO.
10,506,740**

TABLE OF CONTENTS

Page i

I.	INTRODUCTION AND QUALIFICATIONS	1
A.	Introduction	1
B.	Qualifications and Experience	2
C.	Materials Considered.....	7
II.	LEGAL PRINCIPLES	10
A.	Prior Art.....	10
B.	Claim Construction	11
C.	Anticipation	13
D.	Obviousness.....	13
III.	LEVEL OF ORDINARY SKILL IN THE ART	15
IV.	KNOWLEDGE IN THE ART AT THE TIME OF THE ALLEGED INVENTION OF THE '740 PATENT	17
V.	THE '740 PATENT	29
A.	Overview of the '740 Patent.....	29
B.	Prosecution History	37
C.	The Challenged Claims	38
D.	Claim Construction	41
VI.	APPLICATION OF THE PRIOR ART TO ASSERTED CLAIMS	48
A.	Brief Summary of Prior Art	48
1.	Karppanen [Ex. 1004]	48
2.	Yare [Ex. 1005].....	52
B.	Ground 1: Claims 1-3, 5-9, 11-13, 15-18, and 20 Are Obvious Over International (PCT) Patent Application Pub. No. WO2007/116116 by Karppanen et al. ("Karppanen") in view of the ordinary skill in the art.....	54
1.	Claim 1	54

TABLE OF CONTENTS
(continued)

Page ii

a.	Element 1[pre] “An electronic display comprising:”	54
b.	Element 1[a] “an electronic image assembly having a front portion and a rear portion;”	56
c.	Element 1[b] “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”	58
d.	Element 1[c] “a closed loop gas circulation path about the electronic image assembly;”	61
e.	Element 1[d] “a common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path;”	64
f.	Element 1[e] “a gas circulation device positioned to force circulating gas through the common heat exchanger; and”	67
g.	Element 1[f] “an air circulation device positioned to force ambient air through the common heat exchanger.”	80
2.	Claim 2	83
a.	Element 2[a]: “The electronic display of claim 1, further comprising: a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly; and”	83
b.	Element 2[b]: “a space defined between the rear portion of the electronic image assembly and the substantially planar surface;”	86
c.	Element 2[c]: “wherein the space is in gaseous communication with the open loop ambient air flow path.”	88
3.	Claim 3	89
4.	Claim 5	90

TABLE OF CONTENTS
(continued)

Page iii

a.	Element 5[a]: “The electronic display of claim 1, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and”	90
b.	Element 5[b]: “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.”.....	92
5.	Claim 6	96
6.	Claim 7	98
7.	Claim 8	100
a.	Element 8[pre]: “An electronic display comprising:”	100
b.	Element 8[a]: “an electronic image assembly having a front portion and a rear portion;”	100
c.	Element 8[b]: “a closed loop gas circulation path encircling the electronic image assembly;”	100
d.	Element 8[c]: “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”	102
e.	Element 8[d]: “a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel;”	102
f.	Element 8[e]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”	104

TABLE OF CONTENTS
(continued)

Page iv

g.	Element 8[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path;”	106
h.	Element 8[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path.”	108
8.	Claim 9	110
9.	Claim 11	111
a.	Element 11[a]: “The electronic display of claim 8, wherein: the common heat exchanger includes first and second gas pathways, the first and second gas pathways being isolated from each other;”	111
b.	Element 11[b]: “where the first gas pathway is in gaseous communication with the open loop ambient air flow path; and	114
c.	Element 11[c]: “where the second gas pathway is in gaseous communication with the closed loop gas circulation path.”	115
10.	Claim 12	116
11.	Claim 13	118
12.	Claim 15	118
a.	Element 15[a]: “The electronic display of claim 8, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and	118
b.	Element 15[b]: “a front channel defined by a 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.”	118
13.	Claim 16	118
14.	Claim 17	119

TABLE OF CONTENTS
(continued)

Page v

a.	Element 17[pre]: “A cooling system for an electronic image assembly, comprising;”	119
b.	Element 17[a]: “an open loop ambient air flow path at a rear portion of the electronic image assembly;”	123
c.	Element 17[b]: “a closed loop gas circulation path encircling the electronic image assembly;”	125
	Element 17[c]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”	125
d.	Element 17[d]: “a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of and spaced apart from the front portion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path;”	126
e.	Element 17[e]: “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;”	128
f.	Element 17[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and”	129
g.	Element 17[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path and the common heat exchanger.”	130
15.	Claim 18	131
16.	Claim 20	131

TABLE OF CONTENTS

(continued)

Page vi

C.	Ground 2: Claims 1-3, 5, 6, 8, 9, 11-13, 15-18, and 20 Are Obvious Over Yare in View of the Knowledge of a POSITA.....	132
1.	Claim 1	132
a.	Element 1[pre] “An electronic display comprising:”	132
b.	Element 1[a] “an electronic image assembly having a front portion and a rear portion;”	133
c.	Element 1[b] “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”	135
d.	Element 1[c] “a closed loop gas circulation path about the electronic image assembly;”	138
e.	Element 1[d] “a common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path;”	142
f.	Element 1[e] “a gas circulation device positioned to force circulating gas through the common heat exchanger; and”	145
g.	Element 1[f] “an air circulation device positioned to force ambient air through the common heat exchanger.”	152
2.	Claim 2	156
a.	Element 2[a]: “The electronic display of claim 1, further comprising: a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly; and”	156
b.	Element 2[b]: “a space defined between the rear portion of the electronic image assembly and the substantially planar surface;”	158
c.	Element 2[c]: “wherein the space is in gaseous communication with the open loop ambient air flow path.”	160

TABLE OF CONTENTS
(continued)

Page vii

3.	Claim 3	161
4.	Claim 5	161
a.	Element 5[a]: “The electronic display of claim 1, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and”	161
b.	Element 5[b]: “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.”	168
5.	Claim 6	169
6.	Claim 8	172
a.	Element 8[pre]: “An electronic display comprising:”	172
b.	Element 8[a]: “an electronic image assembly having a front portion and a rear portion;”	172
c.	Element 8[b]: “a closed loop gas circulation path encircling the electronic image assembly;”	172
d.	Element 8[c]: “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”	174
e.	Element 8[d]: “a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel;”	174
f.	Element 8[e]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”	177

TABLE OF CONTENTS
(continued)

Page viii

g.	Element 8[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path;”	180
h.	Element 8[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path.”	181
7.	Claim 9	182
8.	Claim 11	182
a.	Element 11[a]: “The electronic display of claim 8, wherein: the common heat exchanger includes first and second gas pathways, the first and second gas pathways being isolated from each other;”	182
b.	Element 11[b]: “where the first gas pathway is in gaseous communication with the open loop ambient air flow path; and	186
c.	Element 11[c]: “where the second gas pathway is in gaseous communication with the closed loop gas circulation path.”	186
9.	Claim 12	187
10.	Claim 13	188
11.	Claim 15	188
a.	Element 15[a]: “The electronic display of claim 8, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and	188
b.	Element 15[b]: “a front channel defined by a 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.”	188
12.	Claim 16	188
13.	Claim 17	189

TABLE OF CONTENTS
(continued)

Page ix

a.	Element 17[pre]: “A cooling system for an electronic image assembly, comprising;”	189
b.	Element 17[a]: “an open loop ambient air flow path at a rear portion of the electronic image assembly;”	191
c.	Element 17[b]: “a closed loop gas circulation path encircling the electronic image assembly;”	191
d.	Element 17[c]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”	191
e.	Element 17[d]: “a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of and spaced apart from the front portion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path;”	192
f.	Element 17[e]: “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;”	194
g.	Element 17[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and”	196
h.	Element 17[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path and the common heat exchanger.”	196
14.	Claim 18	197
15.	Claim 20	197

TABLE OF CONTENTS
(continued)

Page x

VII.	NO SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS	198
VIII.	CONCLUSION.....	201

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

I, Robert Smith-Gillespie, declare as follows:

I. INTRODUCTION AND QUALIFICATIONS

A. Introduction

1. I have been retained by Petitioners Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Samsung” or “Petitioners”) as a technical expert witness in connection with the Petition for *Inter Partes* Review of U.S. Patent No. 10,506,740 (“’740 patent”). The statements set forth in this declaration are based on my own personal knowledge. I am being compensated at my usual rate, which is \$350 per hour, for the time spent preparing this declaration, and my compensation is not contingent on the outcome of any matter or any of the opinions provided below. I have no financial interest in this matter.

2. I understand that the ’740 patent issued on December 10, 2019 from U.S. Application No. 15/789,331, naming William Dunn and Tim Hubbard as inventors. I have been advised and it is my understanding that the earliest provisional priority date of the ’740 patent is March 3, 2008, the filing date of Provisional Application No. 61/033,064, to which the ’740 patent claims priority. For purposes of my analysis herein, I have used this date as the relevant time period.

3. I have been asked by Petitioners to offer opinions regarding the state of the art in the field of cooling electronic display equipment prior to March 3, 2008. I

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

have been asked to provide my opinion concerning the question of whether the devices described in claims 1-3, 5-9, 11-13, 15-18, and 20 of the '740 patent were novel and/or would have been unobvious to a person of ordinary skill in the art ("POSITA") by March 3, 2008.

4. In preparing this Declaration, I have reviewed the '740 patent, its prosecution history, and each of the documents I reference herein. In reaching my opinions, I have relied upon my experience in the field and have also considered the viewpoint of a POSITA at the time of the '740 patent's priority date. As explained below, I am familiar with the level of skill of a POSITA regarding the technology at issue as of that time frame.

5. I would and could competently testify to the matters set forth in this Declaration if called upon to do so.

B. Qualifications and Experience

6. My background includes roughly 35 years of professional experience in the field of illuminated products including LCD displays and backlighting, LED illuminated consumer products, LED general lighting devices and large area LED display products. I am currently working in a consulting role as a manufacturing systems engineer for Alveo Technologies providing process development expertise for micro-fluidic diagnostic product manufacturing.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

7. I received a B.A. in Physics in 1981 from the State University of New York, Plattsburgh, and a B.S. in Mechanical Engineering from Arizona State University in 1989. More recently, I received a Master of Systems Engineering degree from Embry-Riddle Aeronautical University (Oct. 2021). Additionally, I completed several continuing education courses related to optical illuminated systems. These include a UCLA Extension Short Course in 1993 or 1994 on Photometry and Colorimetry & Flat Panel Displays, Optical System Analysis with ASAP optical analysis software by Breault Research Organization in 1996, and a short course on LCD physics and materials at the Kent State University in 1998.

8. My first role involving display products was as a Manufacturing Engineer for Sperry Aerospace Corporation from 1985 through 1987. Sperry was purchased by Honeywell Inc., and I continued at Honeywell's Air Transport Systems Division until 1989. In 1989, I moved into the Flight Deck Packaging group as a Sr. Project Engineer where I was responsible for illuminated controls (switches, lighted panels, LED annunciators and numeric LCD modules). I continued at Honeywell through 1997 working as a Principal Engineer where I was responsible for mechanical and optical designs of the primary displays on the Boeing 777 aircrafts.

9. From 1997 through 1999, I worked as Technical Specialist, Displays at Three-Five Systems, Inc., an original design manufacturer of handheld and small

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

equipment LCD displays. My role focused on integrating LCD cells with backlights and mechanical structures for various custom LCDs into consumer products, and provided guidance for LED backlight design, materials and photometry and colorimetry. While there, I developed novel backlight designs and manufacturing processes for both die-on-board and chip-on-board backlights.

10. From 1999 through 2002, I worked as Technical Staff Engineer at Rosen Products LLC, and I was responsible for management of LCD display technology, strategic planning and product benchmarking for automotive and aircraft entertainment systems.

11. After leaving Rosen Products LLC, I established and served as president of FPD Design & Consulting LLC, a display product design and development consulting company specializing in integration of ruggedized display components into customer specified products. I have worked at FPD Design & Consulting LLC from 2002 to the present. Projects I have worked on include direct-view backlight designs for aviation simulators, CCFL to LED backlight conversions, commercial-off-the-shelf LCD display ruggedization and optical enhancement. During this time, I prepared a number of technical papers on display ruggedization, optical enhancement and backlight thermal design, the later as a “how-to” workshop for a local chapter of the Society for Information Display (SID).

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

12. From 2011 to 2013, I was employed as the Chief Technologist by E3 Displays, LLC. My responsibilities included materials development and qualification (adhesives, EMI shielding, touch panels, LCD backlights & films) as well as supporting sales and design teams in developing technical solutions for display system's optical, mechanical, electrical, and lighting components, including enhanced LED backlight systems and night-vision compatible backlight designs. Key projects at E3 Displays include the development of an etched-nickel micro-mesh for EMI shielding of display screens, the optical design of light guides for high luminance backlights, and the complete re-packaging of a 19-inch mono-chrome LCD panel to meet military ground-vehicle mechanical, thermal, and optical requirements.

13. From 2013 to September 2018, I worked at Riverwood Solutions, Inc. ("RWS") as the Sr. Technical Specialist. RWS provides electronic manufacturing services management for leading product development companies worldwide. As the Sr. Technical Specialist, I provided technical expertise on technology, materials, design, and manufacturability for product applications including medical products, solar powered devices, LED lamps, and LED illumination in electronic consumer products.

14. I received the Honeywell Technical Achievement Award in 1997. The

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

award recognized my outstanding technical contribution in the field of flat panel display backlighting.

15. I have served on professional committees, groups, and organizations. Between 2001 and 2004, I was a member of the conference organizing committee of Society for Information Display (“SID”). My responsibilities focused on planning annual display symposia including technical paper review and selection and session chair.

16. I am an inventor of U.S. Patent No. 7,660,040, entitled “Diffuse reflective article.” I am the author or co-author of 15 scientific and engineering publications, including articles, conference presentations, technical & scientific reports and tutorials. These publications cover a wide variety of topics, including but not limited to flat panel display backlighting techniques, LED backlights, thermal design principles and analysis, design requirements for automotive entertainment displays, development of a high luminance, high contrast fixed format LCD and other areas.

17. A more detailed description of my educational and professional background is set forth in my curriculum vitae, attached hereto as Ex. 1003 to this Declaration.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

C. Materials Considered

18. The analysis that I provide in this Declaration is based on my education and experience in the field of electronic display design and integration, as well as the documents I have considered, including the '740 patent (Ex. 1001) and its prosecution history (Ex. 1031). The '740 patent states on its face that it issued from U.S. Application Ser. No. (U.S.S.N) 15/789,331, which was filed on October 20, 2017 and is a Continuation of U.S.S.N. 14/834,034, which was filed on August 24, 2015 and now U.S. Patent No. 9,801,305, which itself is a Continuation of U.S.S.N. 14/050,464, which was filed on October 10, 2013 and now U.S. Patent No. 9,119,325, which itself is a Continuation of Application Ser. No. 12/641,468, which was filed on December 18, 2009 and now U.S. Patent No. 8,654,302, which claims priority from U.S. Provisional Application Ser. No. 61/138,736 filed December 18, 2008. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/411,925 which was filed March 26, 2009, now U.S. Patent No. 8,854,595, which claims priority from U.S. Provisional Application Ser. No. 61/039,454 filed Mar. 26, 2008.

19. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/556,029 filed September 9, 2009, now U.S. Patent No. 8,373,841, which claims priority from of U.S. Provisional Application No. 61/095,615 filed September 9, 2008. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/234,307 filed September 19,

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

2008, now U.S. Patent No. 8,767,165, which claims priority from U.S. Provisional Application No. 61/033,064 filed March 3, 2008.

20. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/234,360 filed September 19, 2008, which claims priority from U.S. Provisional Application No. 61/053,713 filed May 16, 2008. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/237,365 filed September 24, 2008, now U.S. Patent No. 8,879,042, which claims priority from U.S. Provisional Application No. 61/057,599 filed May 30, 2008. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/235,200 filed September 22, 2008, which claims priority from U.S. Provisional Application No. 61/076,126 filed June 26, 2008.

21. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/620,330 filed November 17, 2009, now U.S. Patent No. 8,274,622, which claims priority from U.S. Provisional Application No. 61/115,333 filed November 17, 2008. U.S.S.N. 12/641,468 is a Continuation-in-Part of U.S.S.N. 12/556,209 filed September 9, 2009, now U.S. Patent No. 8,379,182, which claims priority from U.S. Provisional Application No. 61/095,616 filed September 9, 2008. For the purposes of this Declaration, I have assumed March 3, 2008 as the effective filing date for the '740 patent. I have cited to the following documents in my analysis below:

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

Exhibit No.	Description
Ex. 1001	U.S. Patent No. 10,506,740 (“the ’740 patent”)
Ex. 1003	Curriculum Vitae of Robert Smith-Gillespie
Ex. 1004	International Patent Application No. PCT/FI2006/050145 with Publication No. WO2007116116A1 (“Karppanen”)
Ex. 1005	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	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	U.S. Patent No. 6,825,828 (“Burke”)
Ex. 1015	E. Fred Schubert & Jong Kyu Kim, <i>Solid-State Light Sources Getting Smart</i> , 308 <i>Science</i> 1274 (2005) (“Schubert”)
Ex. 1016	Military Handbook: Reliability Prediction of Electronic Equipment, DEPARTMENT OF DEFENSE, MIL-HDBK-217F (1991) (“MIL-HDBK-217F”)
Ex. 1017	Allan Webber, <i>Calculating Useful Lifetimes of Embedded Processors</i> , TEXAS INSTRUMENTS INCORPORATED, SPRABX4 (Nov. 2014) (“Webber”)
Ex. 1018	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	ALLAN W. SCOTT, COOLING OF ELECTRONIC EQUIPMENT (John Wiley & Sons, 1974) (“Scott”)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

Exhibit No.	Description
Ex. 1020	DAVE S. STEINBERG, COOLING TECHNIQUES FOR ELECTRONIC EQUIPMENT (John Wiley & Sons, 1980) (“Steinberg”)
Ex. 1021	U.S. Patent No. 5,748,269 to Harris et al. (“Harris”)
Ex. 1022	U.S. Patent No. 6,504,713 to Pandolfi et al. (“Pandolfi”)
Ex. 1023	U.S. Patent No. 4,327,803 to Mullejeans et al. (“Mullejeans”)
Ex. 1024	U.S. Patent No. 5,002,118 to Olmstead et al. (“Olmstead”)
Ex. 1025	U.S. Patent No. 6,244,333 to Bergh et al. (“Bergh”)
Ex. 1026	Claim Construction Order, <i>Mfg. Resource Intl., Inc. v. Civiq Smartscapes, LLC</i> , Civil Action No. 17-269-RGA (D. Del. Oct. 3, 2018)
Ex. 1027	U.S. Patent No. 8,854,572 to Dunn (the “’572 patent”)
Ex. 1028	U.S. Patent No. 9,629,287 to Dunn (the “’287 patent”)
Ex. 1029	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

II. LEGAL PRINCIPLES

22. I am not an attorney. For purposes of this Declaration, I have been informed by counsel for Petitioners, about certain aspects of the law that are relevant to my analysis and opinions, as set forth below.

A. Prior Art

23. I understand that the prior art to the ’740 patent includes patents and printed publications in the relevant art that predate the ’740 patent’s priority date. I

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

have been informed by counsel to assume generally the actual filing date of the earliest filed patent application to which the '740 patent claims priority, which I understand is the position that the patent owner has taken in a litigation.

B. Claim Construction

24. I understand that under the legal principles, claim terms are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, *i.e.*, as of the effective filing date of the patent application. I further understand that the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which a claim term appears, but in the context of the entire patent, including the specification.

25. I am informed by counsel that the patent specification, under the legal principles, has been described as the single best guide to the meaning of a claim term, and is thus highly relevant to the interpretation of claim terms. I understand for terms that do not have a customary meaning within the art, the specification usually supplies the best context of understanding the meaning of those terms.

26. I am further informed by counsel that other claims of the patent in question, both asserted and unasserted, can be valuable sources of information as to the meaning of a claim term. Because the claim terms are normally used consistently

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.

27. I understand that the prosecution history can further inform the meaning of the claim language by demonstrating how the inventors understood the invention and whether the inventors limited the invention in the course of prosecution, making the claim scope narrower than it otherwise would be. Extrinsic evidence may also be consulted in construing the claim terms, such as my expert testimony.

28. I have been informed by counsel that, in *inter partes* review (“IPR”) proceedings, a claim of a patent shall be construed using the same claim construction standard that would be used to construe the claim in a civil action filed in a U.S. district court (which I understand is called the “*Phillips*” claim construction standard), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

29. I have been instructed by counsel to apply the “*Phillips*” claim construction standard for purposes of interpreting the claims in this proceeding, to the extent they require an explicit construction. The description of the legal principles set forth above thus provides my understanding of the “*Phillips*” standard

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

as provided to me by counsel.

30. I understand that some claims are independent, and that these claims are complete by themselves. Other claims refer to these independent claims and are “dependent” from those independent claims. The dependent claims include all of the limitations of the claims on which they depend.

C. Anticipation

31. I understand that a patent claim is anticipated if a single prior art document describes every element of the claim such that a person of ordinary skill in the art (“POSITA”) could practice the claimed method without undue experimentation.

32. I understand that anticipation may be by express disclosure in the prior art. I also understand that if the prior art reference does not expressly set forth a particular claim element, the prior art may still anticipate a patent claim if that element is “inherent” in its disclosure—that is, if it is necessarily found in the reference. A property is inherent even if a POSITA would not have appreciated that property as of the date of that prior art.

D. Obviousness

33. I understand that obviousness is a determination of law based on various underlying determinations of fact. In particular, these underlying factual

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

determinations include (1) the scope and content of the prior art; (2) the level of ordinary skill in the art at the time the claimed invention was made; (3) the differences between the claimed invention and the prior art; and (4) the extent of any proffered objective indicia of non-obviousness. I understand that the objective indicia which may be considered in such an analysis include commercial success of the patented invention (including evidence of industry recognition or awards), whether the invention fills a long-felt but unsolved need in the field, the failure of others to arrive at the invention, industry acquiescence and recognition, initial skepticism of others in the field, whether the inventors proceeded in a direction contrary to the accepted wisdom of those of ordinary skill in the art, and the taking of licenses under the patent by others, among other factors.

34. To ascertain the scope and content of the prior art, it is necessary to first examine the field of the inventor's endeavor and the particular problem for which the invention was made. The relevant prior art includes prior art in the field of the invention, and also prior art from other fields that a person of ordinary skill in the art would look to when attempting to solve the problem.

35. I understand that a determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention. Instead, it is my understanding that in order

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

to render a patent claim invalid as being obvious from a combination of references, there must be some evidence within the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination in a way that would produce the patented invention.

36. I further understand that in an obviousness analysis, neither the motivation nor the purpose of the patentee dictates. Rather, any problem known in the field can provide a reason for combining the prior art in the manner claimed.

III. LEVEL OF ORDINARY SKILL IN THE ART

37. I understand that an assessment of claims of the '740 patent should be undertaken from the perspective of a person of ordinary skill in the art as of the earliest claimed priority date, which, as I explained above, I assumed to be March 3, 2008.

38. I understand that a POSITA is a hypothetical person who is presumed to be aware of all pertinent art, applies conventional wisdom in the art, and is a person of ordinary creativity. I have also been advised that to determine the appropriate level of a person having ordinary skill in the art, the following factors may be considered: (1) the types of problems encountered by those working in the field and prior art solutions thereto; (2) the sophistication of the technology in question, and the rapidity with which innovations occur in the field; (3) the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

educational level of active workers in the field; and (4) the educational level of the inventor.

39. Applying these factors, as to the '740 patent, a POSITA in March 2008 would have had 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 POSA 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. To the extent necessary, a POSA may collaborate with one or more other persons of skill in another art (e.g., one of skill in the art of electrical engineering) for one or more aspects with which the other person may have expertise, experience, and/or knowledge that was obtained through her own education, industrial or academic experience. My opinion regarding the qualifications of a POSITA is based on my knowledge, skill, training, experience and review of the materials discussed herein.

40. Based on this definition, I am a person of ordinary skill in the art at least due to my extensive experience in the areas electronic displays including LCD module design, integration, and ruggedization, cold cathode fluorescent lamp

(“CCFL”) and light emitting diode (“LED”) backlight design and thermal management, and materials development. I was also a person of ordinary skill in the art in the 2007–2008 timeframe relevant to this proceeding.

**IV. KNOWLEDGE IN THE ART AT THE TIME OF THE
ALLEGED INVENTION OF THE ’740 PATENT**

41. The ’740 patent discloses an “electronic display with cooling” including both a recirculating gas cooling section and an open loop cooling system.

42. Key features of the system for cooling the electronic image assembly claimed in the ’740 patent include (from claim 1):

- a. A closed loop airflow pathway wherein air is made to pass “about” the electronic image assembly with a portion of the air passes between the cover panel and the electronic image assembly display surface
- b. An open loop ambient air pathway behind the electronic image assembly
- c. An air circulation device to push air around the closed loop; and
- d. A heat exchanger unit placed rearward of the electronic image assembly which exchanges heat between the close loop and open loop airflow paths.

43. I understand that a POSITA is presumed to know and be familiar with

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

all of the relevant art in the field at the time of the relevant invention.

44. The technology at issue in the challenged claims of the '740 patent relates to the cooling of electronic image displays, including liquid crystal displays ("LCDs"). Such displays and their cooling systems have been known and used well-before March 2008.

45. Electronic image displays ("electronic displays") are devices that visually present static or moving images. Electronic displays have been around since the early 1900s and were widely commercialized in the 1940s with the first monochrome television set.

46. A typical LCD is comprised of three main components: an LCD panel, an electronic driver circuit, and a backlight. The LCD panel comprises a thin layer of liquid crystal ("LC") material constrained between two sheets of glass, one of which includes a thin film transistor ("TFT") array and the other which includes the color filter ("CF") array. The glass/LC/TFT/CF stack is covered front and rear with a pair of linear polarizers. Electronic control circuits are attached to the LCD panel via flexible printed circuits and connect to the row and column lines on the TFT substrate glass. A lighting assembly (backlight unit or "BLU") is housed behind the LCD panel to provide a uniform source of light to the rear of the panel. The light from the BLU is modulated pixel-by-pixel in the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

LCD panel to provide a color image on the display.

47. In the early- to mid-2000s, as LCD panel areas grew, their use in a variety of indoor and outdoor environments outside the home also grew. (*See, e.g.*, U.S. Patent No. 6,825,828 (“Burke”), 1:15-30 (Ex. 1014); *Solid-State Light Sources Getting Smart*, E. Fred Schubert & Jong Kyu Kim, *Science* **308**, 1274-78 (2005) (Ex. 1015).) These uses include in commercial office environments and in other indoor environments such as in airplanes, airports and train stations, and for advertising displays such as in malls, as well as in outdoor applications such as in ATM machines, information kiosks, bus shelters, billboards, and street level advertising.

48. The use of electronic displays in such applications yields a design consideration that was well-known to those skilled in the art in March, 2008: namely thermal stress. Thermal stress is a general term for both short- and long-term performance reduction of electronic components subject to operation at elevated temperature. The phenomenon of thermal stress is well known for at least the last 50 years,¹ with initial research and requirements developed by and for

¹ MIL-HDBK-217A Reliability Prediction of Electronic Equipment, Rev. A was issued in 1965 to address failures in monolithic ICs and other components. In

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

military equipment electronics.

49. Thermal stress may cause premature failure of components. Known wear-out mechanisms accelerated by high-temperature operation of semiconductors include gate oxide integrity break-down, electro-migration, and time dependent dielectric break-down.² Thermal stress can also cause component performance to drift or decay temporarily (i.e. at elevated temperature). Thermal stress may be induced by (i) self-heating of components due to high power dissipation, (ii) exposure to elevated ambient temperatures, and (iii) convective, conductive or radiative heating of the immediate environment by other equipment's heat dissipation or by external sources such as solar radiation. The latter of which is a significant factor for displays used in outdoor environments where the sun may impinge directly on the display.

50. Sensitive electronics in display systems include power supply components, microcontrollers, microprocessors, and other semiconductor

1994, MIL-HDBK-217F (1991) (Ex. 1016) was the last revision of the document as new electronics devices and methods of reliability prediction took hold. The U.S. military discontinued maintenance of the document in 1995.

² For a background on failure modes and component reliability, *see Calculating Useful Lifetimes of Embedded Processors*. SPRABX4, Texas Instruments Incorporated, Nov. 2014. (Ex. 1017.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

components, as well as LEDs used in the LCD backlight. Performance impacts on these components include both short- and long-term performance and life degradation. These issues were well known at the time of the '740 patent filing. Thus, some cooling mechanism must be used to ensure the continued reliability of electronics, and ultimately, to prevent failure. (*See* Ex. 1018, p.2 (“[B]ased on a survey by the U.S. Air Force, more than 50% of all electronics failures are caused by shortcomings in temperature control.”).)

51. As noted above, the need to control the thermal environment of electronic components is an old problem. Heat generated by the electronics must be efficiently and effectively removed from the components. This process is generally called “cooling.” (Ex. 1019, p.1 (“All electronic equipment needs cooling.”); Ex. 1020, p.1.) Cooling is accomplished by heat transfer, the movement of thermal energy from one body to another. The three primary modes of heat transfer used to cool electronic equipment are conduction, radiation, and convection. (*Id.*, p.2.)

52. Convective heat transfer is accomplished via the flowing of a fluid, either liquids or gases across a surface. In heat transfer from a surface, energy is transferred to the fluid by conduction across a boundary layer of air at the surface. This energy is carried away by the now warmed bulk fluid. (*Id.*, p.3.) The flow of

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

air can be due to the buoyancy induced in the gas by thermal expansion (natural convection), or it can be induced by mechanical means such as a fan (forced convection). (*Id.*) Often, and as is the case in the '740 patent, air acts as the heat transfer fluid. Convective heat transfer can take place from a hot object to a cooler airstream, or from a hot airstream to a cooler object. The efficiency of the convective heat transfer depends on several factors including fluid density, air velocity, surface area and temperature differential, as well as the thermal conductivity of the object.

53. A plenum is a cavity through which a fluid, normally air, flows. The ductwork in a typical heating and air-condition system is an example of a plenum system which constrains air flows to and from various regions of a building. Here, the air is moved under the influence of a fan. The air intake system on a modern automobile utilizes a plenum formed by a series of connected tubes and housings. In this case, the air is moved by a combination of negative pressure at the intake manifold, and positive pressure upstream of the incoming air filter. In electronics cooling applications, the walls of the plenum may be formed of a thermally conductive material on at least the side in contact with the heat source. This encourages conductive heat transfer through the plenum wall and into the moving airstream. (*See, e.g.*, Ex. 1021 (U.S. Patent No. 5,748,269 issued in 1998

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

(“Harris”)), 5:18–23.)

54. Since electronic displays contain electronics which are impacted by operation at elevated temperature (*see, e.g.*, any of the Temperature Factor tables in MIL-HDBK-217F (Ex. 1016), an example of which is shown below), the thermal design of displays is always a key consideration.

6.3 TRANSISTORS, LOW FREQUENCY, BIPOLAR

$$\lambda_p = \lambda_b \pi_T \pi_A \pi_R \pi_S \pi_Q \pi_E \quad \text{Failures}/10^6 \text{ Hours}$$

Base Failure Rate - λ_b

Type	λ_b
NPN and PNP	.00074

Temperature Factor - π_T

T_J (°C)	π_T	T_J (°C)	π_T
25	1.0	105	4.5
30	1.1	110	4.8
35	1.3	115	5.2
40	1.4	120	5.6
45	1.6	125	5.9
50	1.7	130	6.3
55	1.9	135	6.8
60	2.1	140	7.2
65	2.3	145	7.7
70	2.5	150	8.1
75	2.8	155	8.6
80	3.0	160	9.1
85	3.3	165	9.7
90	3.6	170	10
95	3.9	175	11
100	4.2		

$$\pi_T = \exp \left(-2114 \left(\frac{1}{T_J + 273} - \frac{1}{298} \right) \right)$$

T_J = Junction Temperature (°C)

(Ex. 1016, § 6.3.)

55. Cooling designs incorporating convection have been incorporated in displays for years. The following examples are offered to highlight the state of the art several years prior to the '740 filing wherein thermal considerations and

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

countermeasures were taken by the inventors.

56. *Convective cooling of electronic displays.* Both conductive and convective cooling of electronic displays were well-known at the time of the '740 patent filing. (Ex. 1001, 1:61-2:2 (describing such cooling techniques as known background). Even sealed display systems using convective approaches aimed at removing heat from display systems had been known and used years before the '740 patent application. For example, Harris discloses a convective cooling system for removing heat from “an environmentally-sealed enclosure having a removable cover, and housing a liquid crystal display screen.” (Ex. 1021, Abstract).

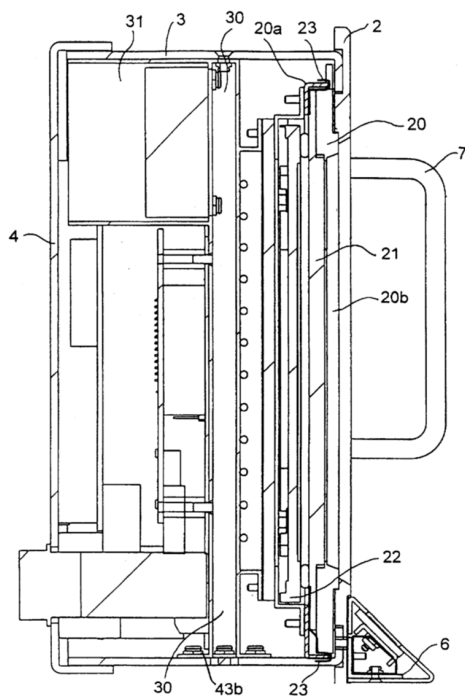


FIG.2

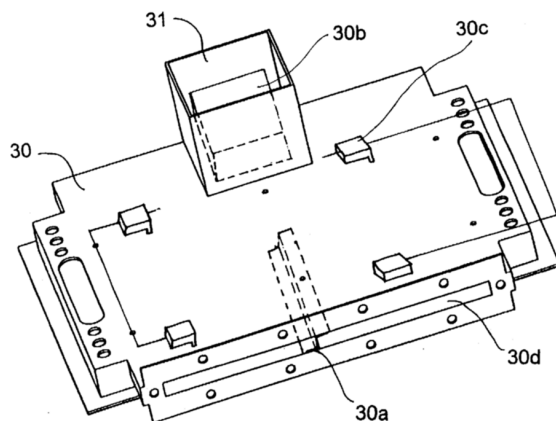


FIG.3

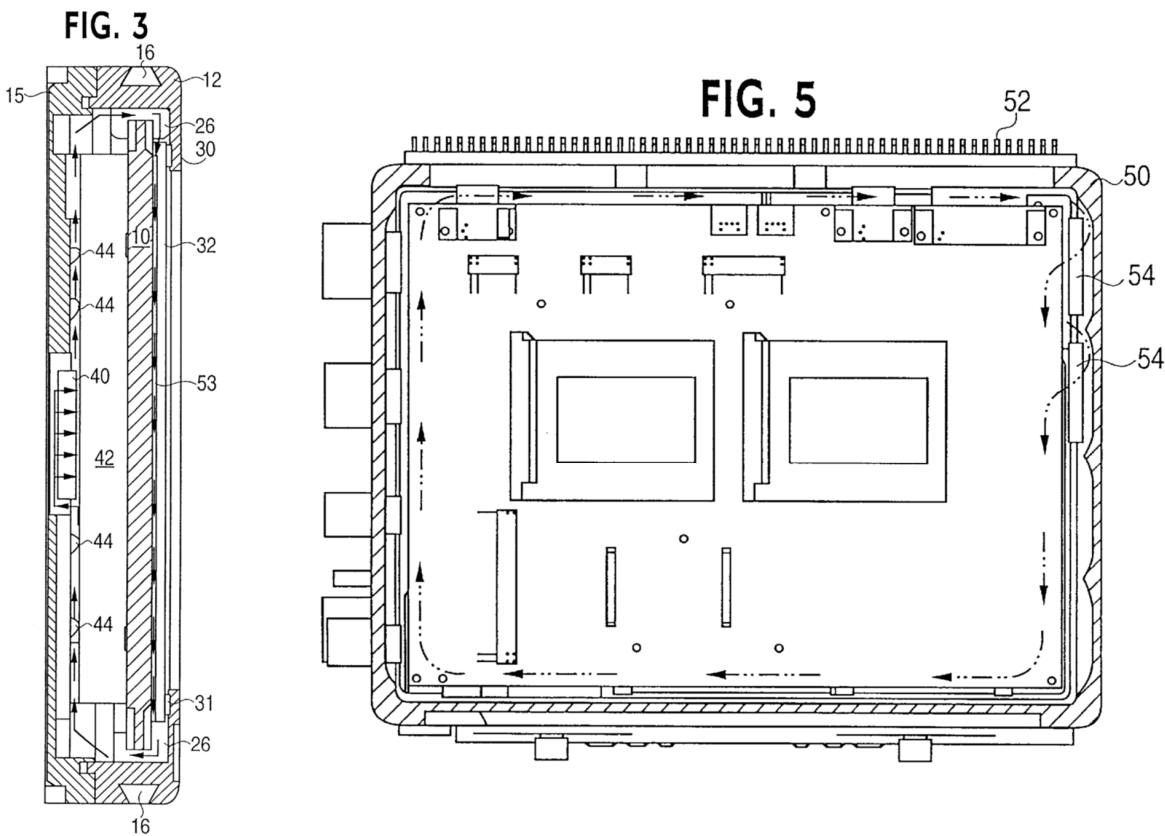
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

(*Id.*, FIGs. 2, 3, 5:18-30 (plenum **30** and fan **30b**, air intake passage **30d**, and exhaust port **31** provide cooling by convection).)

57. Harris discloses a forced convection cooling system for the backlight of an LCD display. “FIG. 3 shows a perspective view of a backlight cooling plenum **30** for the LCD **22** according to the present invention. The plenum **30** is mounted to the enclosure top and bottom preferably by screws, and is preferably constructed by welding and riveting, for example, 0.062" aluminum for superior heat transfer performance and includes a hollow channel formed therein for air flow therethrough to an exhaust port **31**.” (*Id.*, 5:15-23)

58. *Closed loop cooling of electronic displays.* While Harris suggests the use of an open loop cooling system, closed loop cooling of electronic displays was also well-known. For example, U.S. Patent 6,504,713 (Filed: 01/22/1998, Published: 01/07/2003) (“Pandolfi”) discloses sealed, closed loop, forced air cooling system for cooling a display module. (Ex. 1022, Abstract.) Pandolfi discloses “a path for the flow of a circulating cooling fluid, such as air, to circulate through the air gap **53** driven by convection currents or by one or more fans **40** located in the display housing and which may be, but need not be, vented to the outside atmosphere” and “[t]he air is driven by the fan in a circular flow pattern so as to increase the laminar flow of air between the front surface of the display panel

28 and the touch responsive screen **32.**” (*Id.*, 2:55-66.)



(*Id.*, FIGs. 3, 5.)

59. Pandolfi suggests case cooling of the airstream from the single closed loop wherein “[i]nternal fans **54** circulate air through the CPU housing **50** and heat is conducted by the housing to the ambient atmosphere, particularly through the cooling fins **52**.” (*Id.*, 3:25-33.) Note that Pandolfi also discloses the forced air convective cooling of the gap **53** formed between the cover glass **32** and the LCD front surface. (*Id.*, 2:43-47).

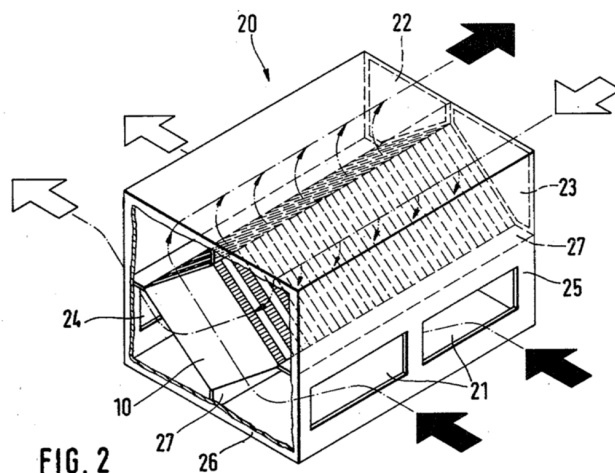
60. *Air-to-air heat exchanger technologies and their application to*

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

electronic displays. Air-to-air heat exchangers were well known both for their use in heat recovery systems in process industries and heating and cooling systems.

Muellejeans (Ex. 1023), issued in 1982 (disclosing a cross-flow heat exchanger), Olmstead (Ex. 1024), issued in 1991 (also disclosing a cross-flow heat exchanger), and Bergh (Ex. 1025) issued in 2001 (disclosing a folded plate heat exchanger), provide examples of a few types of air-to-air heat exchangers.

61. Generally, these devices pass 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. The image below from Muellejeans shows a pair of opposing air flow pathways through a preferred embodiment.



(Ex. 1023, FIG. 2)

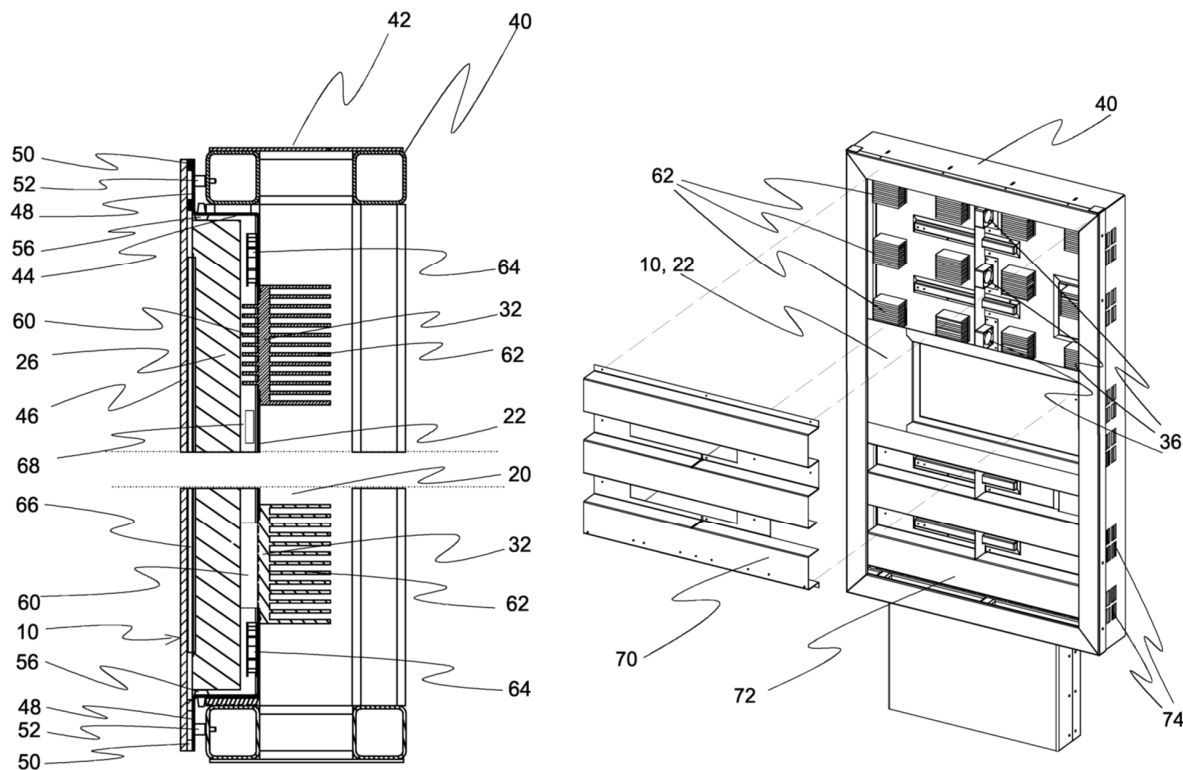
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

62. WO Patent WO 2007/116116 A1 (published October 18, 2007, “Karppanen” (Ex. 1004)) discloses an electronic display sign board incorporating both closed loop and open loop convective cooling systems with an intervening air-to-air heat exchanger placed between the cooling zones. Cooling of the display section including the front of the display is accomplished as follows:

Suitable ducting **66** has been arranged between the display casing and the display element so that an air flow circulating the display element and equalizing the temperatures can be arranged by means of the fans. The fans **64** force the air of the inner casing to flow past the front plate **46** of the device. [] When the thermal conductivity of the front plate is selected suitably, the cool surface of the front plate cools the air flowing between the front plate and the display element.

(Ex. 1004, 9:5-11.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 2 (left), FIG. 3 (right))

63. Karppanen also discloses an air-to-air heat exchanger comprising heat sinks **62** placed in cooling channels **70** (shown in Figures 1 and 4) through which air flow from the outside of the information board is forced by cooling fans (**36**) thereby cooling the air in communication with the closed loop side of heat sink.

V. THE '740 PATENT

A. Overview of the '740 Patent

64. The '740 patent, which is included as Exhibit 1001 with this Declaration, describes cooling systems for electronic displays. (*Id.*, 1:55-57.) The '740 patent describes the cooling systems having two separate gas (e.g., air) flow

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

paths for an electronic display. (*Id.*, 2:36-38.) A first path can include a closed loop path that “travels across [a] front surface of [an] image assembly, continues to [a] rear of the [electronic] display where it may enter a heat exchanger, [and] finally returning to [a] front surface of the image assembly.” (*Id.*, 2:40-43.) A second path can include an “open loop path [that] may draw ambient gas (ex. ambient air) through the rear of the [electronic] display (sometimes through [the] heat exchanger, behind [the] image assembly, or both) and then exhausts it out of [a] display housing.” (*Id.*, 2:43-47.) Furthermore, the “heat exchanger may be used to transfer heat from the circulating gas,” e.g., from the closed loop path, “to the ambient gas”, e.g., from the open loop path. (*Id.*, 2:47-48.) In addition to the heat exchanger **101**, the electronic display **100** includes fan assemblies **102**, **103** that are used for the close loop paths, and fan assemblies **104**, **105** used for open loop paths. (*Id.*, 2:39-47, 3:16-45, FIG. 1.)

65. The electronic display **100** includes side covers **252**, a rear cover **250** and a front display surface **221**. (*Id.*, 5:47-50, 5:57-59, FIG. 2A.) “The front display surface **221** is placed in front of the image assembly **220**, defining a [closed loop] channel **290** through which [] circulating gas may flow. The front display surface **221** may be [made up of] any transparent material (glass, plastic, or composite) and may optionally comprise several layers for polarizing light, reducing glare or

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

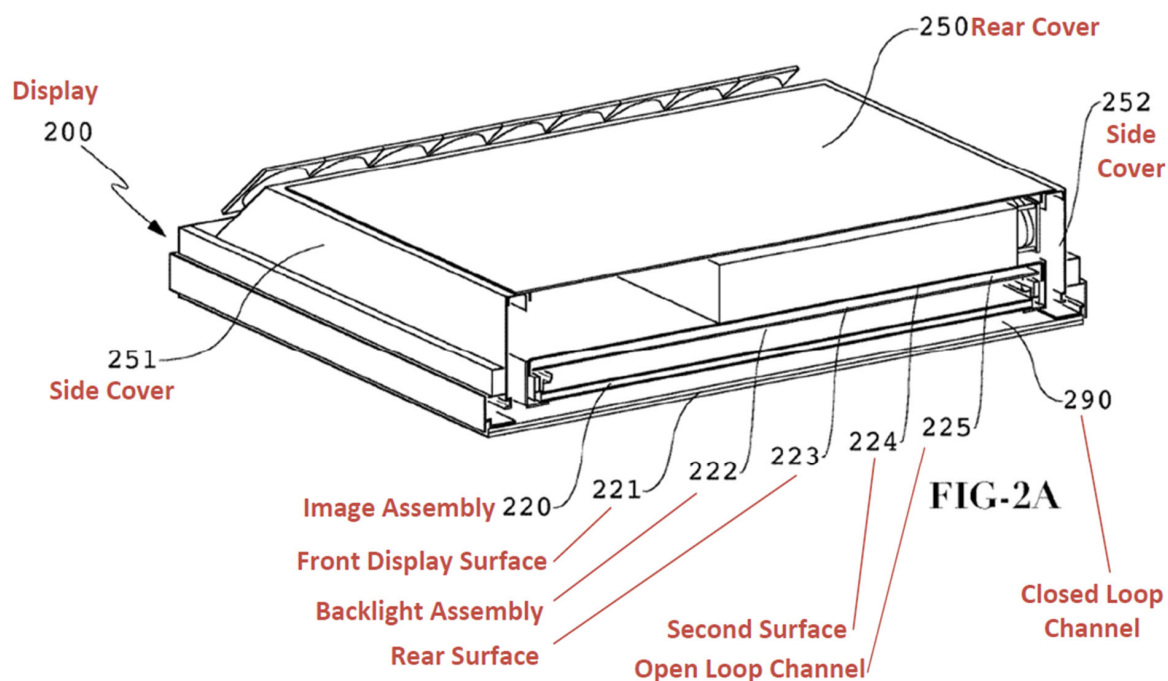
reflections, and protecting the internal display components.” (*Id.*, 5:57-64, FIG. 2A.)

The front display surface **221** can include “two panes of glass which are laminated together with index-matching optical adhesive,” where “a polarizing layer may be attached to one of the panes of glass in order to reduce the internal reflections and solar loading on the image assembly **220**.” (*Id.*, 5:65-6:2.) The ’740 patent also describes that “[i]t is most preferable that the polarizing layer be attached to the inner surface of the front display surface **221** (the one facing the closed loop channel **290**) and also contain an anti-reflective (AR) coating.” (*Id.*, 6:2-6.)

66. The image assembly **220** of the electronic display can include “any form of electronic assembly for generating an image, including but not limited to: LCD, light emitting diode (LED), organic light emitting diode (OLED), field emitting displays (FED), light-emitting polymers (LEP), plasma displays, and any other flat/thin panel displays.” (*Id.*, 5:52-57.) “[T]he image assembly **220** may be an LCD stack with a backlight assembly **222**.” (*Id.*, 6:10-12.) The backlight assembly **222** can include “a printed circuit board (PCB) with a plurality of LEDs (light emitting diodes) on [a] front surface [of the backlight assembly].” (*Id.*, 6:15-17.) The backlight can use a metallic PCB to provide for “a low level of thermal resistance between the front surface of the backlight assembly **222** and [a] rear surface **223** of the backlight [assembly].” (*Id.*, 6:18-20.) “The rear surface **223** of

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

the backlight assembly **222** may contain a thermally conductive material, such as a metal”, where “[a]luminum may be an exemplary material for the rear surface **223**.” (*Id.*, 6:21-23.) Furthermore, “[a] space between the rear surface **223** of the backlight and [a] second surface **224** may define an additional optional open loop channel **225** through which [the] ambient gas may travel in order to cool the backlight assembly **222** (or image assembly **220** if no backlight is used).” (*Id.*, 6:25-30.) Figure 2A of the ’740 patent is shown below.

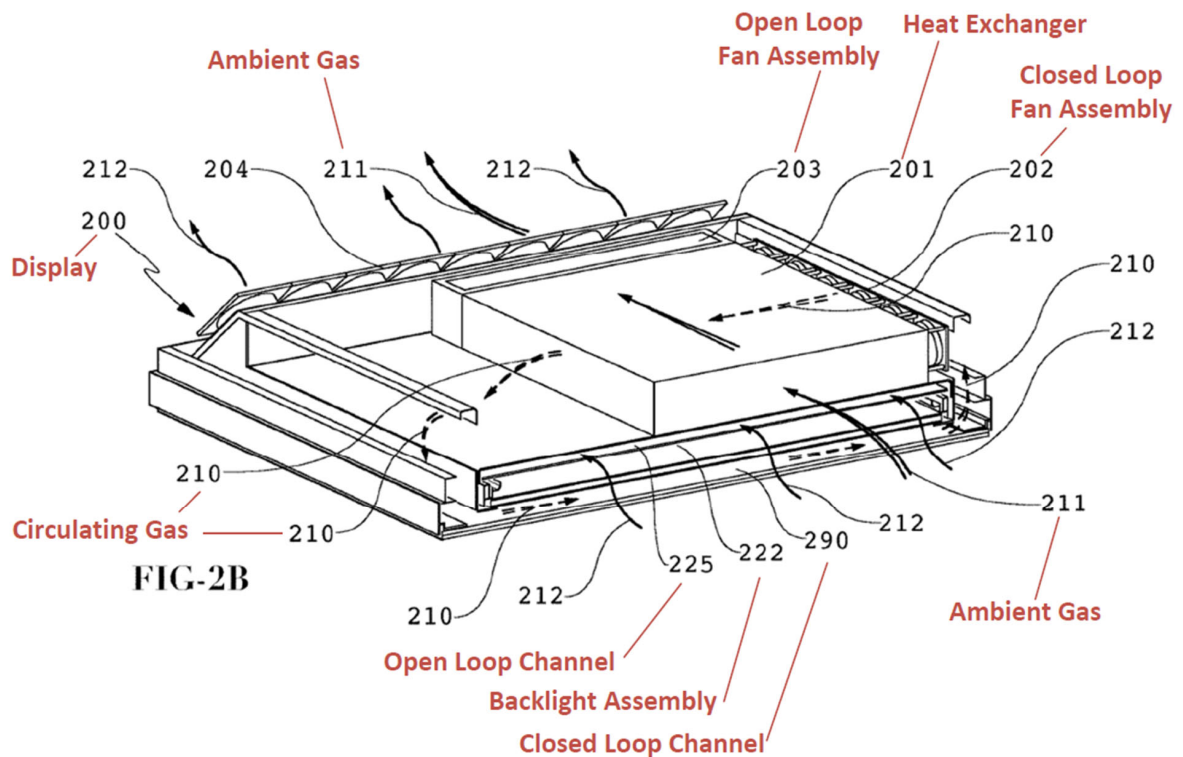


(*Id.*, FIG. 2A (annotated).)

67. Furthermore, the electronic display includes “[a] closed loop fan assembly **202** [which] may be used to propel the circulating gas **210** around the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

closed loop [path]” and “[a] first open loop fan assembly **203** [which] may be used to draw ambient gas **211** through the heat exchanger **201**.” (*Id.*, 6:34-37.) The ’740 patent mentions that more than one open loop fan assembly can be used. (*Id.*, 6:37-48.) The ’740 patent also discloses that the ambient gas, e.g., airflow from the open loop path, does not mix with the circulating gas, e.g., airflow from the closed loop path, to prevent contaminants from the open loop path from mixing with the closed loop path. (*Id.*, 6:49-59.) Figure 2B of the ’740 patent is shown below.

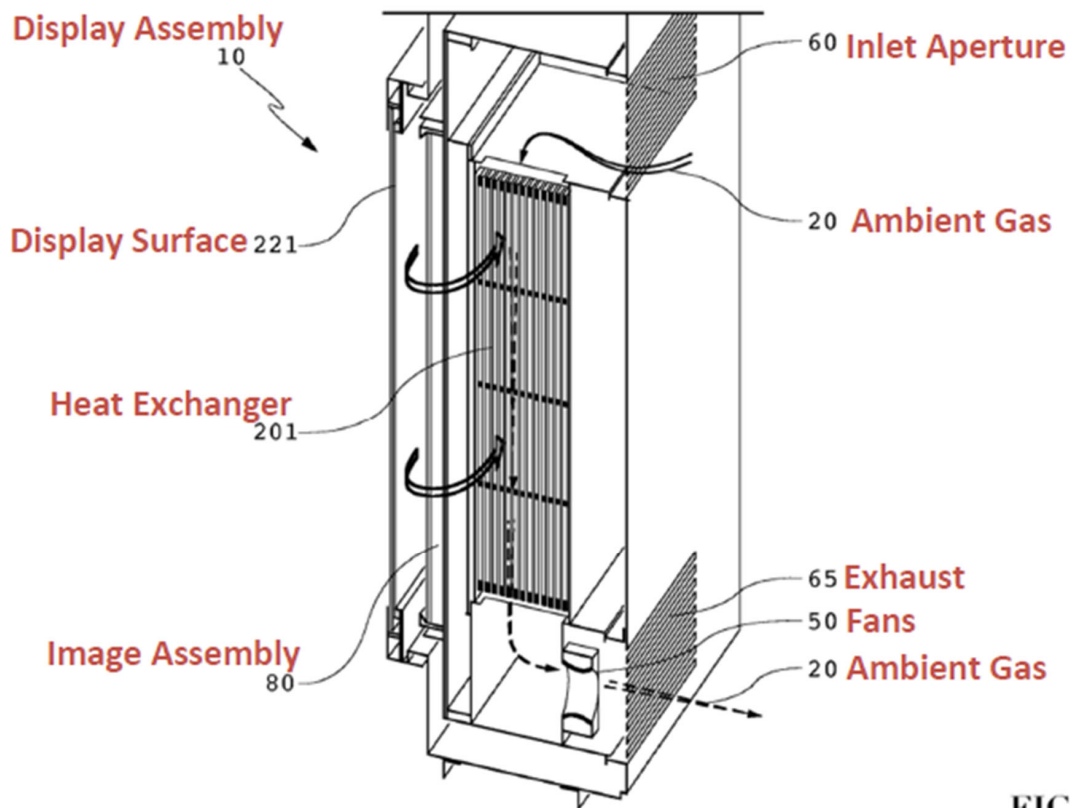


(*Id.*, FIG. 2B (annotated).)

68. The ’740 patent also describes removing heat from the display

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

assembly **10** by directing circulating gas through a channel between the front display surface **221** and the image assembly **80**. (*Id.*, 6:60-7:38, FIG. 3.) For example, the '740 patent describes using fans **50** “to draw the ambient gas **20** into the inlet aperture **60** and through the heat exchanger **201**”, where “the ambient gas **20** is only drawn through the heat exchanger **201** and not through any additional optional channels.” (*Id.*, 6:65-7:2, FIG. 3.) The ambient gas is only flowed into the heat exchanger **201** of the display assembly **10** and not through optional additional channels, e.g., through inlet **60** and exhaust apertures **65** of the display assembly **10**. (*Id.*, 3:6-8, 6:60-62, FIG. 3.) The '740 patent describes that such a configuration can be used when the image assembly **80** does not require additional cooling via an additional channel, e.g., when an OLED is used as the image assembly **80**. (*Id.*, 7:2-7, FIG. 3.) Additionally, the '740 patent describes that the ambient gas **20** can be pre-conditioned, e.g., cooled, before it is directed into the heat exchanger **201**. (*Id.*, 7:19-21, FIG. 3.) The front display surface **221** can also be used protect the image assembly **80** from damage, via the front display surface **221** acting as an anterior (front) wall of the display assembly **10**. (*Id.*, 7:21-23, FIG. 3.) Thus, heat is transferred to the ambient gas **20** and removed from the display via the circulating gas passing through the channel between the front display surface **221** and the image assembly **80**. (*Id.*, 7:30-32, FIG. 3.) Figure 3 of the '740 patent is shown below.

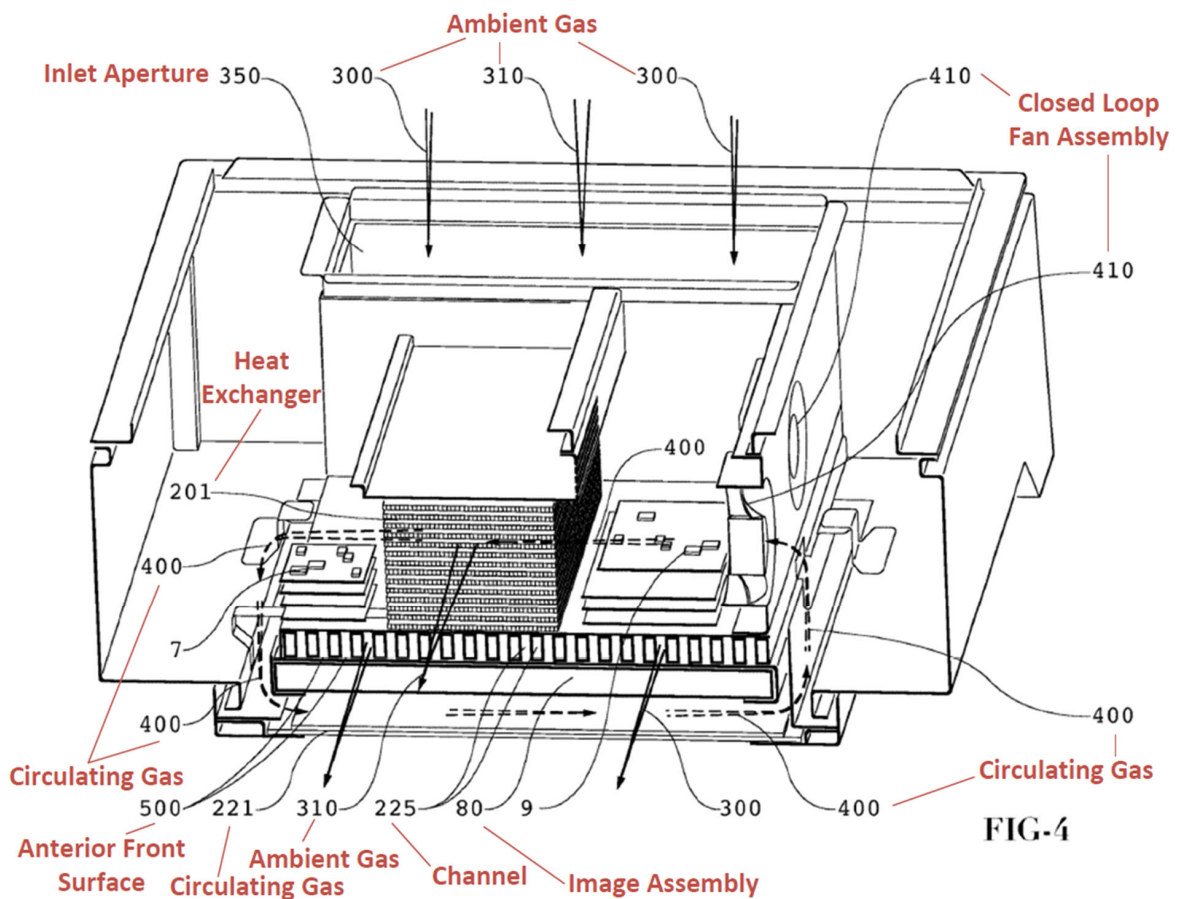


(*Id.*, FIG. 3 (annotated).)

69. Additionally, the '740 patent describes removing at least a portion of heat absorbed from the image assembly **80** and front display surface **221** by forcing circulating gas **400**, which may be propelled by a closed loop fan assembly **410**, between the front display surface **221** and the image assembly **80**, and subsequently forcing circulating gas **400** through the heat exchanger **201**. (*Id.*, 7:39-45, FIG. 4.) The '740 patent also describes receiving the circulating gas **400** and the ambient gas **310** in a substantially perpendicular direction to transfer heat between the two gases.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

(*Id.*, 7:45-49, FIG. 4.) Furthermore, in order to cool the rear portion of the image assembly **80**, an additional flow of ambient gas **300** can be received through the inlet aperture **350** and directed along channel **225** to cool the rear portion of the image assembly **80**. (*Id.*, 7:49-52, FIG. 4.) Thus, the ambient gas **300** is used “to absorb heat from the image assembly **80**.” (*Id.*, 7:57-58, FIG. 4.) Figure 4 of the ’740 patent is shown below.



(*Id.*, FIG. 4 (annotated).)

70. To further cool the image assembly **80**, the ’740 patent describes

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

removing distributed heat to a plurality of ribs and to thermally-conductive surfaces using the ambient gas **300**. (*Id.*, 7:49-58, 8:1-21, FIG. 4.) The ambient gas **300** is directed along channel **225** in order to cool the rear portion of the image assembly **80**, the channel **225** including a thermally conductive anterior (front) surface **500** in thermal communication with “at least a portion of the image assembly **80**.” (*Id.*, 7:49-58, FIG. 4.) A plurality of thermally conductive ribs are also placed within the channel **225**, the ribs in thermal communication with the surface **500**. (*Id.*, 8:1-4, FIG. 4.) Thus, the ambient gas **300**, directed through the channel **225**, removes heat distributed throughout the ribs and heat from the thermally conductive surfaces, such as surface **500**. (*Id.*, 7:49-58, 8:1-8, FIG. 4.)

B. Prosecution History

71. I reviewed the history of the application as it was considered and then approved by the patent office, which I understand is called the “prosecution history.”

72. During prosecution, the Examiner rejected claims 1-20 as being obvious in light of the prior art in office actions dated October 5, 2018, and June 19, 2019. (*See* Ex. 1031, pp.236-246 (10/05/2018 Non-Final Rejection), pp.54-64 (06/10/2019 Final Rejection).) The Examiner primarily relied on U.S. Patent Publication No. 2004/0135482 (“Thielemans”). (*See id.*, pp.236-246, pp.54-64.) In a January 7, 2019 response to the June 19, 2019 Final Office Action, the Patent

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

Owner argued that “Thielemans . . . fails to teach or suggest the use of an open loop ambient air flow path and a closed loop gas circulation path.” (*Id.*, p.44.) Patent Owner further argued that “Thielemans also fails to teach or suggest a closed loop (or any) gas circulation path about or encircling an electronic image assembly.” (*Id.*) No claim amendments were made during prosecution. A notice of allowance was issued on September 10, 2019. (*Id.*, p.9.)

C. The Challenged Claims

73. This Declaration addresses claims 1-3, 5-9, 11-13, 15-18, and 20 of the '740 patent. Claims 1, 8 and 17 are the independent claims.

74. Independent Claim 1 recites:

1[pre]	An electronic display comprising:
1[a]	an electronic image assembly having a front portion and a rear portion;
1[b]	an open loop ambient air flow path behind the rear portion of the electronic image assembly;
1[c]	a closed loop gas circulation path about the electronic image assembly;
1[d]	a common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path;

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

1[e]	a gas circulation device positioned to force circulating gas through the common heat exchanger; and
1[f]	an air circulation device positioned to force ambient air through the common heat exchanger.

75. Independent Claim 8 recites:

8[pre]	An electronic display comprising:
8[a]	an electronic image assembly having a front portion and a rear portion;
8[b]	a closed loop gas circulation path encircling the electronic image assembly;
8[c]	an open loop ambient air flow path behind the rear portion of the electronic image assembly;
8[d]	a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel;
8[e]	a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

8[f]	at least one fan positioned to force circulating gas through the closed loop gas circulation path;
8[g]	at least one fan positioned to force ambient air through the open loop ambient air flow path.

76. Independent Claim 17 recites:

17[pre]	A cooling system for an electronic image assembly, comprising:
17[a]	an open loop ambient air flow path at a rear portion of the electronic image assembly;
17[b]	a closed loop gas circulation path encircling the electronic image assembly;
17[c]	a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;
17[d]	a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of and spaced apart from the front portion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path;
17[e]	a rear channel defined by a space between the rear portion of the electronic image assembly and a substantially planar surface located

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

	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;
17[f]	at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and
17[g]	at least one fan positioned to force ambient air through the open loop ambient air flow path and the common heat exchanger.

77. I have added indices of the form 1[a], 1[b], 1[c], *etc.* to each of the claim elements for ease of reference, and to match the indices used in the Petition.

D. Claim Construction

78. Independent claims 1, 8, and 17 of the '740 patent recite a “closed loop gas circulation path.” (*See* Ex. 1001, 9:59-60, 10:35-36, and 11:24-25.) I have been informed that the terms “closed loop” and “closed gaseous loop,” as recited in the claims of U.S. Patent No. 8,854,572 (“the '572 patent”), U.S. Patent No. 9,629,287 (“the '287 patent”), and U.S. Patent No. 9,173,325 (“the '325 patent”), were construed in a previous case in which the Patent Owner was the plaintiff. (Ex. 1026, p.1.) The '740 patent is related to the '572, '287, and '325 patents because the '740 patent and the '572, '287, and '325 patents have a common ancestor, namely, U.S. Patent Application No. 12/620,330 (the “'330 application”) which issued as U.S. Patent No. 8,274,622. (*See* Ex. 1001, face page

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

(disclosing that the '740 patent is a continuation-in-part (through other patents) of the '330 application); Ex. 1027, face page (disclosing that the respective patent is a continuation of the '330 application); Ex. 1028 (same); Ex. 1029, face page (disclosing that the '325 patent is a continuation-in-part of the '330 application).)

Therefore, I have been instructed that the Court's prior construction of "closed loop" is relevant to the interpretation of that term as recited in the claims of the '740 patent.

79. Moreover, like the '740 patent, the subject matter in the '572, '287, and '325 patents relates to cooling of electronic displays using a cooling system having closed loop pathways. Specifically, the '740 patent states that "[e]xemplary embodiments may comprise **two separate flow paths** for gas through an electronic display. A first flow path may be a **closed loop** . . ." (Ex. 1001, 2:37-38.)

80. Likewise, the '572 and '287 patents both describe the use of **closed loops**. (Ex. 1027, 3:33-42, 3:53-55 (describing "an isolated gas cooling chamber **20**" that "comprises a **closed loop**" for cooling an LCD display), FIGs. 1, 2; Ex. 1028, 3:51-54, 4:4-7 (same), FIGs. 1, 2.) The '325 patent also describes the use of a closed loop for cooling a display. (Ex. 1029, 3:50-53, 4:56-59, 7:33-36 (disclosing "circulating gas" traveling "in a **closed loop**" for cooling an "LCD assembly **85**"), 5:5-6 (same), FIGs. 1, 2C, 3C.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

81. The structure of the closed loops in all four patents is similar, i.e., the closed loop pathways in all four patents surround a display element / image assembly. In particular, the '740 patent states: “[t]he closed loop path travels across the front surface of the image assembly, continues to the rear of the display where it may enter a heat exchanger, finally returning to the front surface of the image assembly.” (Ex. 1001, 2:40-43; *see id.*, 6:09-11, 6:33-41 (describing “circulating gas **210** around the closed loop,” and around the “image assembly **220**”), FIGs. 2A, 2B.)

82. In the same manner, the closed loop in the '572 and '287 patents surrounds the respective image assemblies therein. Specifically, both the '572 and '287 patents state that the “cooling chamber **20**” that “comprises a **closed loop** which includes a first gas chamber **30** and a rear cooling chamber **40**” “**surrounds an electronic display 80.**” (Ex. 1027, 3:33-35, 3:39-42, and 3:53-55, FIGs. 1, 2; Ex. 1028, 3:51-54, 3:57-60, and 4:4-7, FIGs. 1, 2.)

83. The structures of the closed loops of the '740 patent and the '325 patent are even more similar, i.e., in both patents, the closed loop gas circulates around the image assembly passing via a gap between a front plate and the front of the image assembly, and also passes through a heat exchanger. In particular, the '740 patent states: “the fan assemblies **102** and **103** for the **closed loop** may be

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

placed along two opposing edges of a **heat exchanger 101**” though “[s]ome embodiments may use only one fan assembly for the **closed loop**.” (Ex. 1001, 3:20-28, FIG. 1.) The ’740 patent further states: “it may be preferable to place the fan assembly at the inlet of the heat exchanger **101**, so that the **circulating gas** is ‘pulled’ across the **front of the image assembly** and pushed through the **heat exchanger 101**.” (*Id.*, 3:29-32, FIG. 1.)

84. Likewise, in the ’325 patent, the “circulating gas preferably travels in a **closed loop** where it is drawn through . . . the **heat exchanger 45** and then directed into . . . the **channel[] 30**” “defined by the space between the front surface of the LCD assembly **85** (or other electronic image assembly) and the transparent plate **90**.” (Ex. 1029, 4:56-62, FIGs. 2A, 2C.)

85. Thus, like the ’740 patent, the ’572, ’287, and ’325 patent describe cooling of electronic displays using closed loops, where the closed loop **surrounds the image assembly**. Moreover, during prosecution of the ’740 patent, the Applicant distinguished the claimed invention from a prior art reference, Thielemans, by arguing that Thielemans did not disclose a closed loop surrounding an image assembly, and did not disclose both an open loop and a closed loop. (Ex. 1031, pp.236-45, pp.54-64 (Office Actions dated 10/05/2018 and 06/03/19), pp.151-62 and pp.35-50 (Responses filed on 01/07/2019 and 08/05/2019).)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

86. Specifically, in an Office action issued on October 5, 2018, the Examiner stated that Thielemans disclosed all of the limitations of the originally filed claim 1. (*Id.*, pp.238-39 (Office Action dated 10/05/2018 at 2-3).) In response, Applicant argued that “Thielemans fails to teach a closed loop gas circulation path about or encircling the electronic image assembly,” and that “Thielemans actually teaches away from such a construction.” (*Id.*, p.160 (Response filed on 01/07/2019 at 10.)

87. The Examiner rejected the claims over Thielemans again, in a Final Office Action issued on June 3, 2019. (*Id.*, pp.56-57; *see generally, id.*, pp.54-64.) In a response filed on August 5, 2019, Applicant argued that “Thielemans . . . fails to teach or suggest the use of [**both**] an open loop ambient air flow path **and** a closed loop gas circulation path. Thielemans also fails to teach or suggest a closed loop (or any) gas circulation path **about or encircling** an electronic image assembly.” (*Id.*, p.44 (emphasis added in part, original in part); *see generally, id.*, pp.35-50.) Applicant further stated that “Thielemans [] fails to teach or suggest the **simultaneous presence and use** of an open loop ambient air flow path and a closed loop gas circulation path.” (*Id.*, p.45.)

88. Thus, Applicant distinguished its closed loop from Thielemans’ by arguing that Thielemans’ loop did not surround or encircle the image assembly,

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

and also distinguished between its “closed loop” and “open loop,” arguing that Thielemans’ disclosed only one but not both types of loops. Therefore, the Court construction of “closed loop” as a “gas pathway within a display housing containing gas that is essentially isolated from external air” (*see* Ex. 1026, p.1), is applicable to the claims at issue and should be adopted by the Board.

89. Therefore, I agree that the Court’s prior construction of “closed loop” is relevant to the interpretation of that term as recited in the claims of the ’740 patent.

90. The Court construed “closed loop” as “gas pathway within a display housing containing gas that is essentially isolated from external air.” (Ex. 1026, p.1.) In my opinion, this is a proper construction of the term “closed loop” recited in the claims of the ’740 patent as well, in light of the specification and prosecution history of the ’740 patent.

91. The ’740 patent refers to the gas/air, circulating through a closed loop as the “circulating gas” and also as the “isolated gas.” For example, independent claims 1, 8, and 17 each recite “a closed loop gas circulation path.” (Ex. 1001, 9:59-60, 10:35-36, 11:24-25.) The specification of the ’740 patent states that “[t]he **circulating gas** which is being forced by the **closed loop** fan assemblies is primarily **circulating around the display.**” (*Id.*, 3:47-49.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

92. The '740 patent also states:

Some embodiments may use only one fan assembly for the **closed loop**. If only one fan assembly is used, it may be preferable to place the fan assembly at the inlet of the heat exchanger **101**, so that the **circulating gas** is 'pulled' across the front of the image assembly and pushed through the heat exchanger **101**. This is not required however; other embodiments may pull the **isolated gas** through the heat exchanger **101**. Other embodiments may push the isolated gas across the front of the image assembly.

(*Id.*, 3:27-36, FIG. 1.)

93. Thus, the circulating gas/air recited in the claims of the '740 patent is an isolated gas. As such, the Court's construction of "closed loop" as a "gas pathway within a display housing containing gas that is essentially isolated from external air" (*see* Ex. 1026, p.1) is applicable to the claims at issue.

94. Therefore, the Court's construction of "closed loop" as a "gas pathway within a display housing containing gas that is essentially isolated from external air" (*see id.*), is applicable to the claims at issue and should be adopted by the Board.

95. I understand that in this proceeding, the other claim terms should be given their plain and ordinary meaning in light of the specification.

**VI. APPLICATION OF THE PRIOR ART TO ASSERTED
CLAIMS**

96. I have reviewed and analyzed the prior art references and materials listed in Section I.C. above. In my opinion, the claims of the '740 patent are rendered unpatentable based on the following prior art:

Ground	References	Claim(s)
1	Karppanen [Ex. 1004]	1-3, 5-9, 11-13, 15-18, and 20
2	Yare [Ex. 1005]	1-3, 5, 6, 8, 9, 11-13, 15-18, and 20

97. I am informed by counsel that each reference listed above qualifies as prior art to the challenged claims because each reference was filed and/or published before the earliest claimed priority date of the '740 patent. I reserve the right to respond in the future to any arguments or positions that the Patent Owner may raise, taking account of new information as it becomes available to me.

A. Brief Summary of Prior Art

1. Karppanen [Ex. 1004]

98. International Patent Application No. PCT/FI2006/050145 with Publication No. WO2007116116A1 ("Karppanen") (Ex. 1004), entitled "Electronic

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

Information Board” was filed on April 11, 2006 and published on October 18, 2007.

I am informed that Karppanen qualifies as prior art to the ’740 patent under pre-AIA 35 U.S.C. §§ 102(a) and 102(e) because it designated the U.S. and published in English before and was filed before the earliest claimed priority date of Mar. 3, 2008 for the ’740 patent.

99. Karppanen discloses an “electronic information board” that leverages an “electronic display” such as a TFT LCD or plasma display. (Ex. 1004, Abstract.) The “electronic information board” can be used as a digital replacement for outdoor paper poster advertising displays. (*Id.*, 1:6-14.)

100. According to Karppanen, “the temperatures of the display devices easily rise too high” in hot environments and “it is important that the temperatures at different points inside the display device can be kept as constant as possible” so that the device can operate in a wide range of temperatures. (*Id.*, 1:25–32; *see also id.*, 3:10–13, 5:33–37 (stating that an objective of the invention is to facilitate use of electronic displays outdoors); 2:18–29 (identifying certain shortcomings of the known cooling systems).)

101. To address these issues, Karppanen discloses an electronic display unit having a frame, a display casing, a device casing, a flat display element (such as an LCD or LED display), and cooling equipment. (*Id.*, 1:3–5, 3:21–32, claim 23.) The

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

casing can be made weatherproof. (*Id.*, 4:6–8.) The display casing **10** includes a back wall **22**, a transparent front plate **46**, and edge parts with fasteners, which together form a “closed” casing. (*Id.*, 7:31–38.) Karppanen discloses that “due to the efficient temperature control, it is possible to use large electronic displays” in conjunction with the disclosed cooling system. (*Id.*, 5:16–19.)

102. Karppanen discloses providing efficient temperature control including mechanisms for circulating air within the closed display casing. Fans **64** may be used to facilitate air circulation in the display casing, (*id.*, 4:32–34, 9:3–9), and air ducts may be “arranged between the walls of the casing and the display element for directing the circulation of air around the display element” in order to cool it. (*Id.*, 4:34–36.)

103. Karppanen discloses that the interior of the overall system contains a cooling space between the display casing and the device case and back cover of the system, and that cooling elements can conduct the heat generated by the display device into the cooling space. (*Id.*, 3:36–4:17.) Specifically, the back wall of the display casing (**10**) may include a plate-like “heat transfer part” and “cooling fins or conduction elements” to facilitate heat transfer from inside the display casing (**10**) to the cooling space (**20**). (*See id.*, 8:14–16, 8:29–9:3, FIG. 2.)

104. Heat in the cooling space may then be transmitted to the external

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

environment using ambient air flow and cooling fans **36**. (*Id.*, 8:19–22.) The cooling space **20** may have “ventilator slots or holes on opposite sides of the cooling space for enabling air flow from the outside . . . to the cooling space and from the cooling space back to the outside.” (*Id.*, 4:19–23, 7:16–19.) Figures 2 and 4 depict the heat conducting and cooling pathways inside an exemplary embodiment of the Karppanen display unit:

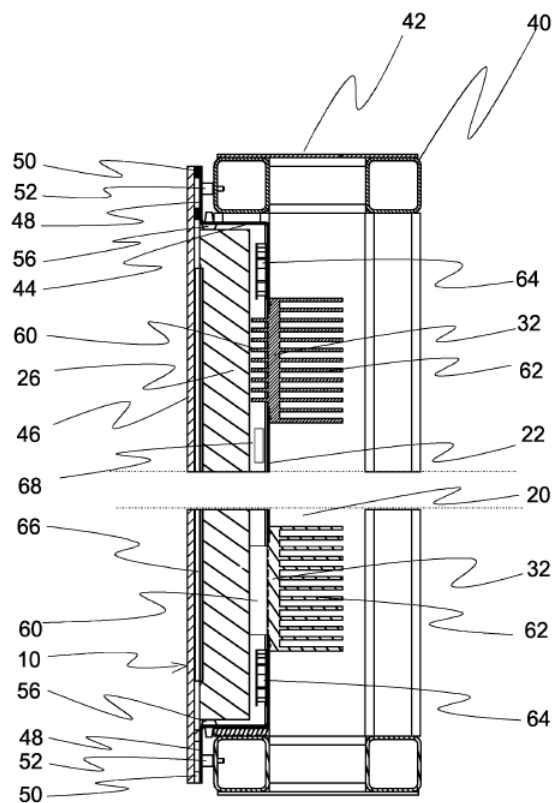


Fig. 2

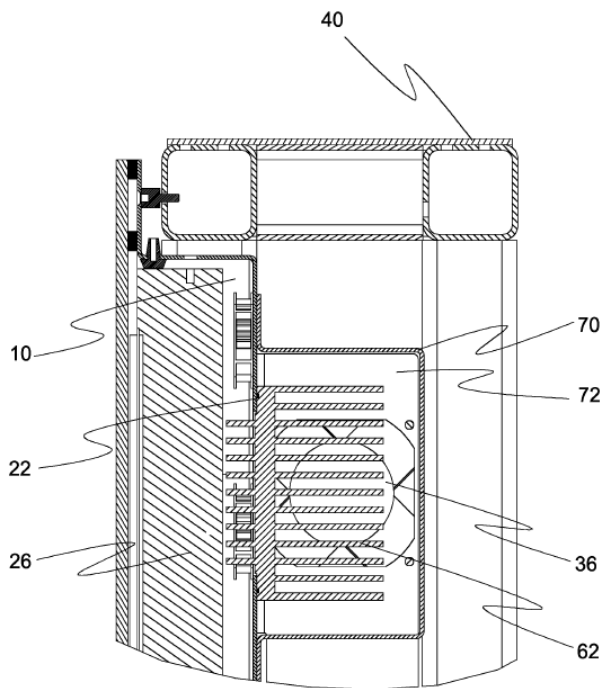


Fig. 4

(*Id.*, FIGs. 2, 4.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

2. Yare [Ex. 1005]

105. United Kingdom Patent Application No. GB 2402205A by Yare (“Yare”) (Ex.1005), entitled “A Display System Cabinet and Display System Including Heat Removal Means,” published on Dec. 1, 2004. I am informed that Yare qualifies as prior art to the ’740 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b) because it was published more than one year the earliest claimed priority date of Mar. 3, 2008 for the ’740 patent.

106. Yare discloses “a cabinet for mounting a display system” where the cabinet has “improved cooling facilities” and is “particularly suitable for” providing “displays in public places.” (Ex. 1005, 1:4-6.) A display according to Yare can be a “plasma, LCD or rear projection” display. (*Id.*, 1:14-15.) Yare recognizes that such a display “can generate a lot of heat” and that “an efficient cooling system” is necessary for such a display to “function normally.” (*Id.*, 1:15-17.) Yare also notes that in public places a conventional cooling system “can become clogged with dust, dirt and general pollution” and may “compromise the functionality of the display” and can result in “failure of the display system.” (*Id.*, 1:19-23.)

107. To address these problems, Yare discloses a cabinet **10** having a sealed zone **30** that is sealed from the external environment, and contains a display **20**. (*Id.*, 4:1-7, FIG. 1; *see id.*, 2:8-9.) The sealed zone also includes an internal cooling

system having fans **80**. (*Id.*, 4:31-33, FIGs. 1, 4; *see id.*, 2:9-10.) In addition, the cabinet **10** includes an atmospheric air zone **40** and a heat exchanger **70** for transferring heat from the sealed zone **30** to the atmospheric air zone **40**. (*Id.*, 4:11-22, FIGs. 1, 4; *see id.*, 2:19-29.)



-53-

108. Air flows in the sealed and atmospheric air zones are not mixed and, instead, the heat exchanger transfers the heat. The cabinet **10** includes vents **60** and a fan/exhaust **50** for drawing ambient air into the atmospheric air zone. (*Id.*, 4:11-16, FIGs. 1-4; *see id.*, 2:8-9.) The heat from the display **20** that is extracted by the air circulating in the sealed zone **30** may be transferred to the ambient air in the atmospheric zone **40** via the heat exchanger **70**. (*Id.*, 5:2-10, FIGs. 1, 4; *see id.*, 2:8-9.) The heated ambient air may then be released outside the cabinet **10** by the fan/exhaust **50**. (*Id.*, 5:2-10, FIGs. 1-4.) Thus, air flows in the sealed and atmospheric air zones, with the aid of the heat exchanger, can effectively cool the display, while avoiding dirt and other contaminants from reaching the display **20**.

B. Ground 1: Claims 1-3, 5-9, 11-13, 15-18, and 20 Are Obvious Over International (PCT) Patent Application Pub. No. WO2007/116116 by Karppanen et al. (“Karppanen”) in view of the ordinary skill in the art

1. Claim 1

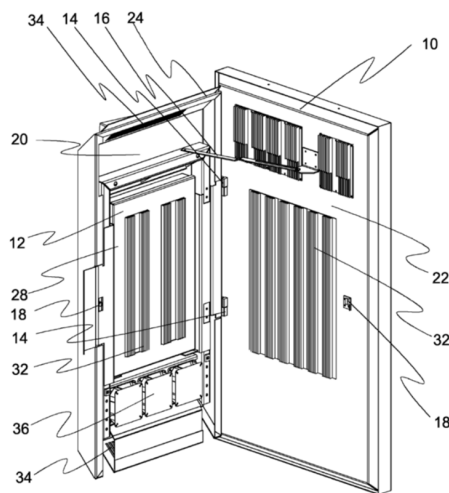
a. Element 1[pre] “An electronic display comprising:”

109. Karppanen discloses an electronic display. In particular, Karppanen discloses “an electronic information board” having “a flat display element (**26**), such as a TFT LCD display or plasma display for presenting information, and electronic equipment for controlling the display element.” (Ex. 1004, Abstract.)

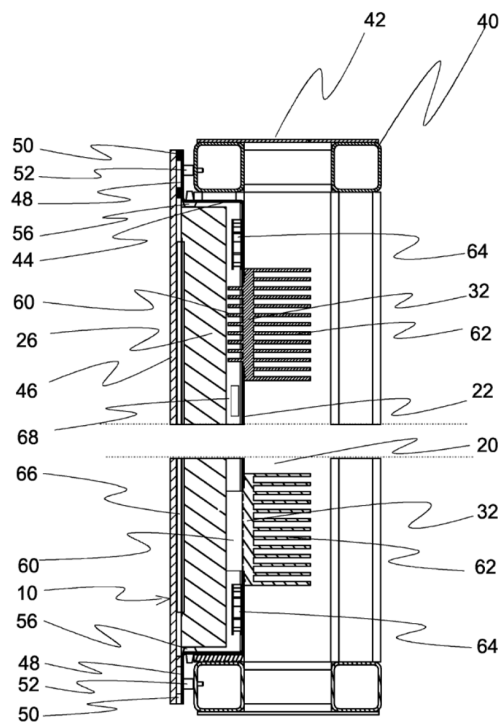
110. Karppanen also states that “[i]n Fig. 1, an electronic information board”

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

is “depicted obliquely from behind” where the “information board has a closed display casing **10**” and a “closed device casing **12**.” (*Id.*, 6:16-21, FIG. 1.) Karppanen further states: the “display element **26** of the information board (Fig. 2) has been placed inside the display casing [10], and the electronic equipment needed in the control of the display element have been placed inside the device casing [12].” (*Id.*, 6:21-24, FIG. 1.)



(*Id.*, FIG. 1.)



(*Id.*, FIG. 2.)

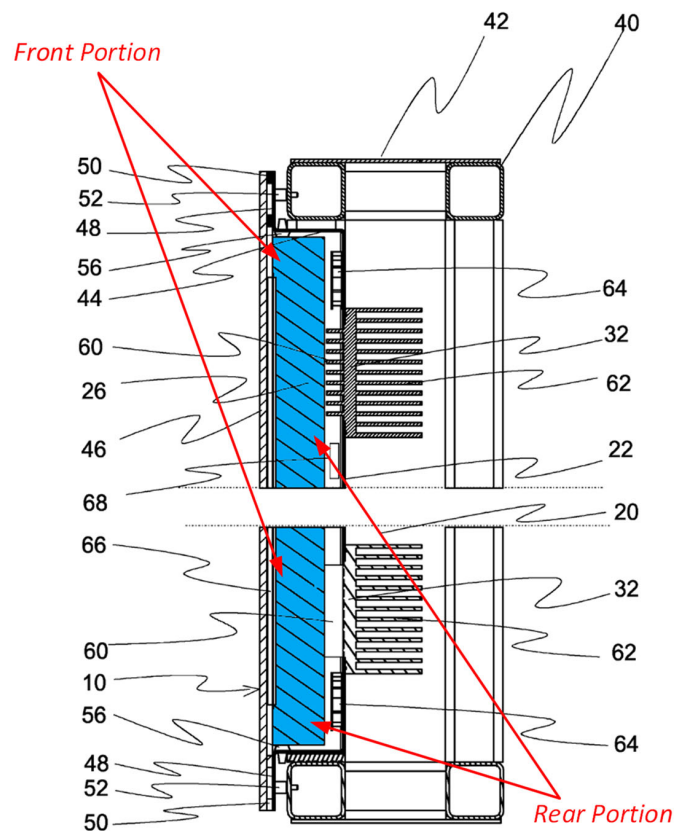
111. Karppanen also states that “[i]nside the display casing there is a display element **26**” that “is preferably a TFT LCD display.” (*Id.*, 8:4-9.) Thus, Karppanen discloses an “*electronic display*.”

b. Element 1[a] “an electronic image assembly having a front portion and a rear portion;”

112. Karppanen discloses this claim element because Karppanen’s system includes a display element **26** that may be a flat screen LCD display, i.e., an “*electronic image assembly*.” Karppanen states: “[i]nside the display casing there is a display element **26**” that “is preferably a TFT **LCD display**.” (Ex. 1004, 8:5-9, FIG. 2.) Karppanen also states, “the display element can also be some other suitable,

flat electronic display element, such as a plasma display, a LED display or an organic LED display.” (*Id.*, 9-11.)

113. Karppanen also states that “the electronic equipment needed in the control of the display element have been placed inside the device casing [12]” and that “this equipment includes . . . the power supplies of the **background light of the display.**” (*Id.*, 6:21-26, FIG. 1.) Thus, Karppanen discloses or at least suggests a background light or a backlight for the LCD display **26**.



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

114. As shown in annotated Figure 2 above, the display element **26**

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

(highlighted blue) has a front portion and a rear portion.

115. The display element **26** is “*an electronic image assembly.*” This is consistent with the ’740 patent, which states: “the image assembly **220** may comprise any form of electronic assembly for generating an image, including but not limited to: **LCD**, light emitting diode (LED), organic light emitting diode (OLED), field emitting displays (FED), light-emitting polymers (LEP), plasma displays, and any other **flat/thin panel displays.**” (Ex. 1001, 5:52-57, FIG. 2A.) Thus, like the ’740 patent, Karppanen also discloses a flat electronic display element, and in particular, an LCD display. A combination of an LCD panel and its backlight, which Karppanen discloses, as noted above, also constitutes an “*electronic image assembly.*”

116. In summary, the display element **26** individually, and also in combination with the background light, is “*an electronic image assembly having a front portion and a rear portion.*”

c. **Element 1[b] “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”**

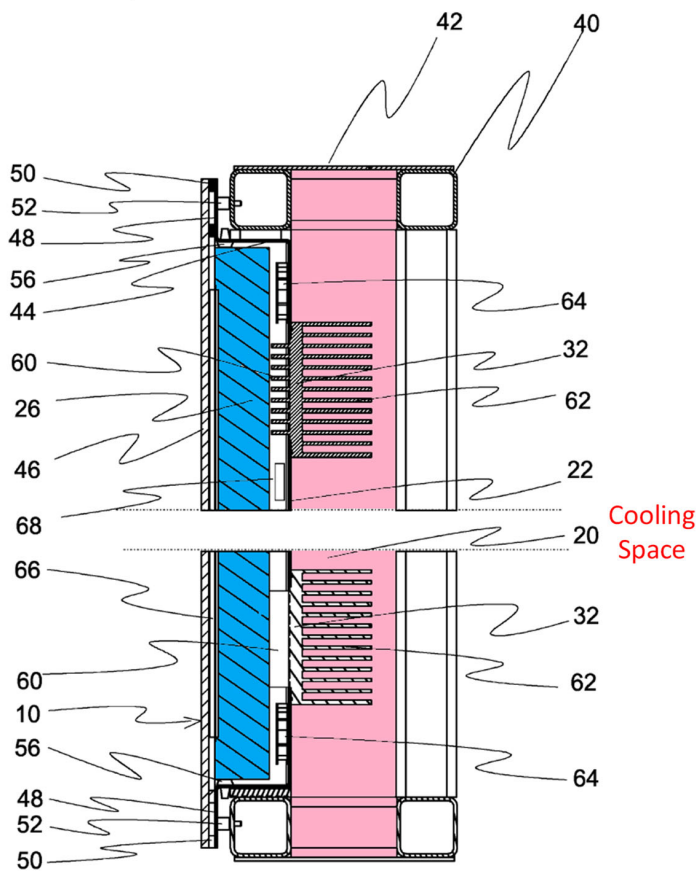
117. Karppanen discloses this claim element because Karppanen’s system provides an open “cooling space **20**” for the flow of ambient air. Karppanen states:

In normal use, the display casing [10] and the device casing [12] are turned against each other to a closed position and locked to each other

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

by locking means 18 on one side of the casings. In the closed position, there remains a **cooling space 20** between the display casing [10] and the device casing [12], delimited by the cover 24 and the display casing (Fig. 2).

(Ex. 1004, 7:7-11, FIG. 2.)



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

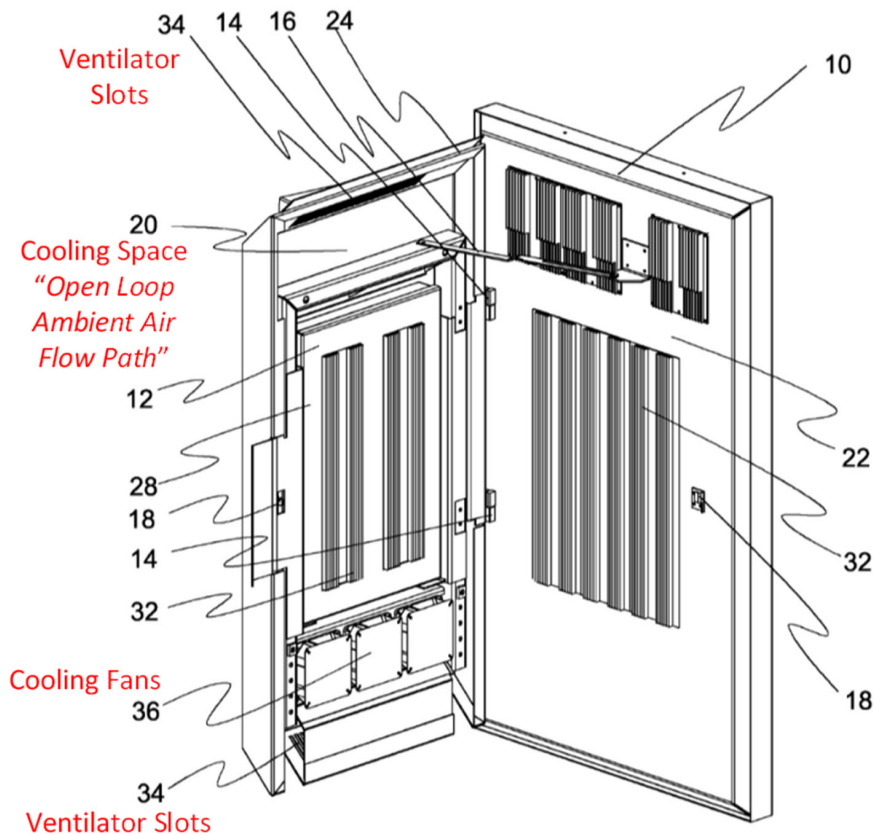
118. The cooling space **20** (highlighted pink) is behind the display element **26** (highlighted blue), i.e., “*behind the rear portion of the electronic image assembly.*” In addition, Karppanen states that “[i]n the back wall **22** of the display

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

casing and the back cover **28** of the device casing there are cooling elements **32**, by which heat is transferred from the inside of the device casing and the display casing to the cooling air in the cooling space **20**.” (*Id.*, 7:11-14.) Karppanen further discloses:

In the first edge of the cover **24** pointed downward and the second edge pointed upward there are ventilator slots **34**, which enable the movement of air from the outside of the device to the cooling space and from the cooling space back to the outside of the device. When required, the ventilator slots can be provided with filters in order to prevent the access of impurities to the ventilation space. In the cover **24** there are cooling fans **36**, by which the circulation of air through the cooling space [**20**] is regulated.

(*Id.*, 7:16-22, FIG. 1.)



(*Id.*, FIG. 1 (annotated).)

119. Thus, the cooling space [20] is an open flow path for ambient air, where the path is behind the display element 26. Accordingly, Karppanen teaches this claim element.

d. Element 1[c] “a closed loop gas circulation path about the electronic image assembly;”

120. Karppanen discloses this claim element because Karppanen’s system includes a closed loop cooling path formed by ducting 66 within the display casing 10. Specifically, Karppanen’s system includes “a **closed** display casing 10” having

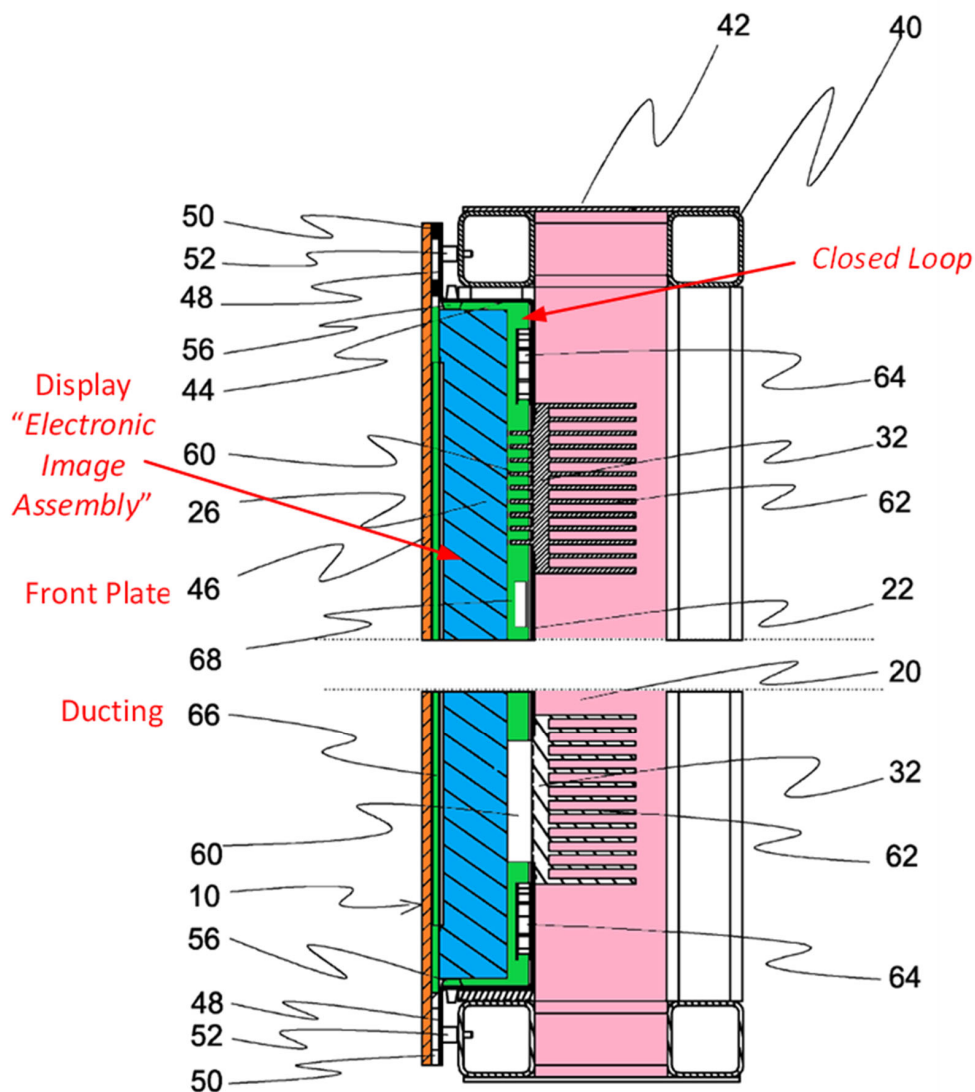
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

a back wall **22** [and] a transparent front plate **46**.” (Ex. 1004, 6:17-19, 7:31-34, FIGs. 1, 2.)

121. Karppanen states:

Inside the display casing on the back wall **22** there are fans **64**, which circulate air in the space between the display element [**26**] and the walls of the display casing. Suitable **ducting 66** has been arranged between the display casing and the display element so that an air flow circulating the display element and equalizing the temperatures can be arranged by means of the fans. The fans **64** force the air of the inner casing to flow past the front plate **46** of the device.”

(*Id.*, 9:3-8, FIG. 2.)



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

122. As seen in annotated Figure 2 above, within the closed display casing 10, the space between the display element 26 (highlighted blue) and the back wall 22, and the ducting 66 in front of the display element 26 but behind the front plate 46 (highlighted orange), form a closed pathway (highlighted green). Through this

closed pathway air may be circulated by the fans **64**. The closed pathway is formed around the display element **26** and is thus “*a closed loop gas circulation path about the electronic image assembly.*”

e. **Element 1[d] “a common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path;”**

123. Karppanen discloses this claim element because Karppanen’s system includes a cooling element **32**. 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 (“*the closed loop gas circulation path*”) and also in the open cooling space **20** (“*the open loop ambient air flow path*”), and transfers heat from the closed loop to the open loop.

124. Specifically, Karppanen states: [i]n the back wall of the display casing there are cooling elements **32**, which have a first heat transfer part **60** extending to the inside of the display casing and a second heat transfer part **62** extending to the cooling space **20** outside the display casing.” (Ex. 1004, 8:13-16, FIG. 2.)

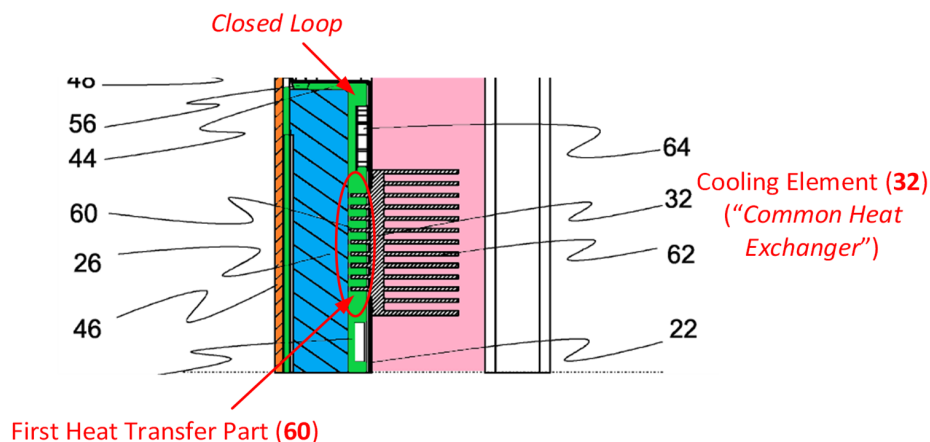
125. Regarding the first heat transfer part **60** Karppanen discloses that “[t]he first heat transfer part may comprise **cooling fins** or conduction elements or both.” (*Id.*, 8:29-30, FIG. 2.) Karppanen also states:

The first cooling element **32**, in which the **first heat transfer part 60** extending to the display casing **comprises cooling fins**, is shown in the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

upper part of Fig. 2 by way of example. Inside the display casing [10] on the back wall 22 there are fans 64, which circulate air in the space between the display element [26] and the walls of the display casing [10].”

(*Id.*, 9:1-5, FIG. 2.)



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

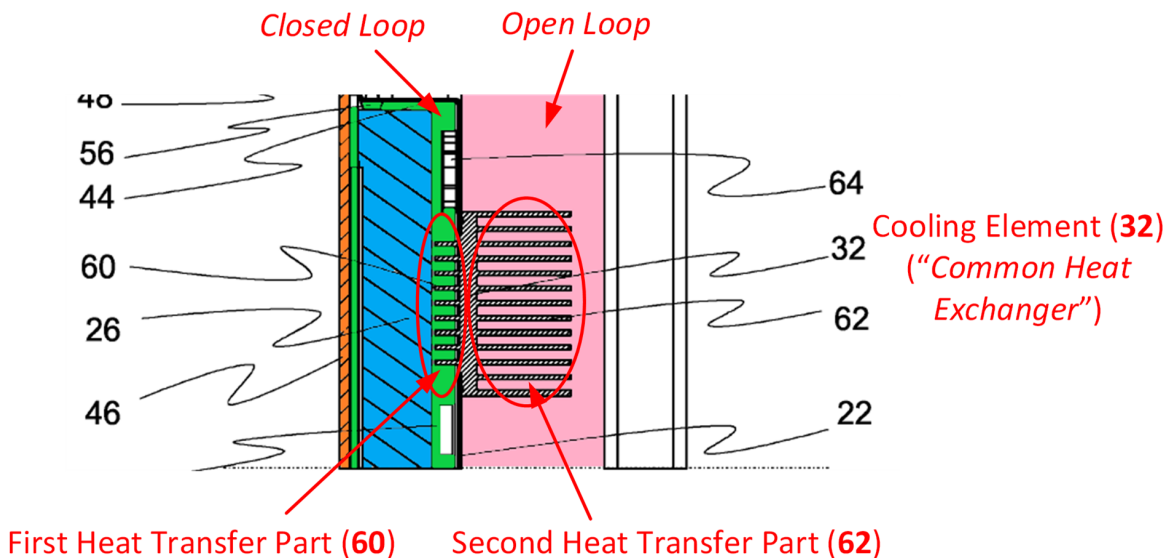
126. As discussed above in connection with claim element 1[c], the space between the display element 26 and the back wall 22, and the ducting 66 in front of the display element 26 form a closed pathway through which air may be circulated by the fans 64. (*See supra* § VI.B.1.d.) As further described in connection with claim element 1[c], the closed pathway (highlighted green) is “*the closed loop gas circulation path.*” (*See id.*) The first heat transfer part 60 of the first cooling element 32, where the part 60 comprises cooling fins, is within the closed pathway, i.e., “*in the pathway of [] the closed loop gas circulation path.*”

127. Regarding the second heat transfer part 62, Karppanen states:

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

The second heat transfer part [62] comprises a number of plate-like cooling fins placed side by side. 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 [20], from which it is further conducted by the air flow produced by the cooling fans 36 out from the entire device.

(*Id.*, 8:16-22, FIG. 2.)



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

128. As discussed above in connection with claim element 1[b], the cooling space 20, along with the ventilator slots 34, forms “*the open loop ambient air flow path.*” (See *supra* § VI.B.1.c.) The second heat transfer part 62 is within the cooling space 20, i.e., “*in the pathway of . . . the open loop ambient air flow path.*” Thus,

the cooling element **32** is “*a common heat exchanger*” a first part **60** of which is located in the closed pathway (within the display casing **10**), i.e., “*the pathway of [] the closed loop gas circulation path*” and a second part **62** of which is located in the cooling space **20**, i.e., “*the open loop ambient air flow path.*”

129. Together, the first and second heat transfer parts (**60** and **62**), along with the base from which they protrude, form a heat exchanger **62** which transfers heat from the closed loop zone to the cooler open loop zone.

130. The first heat transfer part **60** is within the closed pathway (within the display casing **10**) i.e., “*in the pathway of [] the closed loop gas circulation path.*” The second heat transfer part **62** is within the cooling space **20**, i.e., “*in the pathway of . . . the open loop ambient air flow path.*” Accordingly, the cooling element **32** (“*common heat exchanger*”) has two parts – one in the closed loop path and the other in the open loop path. Therefore, Karppanen teaches this claim element.

f. Element 1[e] “a gas circulation device positioned to force circulating gas through the common heat exchanger; and”

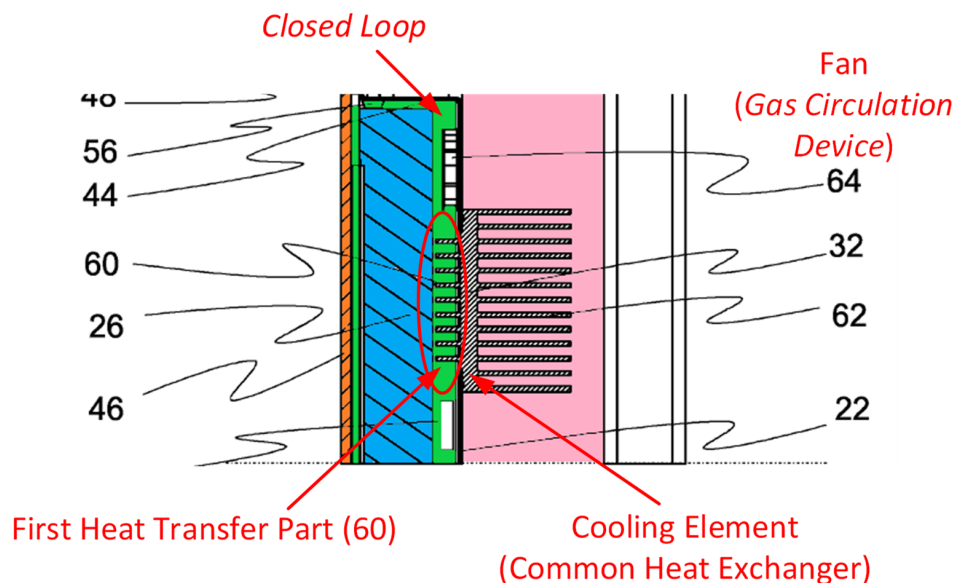
131. Karppanen discloses this claim element because Karppanen’s system includes fans **64** (“*a gas circulation device*”) that are positioned in the closed loop section of closed display casing **10** to force the air circulating (“*to force circulating gas*”) in the closed pathway (“*closed loop*”), and through the first heat transfer part

60 of the common heat exchanger. The first heat transfer part 60 of the cooling element 32 is located within the closed pathway (the “*closed loop*”), and the fans 64 force the air through the first heat transfer part 60 (e.g., fins) of the cooling element 32 (“*the common heat exchanger*”).

132. Karppanen states:

Inside the display casing on the back wall 22 there are fans 64, which circulate air in the space between the display element [26] and the walls of the display casing. Suitable ducting 66 has been arranged between the display casing and the display element so that an air flow circulating the display element and equalizing the temperatures can be arranged by means of the fans. The fans 64 force the air of the inner casing to flow past the front plate 46 of the device.”

(*Id.*, 9:3-8, FIG. 2.)



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

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

133. As discussed above in connection with claim element 1[c], the space between the display element **26** and the back wall **22**, and the ducting **66** in front of the display element **26** form a closed pathway through which air may be circulated by the fans **64**. (*See supra* § VI.B.1.d.) As further described in connection with claim element 1[c], the closed pathway (highlighted green) is “*the closed loop gas circulation path.*” (*See id.*) As such, the air forced and circulated by the fans **64** through the closed pathway is “*circulating gas*” and a fan **64** is “*a gas circulation device.*”

134. As discussed above in connection with claim element 1[d], the first cooling element **32** (“*the common heat exchanger*”) has a first heat transfer part **60** (e.g., cooling fins) that is located within the closed pathway, i.e., within “*the closed loop gas circulation path.*” (*See supra* § VI.B.1.c.) The cooling element **32** has a second heat transfer part **62**, also in the form of “cooling fins,” where “the cooling air flows **between** the fins.” (Ex. 1004, 8:13-19, FIG. 2.)

135. Air flowing “between” the fins is air flowing “through” the fins. As such, the fans **64** force the air (“*circulating gas*”) through the cooling fins forming the first heat transfer part **60**, i.e., through the first heat transfer part **60** of the cooling element **32** (“*the common heat exchanger*”), and thus “*through the common heat exchanger.*” This operational principle of heat exchangers was well known at the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

time of the '740 application. (*See, e.g.*, Ex. 1020, Section 6.24, Pressure losses in multiple-fin heat exchangers.) Also, during prosecution the applicant did not disagree with the examiner who found that Thielemans teaches airflow “through” the heat exchanger even though Thielemans teaches “a heat sink **22** in the form of a heat transporting plate.” (Ex. 1031, p.239; Ex. 1030, ¶49.) Therefore, Karppanen teaches the “*a gas circulation device positioned to force circulating gas through the common heat exchanger,*” as this claim element recites.

136. As noted above, Karppanen discloses air flow through a heat exchanger under the plain meaning of this phrase because the air in Karppanen flows through Karppanen’s cooling fins. To the extent some more narrow definition of “through the heat exchanger” requires a heat exchanger configuration that includes some dedicated channel or overlapping plates specific to the embodiments in the '740 patent, the claim still would have been obvious because these narrow heat exchanger embodiments were well known to a person of skill in the art, as discussed below.

137. A POSITA would have understood that in Karppanen’s system, the fins of the part **60** extending from the base of the cooling element **32** into the space between the display **26** and the backwall **22** could alternatively be encased within a cover plate, such that the air flow in the closed path passes through the channel created by part **60** of the cooling element **32** (“*the common heat exchanger*”). Before

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

2008, such implementations of heat sinks and heat exchangers were common. They were also known to improve the heat extraction efficiency of the heat sink / heat exchanger.

138. For example, Hoffman (U.S. Patent App. Pub. No. 2009/0145581) (Ex. 1006) discloses heat sinks for any “thermal system,” (Ex. 1006, ¶2, such as that of Karppanen’s, that removes heat from a display element **26**. Hoffman discloses a heat sink having a base **52** and an upper lid **59**, and fins **51** extending therebetween. (*Id.*, ¶108, FIG. 7.) The use of the upper lid **59** helps improve the heat transfer efficiency. (*See id.*, ¶109.) Specifically, Hoffman discloses that the distance between the base **52** and the lid **59** is constant, (*id.*, ¶¶108, 109), which generally creates a laminar flow within the base and the lid.

139. Hoffman also states that the “fins **51** may simply support, touch, or not touch or be fixedly joined to the foundation surface of the upper lid **59**.” (*Id.*) In particular, the height of the fins at the entrance of the airflow is smaller than that at the exit, which can “cause a displacement trip, whereby the transition from laminar flow to turbulent flow is hastened, causing a higher heat transfer coefficient.” (*Id.*, ¶109.) Thus, a POSITA would have known that by employing a lid and fins of different heights, the heat extraction efficiency of the part **60** of Karppanen’s cooling unit **32** (“*the common heat exchanger*”) can be increased.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

140. The use of a heat exchanger having fins encased between two surfaces, such that airflow passes through the heat exchanger (through the fins) was known in connection with cooling displays. For example, Williams discloses a back lighting system for LCDs. (Ex. 1007, 1:40-41, 1:12-14, FIG. 1D.) With reference to Figure 1C, Williams discloses the use of a “plurality of heat sinks or heat exchangers **130a**, **130b**, **130c**.” (*Id.*, 6:29-31, FIG. 1C.)

141. Referring to its Figure 1D, Williams discloses a “lighting module” similar to that of Karppanen’s in that the lighting module **112** is cooled in part by “a captive or re-circulating fluid, such as air,” shown by “arrows A.” (*Id.*, 6:49-54, FIG. 1D.) The recirculated air is passed through a “bottom portion **148** of heat exchanger **130**.” (*Id.*, 6:61-63, FIG. 1D.) Williams further states:

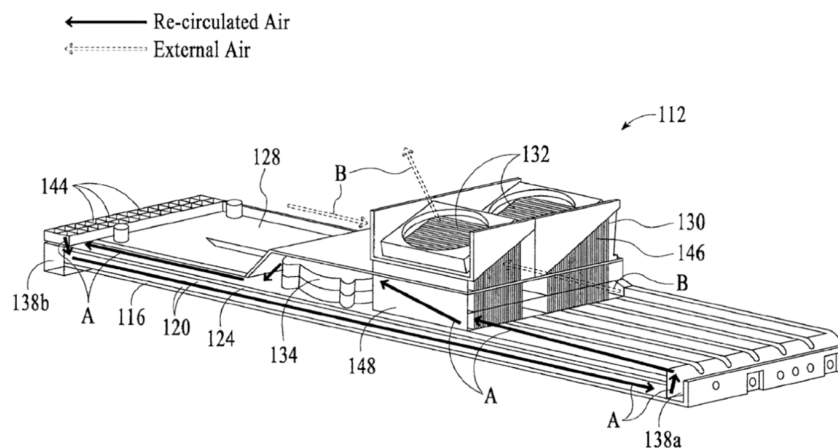
Fans **132** may direct **external air** in the direction of **arrows B**, through a plurality of fins **176** (FIG.1E) on **top portion 146 of heat exchanger 130**, whereby the external air absorbs and transfers the heat from the heated re-circulated air out of the lighting module **112**. Thus, the **re-circulated air may be cooled by the external air** when blown through the heat exchanger **130**, before returning to the plurality of light sources **120**.

(*Id.*, 6:63-7:4, FIGs. 1D, 1E.)

142. Thus, like Karppanen’s system, Williams’ system employs captive or re-circulated air, i.e., a closed loop, and external air, i.e., an open loop, for cooling a

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

display. Additionally, as in Karppanen's system, in Williams' system also, the re-circulated air and external air pass through respective portions of a heat exchanger having fins. In Williams' heat exchangers **130**, the fins **176**³ are disposed between a bottom plate and a top plate. (*See id.*, FIG. 1D.)



(*Id.*, FIG. 1D.)

143. A POSITA would have known that disposing the fins of a heat sink / heat exchanger in an enclosure, such as that formed by bottom of top plates, generally allows the use of thin, narrowly spaced fins that can maximize the airflow through the heat exchanger and can thus maximize the exchanger's heat extraction efficiency. This modification would have been well within the skill of the art and would have been a simple modification that resulted in predictable results, including

³ The fins **176** are mislabeled as “**146**” in Figure 1D. (*See id.*, FIG. 1E.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

increased heat dissipation.

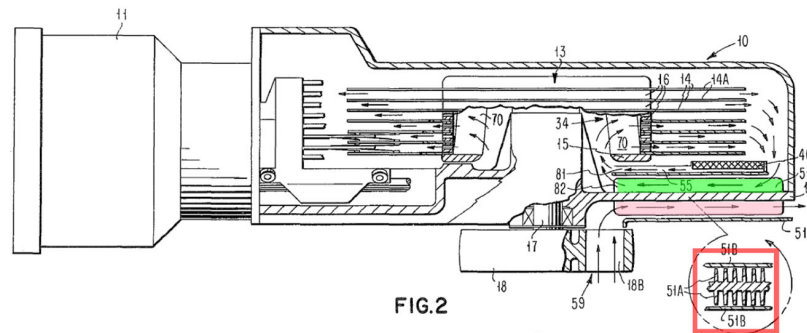
144. Horng (U.S. Patent App. Pub. No. 2008/0083527) (Ex. 1008) also discloses a similar structure and the same benefit. Horng discloses “[a] combined backlighting and heat-dissipating module for a flat panel display.” Horng, Abstract. Specifically, Horng’s system includes “a back light unit” **1**, “a heat dissipating plate” **3**, “a plurality of cover plates” **4**, and a cross-flow fan system **5**. (Ex. 1008, ¶30; FIGs. 2, 3.)

145. Horng further discloses that the heat dissipating plate **3** has “a plurality of thermal-exchanging,” i.e., heat exchanging, “channels **31**” formed between “adjacent heat-dissipating fins **32**.” (*Id.*, ¶34, FIG. 2.) Horng further states: “[t]o provide a **better efficiency of heat dissipation**, there is provided a set of the cover plates **4** which are helpful in thermal exchange. A total **surface area** of the heat dissipating plate **3** is further **increased**.” (*Id.*, ¶35, FIG. 2.)

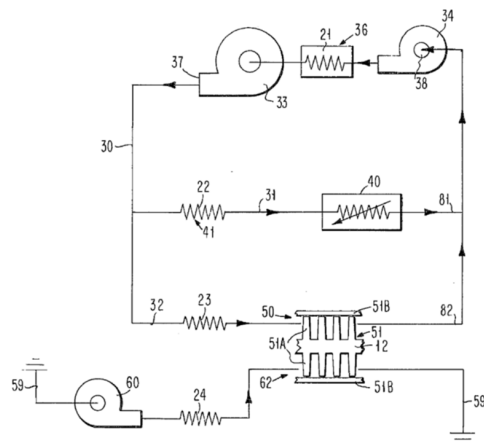
146. The use of a heat sink / heat exchanger having fins enclosed between top and bottom plates was generally well known before 2008, including in other fields. For example, Davis (U.S. Patent No. 4,488,193) (Ex. 1009) discloses a “closed loop” cooling system for cooling magnetic disks of a computer. (Ex. 1009, Abstract, 1:8-11, 2:44-52.) Davis’s “[h]eat exchanger **51** comprises a plurality of finned members **51A** which extend vertically upward, as shown in FIG. 3. from the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

baseplate [12] and **are covered by a plate 51B** parallel to the baseplate to define [a]
closed channel.” (*Id.*, 2:42-46, FIGS. 2, 3.)



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



(*Id.*, FIG. 3.)

147. Like Karppanen’s system, Davis’ system includes both a “closed loop path 30” and an “open loop air path 59,” both of which pass through a “heat exchanger 51” (*Id.*, 4:49-52, 4:59-62, FIG. 3.) Additionally, in Karppanen’s system, the base of the cooling unit 32 separates the “closed loop” and “open loop” pathways,

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

the fins of part **60** extend into the closed loop pathway, and the fins of part **62** extend into the open loop pathways.

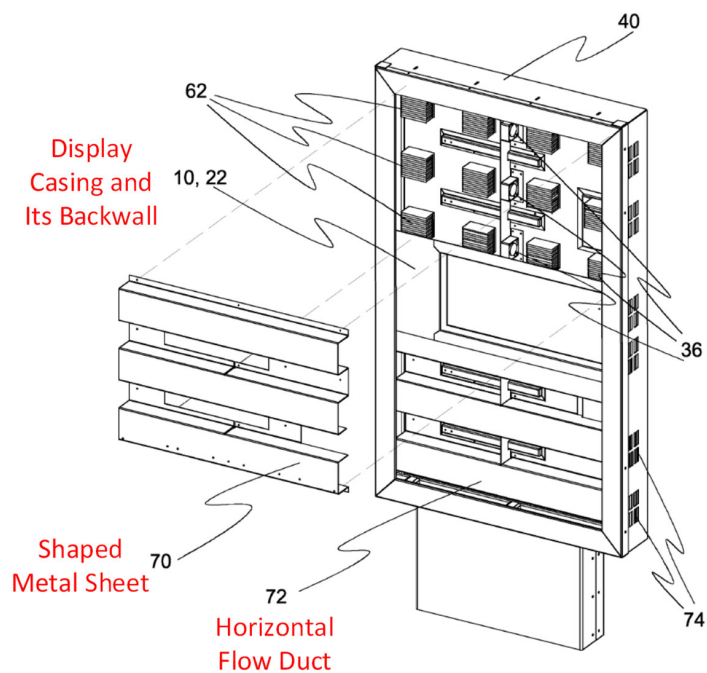
148. Likewise, as seen in Davis' Figures 2 (annotated above) and 3, the baseplate **12** separates the closed loop path (highlighted green) from the open loop path (highlighted pink). A set of fins **51B** extending in the upward direction, extend into the closed loop path **30**, and another set of fins **51B** extending in the downward direction, extend into the open loop path **59**. Thus, even though Davis is directed to cooling a computer disk, the heat exchanger structure it discloses was known to a POSITA since the 1980s, and is used for cooling electronic displays, as Karppanen teaches. Moreover, the benefits of that structure were known generally, as Hoffman teaches, and in the context of display systems, as Williams and Horng teach.

149. In light of such as well-known configuration of a heat sink / heat exchanger, where the fins are disposed within an enclosure, e.g., in-between bottom and top plates, and the known benefits of this structure, e.g., improved flow regulation, increased heat extraction areas, and, improved heat extraction, a POSITA would have modified Karppanen's cooling unit **32** to include a cover plate, to encase the fins of the part **60** within the cooling unit, such that the airflow in the "*closed loop*" passes through the cooling unit **32** ("the common heat exchanger"). Adding cover plates to encase the fins would have been a straightforward modification.

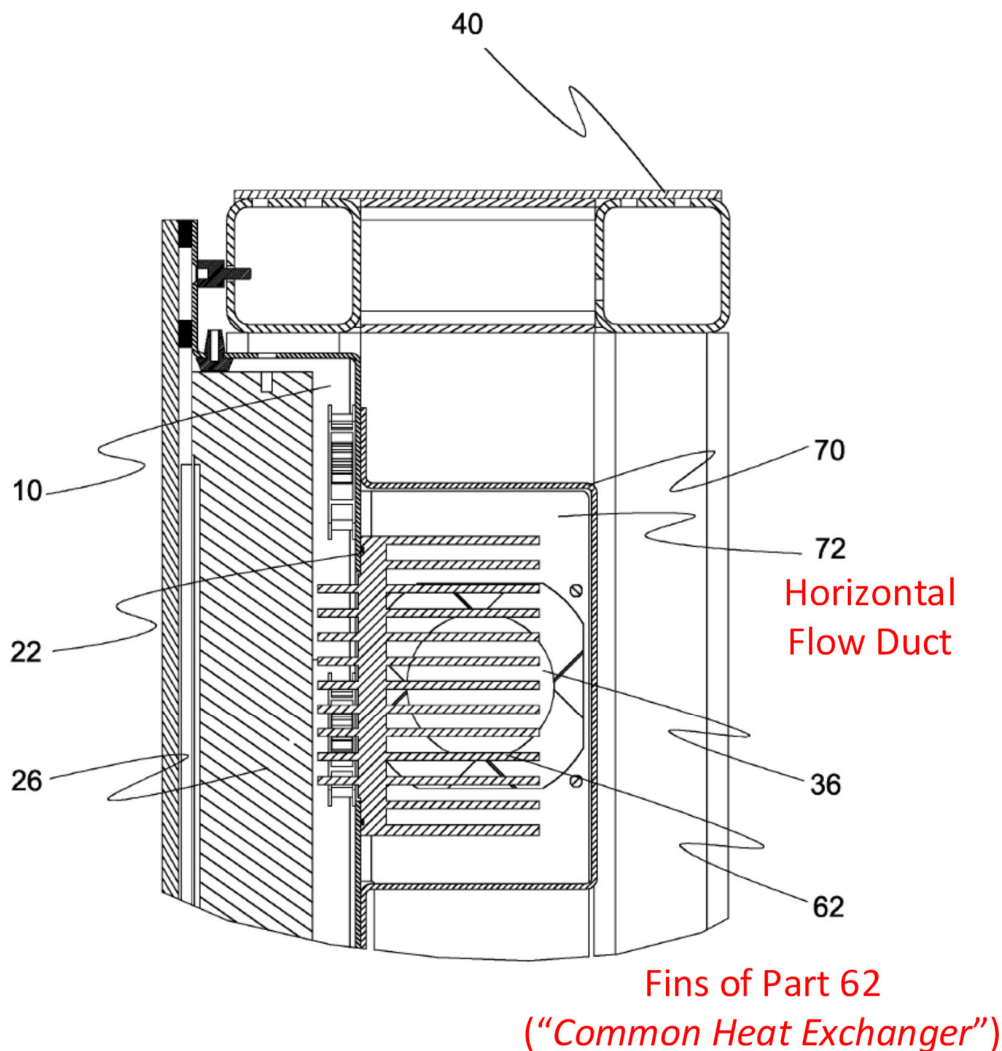
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

150. For instance, a POSITA would have recognized it to be simply an addition of a known element (a cover plate, as evidenced by Exs. 1006-08 discussed above). Alternatively, it would have been a simple substitution of Karppanen's heat exchanger with one having encased fins (as evidenced by Exs. 1006-08). In fact, Karppanen discloses encased fins. Specifically, with reference to Figures 3 and 4, Karppanen discloses an embodiment in which "one or more flow controllers **70** made of a shaped metal sheet have been fastened to the back wall **22** of the display casing **10**" that, "[t]ogether with the back wall, . . . form one or more essentially **horizontal flow ducts 72**" within the cooling space **20**. (Ex. 1004 10:36-11-4, FIGs. 3, 4.) Karppanen further discloses that inside the ducts **72** "the second heat transfer parts **62** (e.g., **fins**) of the cooling elements **32** and the cooling fans **36** fastened to the back wall are placed." (*Id.*)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 3 (annotated).)



(*Id.*, FIG. 4 (annotated) (depicting that the flow duct **72** encases the fins of the part **62** of the *common heat exchanger*).)

151. Such a modification was also well within the scope of a POSITA, because it required nothing more than affixing cover plates, which can be accomplished using commonly used techniques such as spacers, brackets, etc. or affixing an improved heat exchanger to the wall of the display casing **10** in the same

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

way the cooling element **32** is affixed. As such a POSITA would have known that this modification would succeed, and would provide the benefits discussed above.

152. As explained, in my opinion, Karppanen discloses air circulating “through” the heat exchanger without any modification.

153. To the extent a more narrow meaning of “through the heat exchanger” requires a heat exchanger specific to the embodiments disclosed in the ’740 specification, the heat exchangers explicitly shown in the ’740 patent were well known to a person of skill in the art as evidenced by the many prior art that show the same heat exchangers in similar devices.

154. Thus, Karppanen individually, and in view of the knowledge of a POSITA, teaches this claim element.

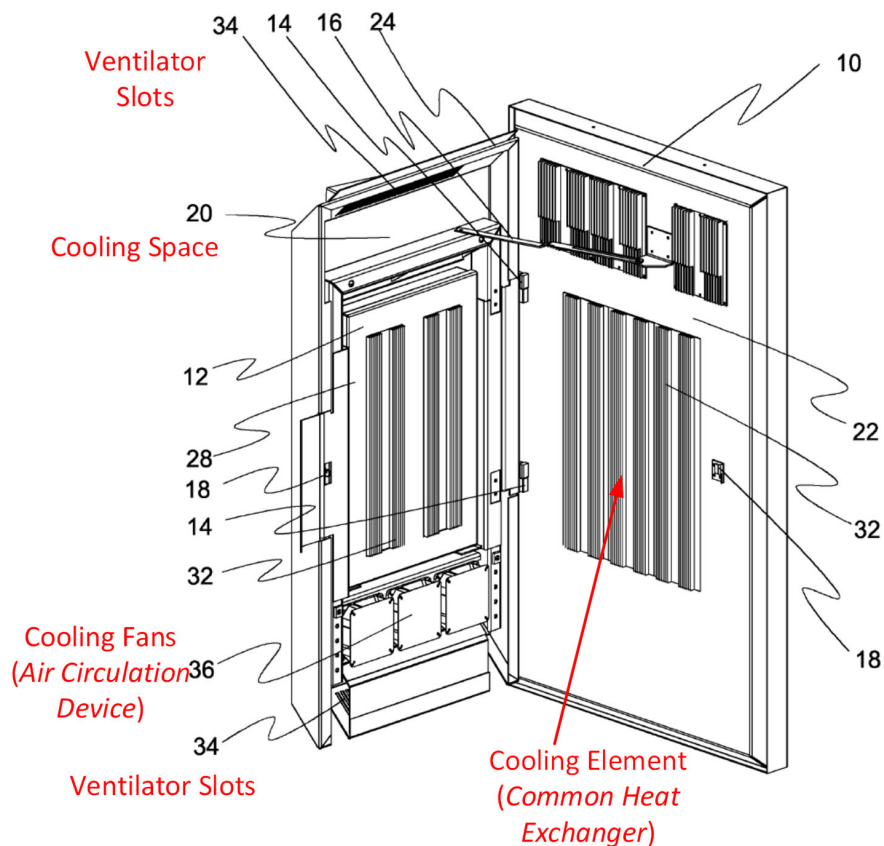
g. Element 1[f] “an air circulation device positioned to force ambient air through the common heat exchanger.”

155. Karppanen discloses this claim element because Karppanen’s system includes fans **36** to force ambient air through cooling space **20**. The second heat transfer part **62** of the cooling element **32** is located within the cooling space **20**, and the fans **36** force the ambient air through the second heat transfer part **62** of the cooling element **32** (“*the common heat exchanger*”).

156. Karppanen states that “[i]n the cover **24** there are **cooling fans 36**, by

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

which the circulation of air through the cooling space [20] is regulated.” (Ex. 1004, 7:21-22, FIG. 1.) As discussed above in connection with claim element 1[b], the cooling space 20 is “*the open loop ambient air flow path.*” (See *supra* § VI.B.1.c.) Thus, a cooling fan 36 is “*an air circulation device.*”



(Ex. 1004, FIG. 1 (annotated).)

157. As discussed above in connection with claim element 1[d], the first cooling element 32 (“*the common heat exchanger*”) has a second heat transfer part 62 that is located within the cooling space 20, i.e., within “*the open loop ambient air flow path.*” (See *supra* § VI.B.1.e.) The second heat transfer part 62, may be in the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

form of “cooling fins,” where “the cooling air flows **between** the fins.” (Ex. 1004, 8:13-19, FIG. 2.) As such, the fans **36** force ambient air between the fins of the second heat transfer part **62**, i.e., through the part 62 of the cooling element **32** (“*the common heat exchanger*”), i.e., “*through the common heat exchanger.*”

158. Moreover, for the reasons discussed above for claim elements 1[e] and 1[f], a POSITA would have understood that in Karppanen’s system, the fins of the part **62** extending from the base of the cooling element **32** into the cooling space **20** may be encased by a cover plate, such that the ambient air flow in the “*open loop*” passes through the part **63** of the cooling element **32** (“*the common heat exchanger*”). In fact, Karppanen discloses such a system in Figure 4 where heat transfer part **62** is covered by horizontal flow ducts **72**, which also encase cooling fans **36** which act to force air through the open loop side of the common heat exchanger. (*See id.*, 11:1-4 (disclosing “horizontal flow ducts **72**” encasing “the second heat transfer parts **62** of the cooling elements **32** and the cooling fans **36**”), FIG. 4.) Thus, Karppanen individually and in view of the knowledge of a POSITA, teaches this claim element.

159. In summary, Karppanen, individually and in view of the knowledge of a POSITA, discloses each and every element of claim 1 and renders obvious claim 1.

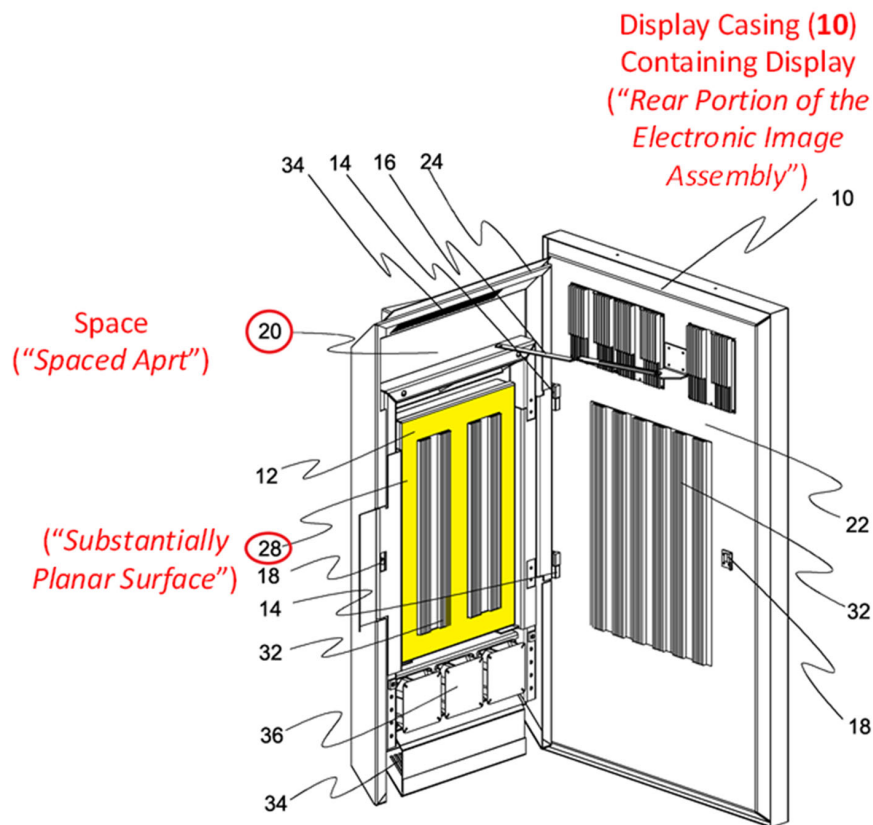
2. Claim 2

- a. Element 2[a]: “The electronic display of claim 1, further comprising: a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly; and”**

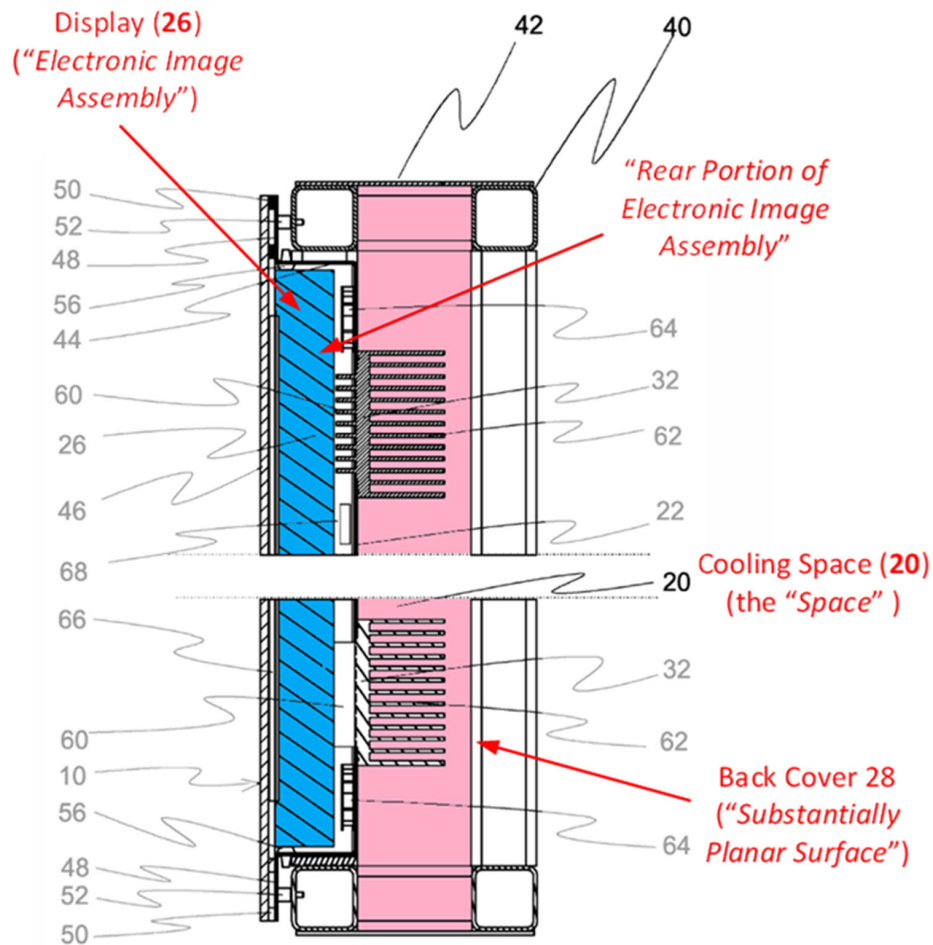
160. Karppanen teaches this claim element because Karppanen’s system includes a device casing **12** located behind the display **26** (“*the electronic image assembly*”), and the device casing **12** has a planar rear cover **28** (“*a substantially planar surface*”).

161. Karppanen states: “[t]he information board has a closed display casing **10**, to the back wall **22** of which a cover **24** opening on hinges **14** has been connected.” (Ex. 1004, 6:17-19, FIG. 1.) Karppanen also states: “[a] closed device casing **12** has been fastened to the bottom of the cover [**24**].” (*Id.*, 6:20-21, FIG. 1.) The “closed” device casing has a “back cover **28**.” (*Id.*, 7:11-14 (disclosing that “[i]n the back wall **22** of the display casing and the **back cover 28 of the device casing [10]** there are cooling elements **32**”), FIG. 1.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 1 (annotated).)



(*Id.*, Fig. 2 (annotated).)

162. As seen in the annotated Figures 1 and 2 above, the back cover **28** (highlighted yellow) is "*a substantially planar surface.*" Karppanen also discloses that in the closed position of the cover **24**, the device casing **12** is located behind the display casing **10**. (*Id.*, 7:7-9 (stating that "[i]n normal use, the display casing and the device casing are turned against each other to a closed position and locked to each other by locking means **18**").)

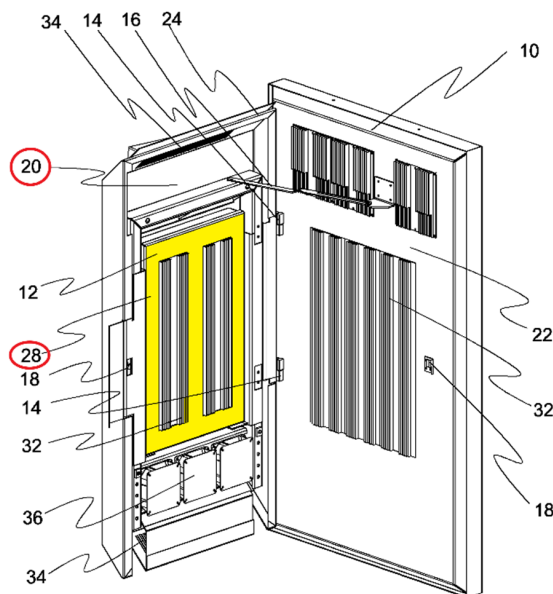
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

163. As discussed for claim element 1[a], the display **26** (“*the electronic image assembly*”) is disposed within the display casing **10**. (*See supra* § VI.B.1.b.) Moreover, as discussed for claim element 1[b], the device casing **12** is spaced apart from the display casing **10** by the cooling space **20**. (*See supra* § VI.B.1.c; Ex. 1004, 7:9-11 (stating that “[i]n the closed position, there remains a **cooling space 20** between the display casing and the device casing”).) Therefore, in the closed position, the back cover **28** (“*a substantially planar surface*”) of the device casing **12** is “*located behind and spaced apart*” by the cooling space **20** “*from the rear portion of*” the display **26** (“*the electronic image assembly*”). Accordingly, Karppanen teaches this claim element.

b. Element 2[b]: “a space defined between the rear portion of the electronic image assembly and the substantially planar surface;”

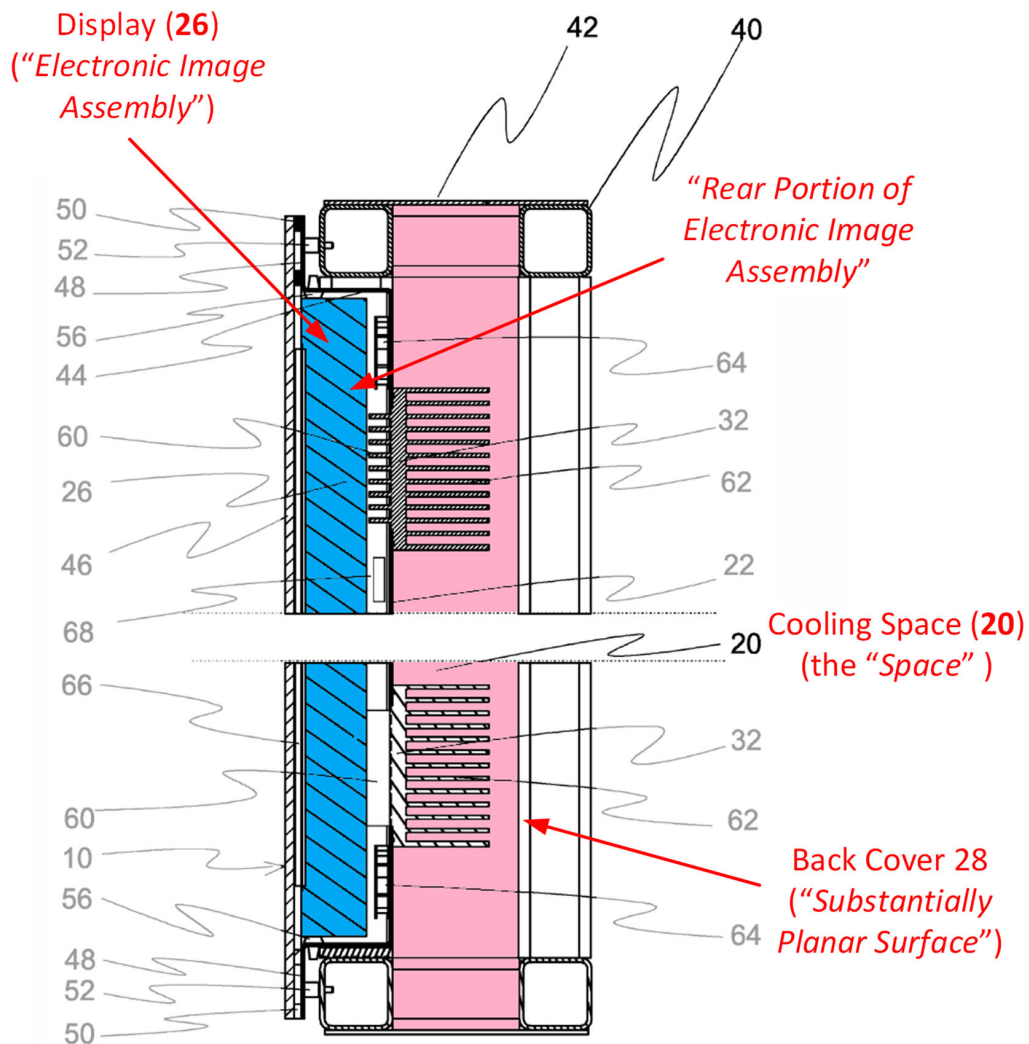
164. Karppanen teaches this claim element. As discussed for claim element 2[a], in the closed position, the back cover **28** of the device casing **12** is spaced apart from the rear portion of the display **26** by the cooling space **20**. (*See supra* § VI.B.2.a.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(Ex. 1004, FIG. 1 (annotated) (showing the back cover **28** (highlighted yellow) and the cooling space **20**).)

165. Thus, as shown below in annotated Figure 2, at least a portion of the cooling space **20** is at least a part of the “*space defined between the rear portion of*” the display **26** “*the electronic image assembly and*” the back cover **28** “*the substantially planar surface.*”



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

166. Accordingly, Karppanen teaches this claim element.

- c. **Element 2[c]: “wherein the space is in gaseous communication with the open loop ambient air flow path.”**

167. Karppanen teaches this claim element. As discussed for claim element 2[b], the “*space defined*” includes at least a portion of the cooling space **20**. (See

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

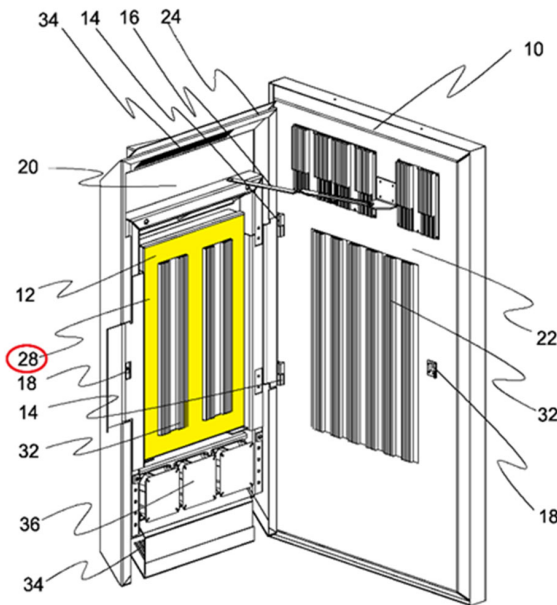
supra § VI.B.2.b.) As discussed for claim element 1[b], the cooling space **20** is the “open loop ambient air flow path.” (See *supra* § VI.B.1.c.) Therefore, Karppanen teaches this claim element.

168. In summary, Karppanen teaches all of the elements of claim 2, and renders claim 2 obvious.

3. Claim 3

169. Claim 3 recites: “The electronic display of claim 2, wherein the substantially planar surface is a plate.”

170. Karppanen discloses this claim element. In particular, the back cover **28** of the device casing **12** is depicted as a plate.



(Ex. 1004, FIG. 1 (annotated) (back cover **28** is highlighted yellow).)

171. Moreover, Karppanen discloses the use of a plate as the “back wall **22**” of the display casing **10**. (Ex. 1004, 7:31-35 (disclosing a “display casing **10** comprising a back wall **22**,” also referred to as “back plate,” and stating that “the back plate and the edge parts have been formed of one plate-like part by some known plate machining method, such as pressing.”))

172. Therefore, to the extent Karppanen does not explicitly state that the back cover **28** is a plate, a POSITA would have understood that like the display casing’s back wall **22**, which is disclosed as a plate, the device casing’s back cover **28** (“the substantially planar surface”) can also be a plate. Thus, Karppanen discloses or at least suggests the limitation of claim 3.

4. Claim 5

- a. **Element 5[a]: “The electronic display of claim 1, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and”**

173. Karppanen discloses this claim element because Karppanen’s display casing has a transparent, preferably glass, front plate (“*a front display surface*”) in front of and spaced apart from the display element **26** (“*the electronic image assembly*”).

174. Karppanen discloses a “display casing **10** comprising a back wall **22**, a **transparent front plate 46.**” (Ex. 1004, 7:31-34, FIG. 2.) Karppanen also states

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

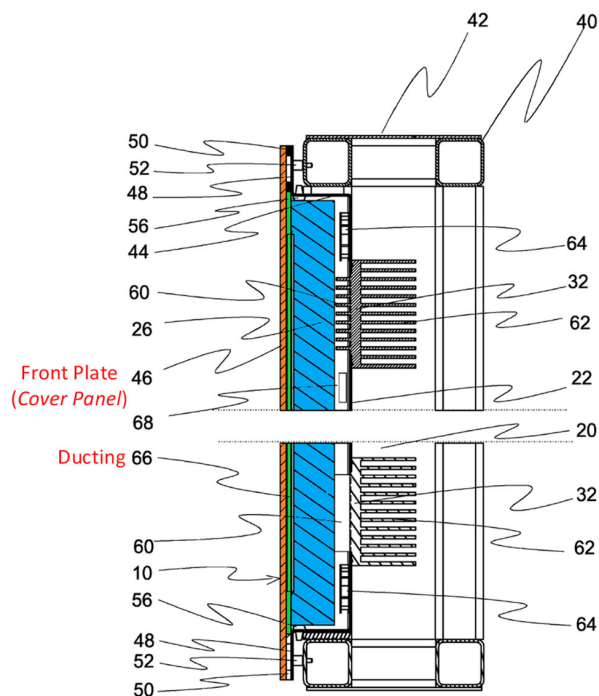
that “the edge parts of the front plate [46] and the back wall form a closed display casing,” i.e., the display casing 10, and that the “front plate is preferably made of shock-resistant glass.” (*Id.*, 7:35-38.)

175. Additionally, Karppanen discloses that the front plate 46 is “*spaced apart from the front portion of the electronic image assembly.*” In particular, Karppanen states:

Inside the display casing on the back wall 22 there are fans 64, which circulate air in the space between the display element and the walls of the display casing. Suitable **ducting 66** has been arranged between the display casing and the display element so that an **air flow circulating the display element** and equalizing the temperatures can be arranged by means of the fans. The fans 64 **force the air** of the inner casing **to flow past the front plate 46** of the device.

(*Id.*, 9:3-8, FIG. 2.)

Declaration of Robert Smith-Gillespie in Support of
 Petition for *Inter Partes* Review of
 U.S. Patent No. 10,506,740



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

176. Karppanen’s annotated Figure 2 shows that the front plate 46 (highlighted orange) is located in front of the display element 26 (highlighted blue), and is separated from the display element 26 (the “*electronic image assembly*”) by a gap that contains a portion of the ducting 66 (highlighted green). Thus, the front plate 46 is “*spaced apart from the front portion of the electronic image assembly.*” Thus, Karppanen teaches this claim element.

- b. **Element 5[b]: “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.”**

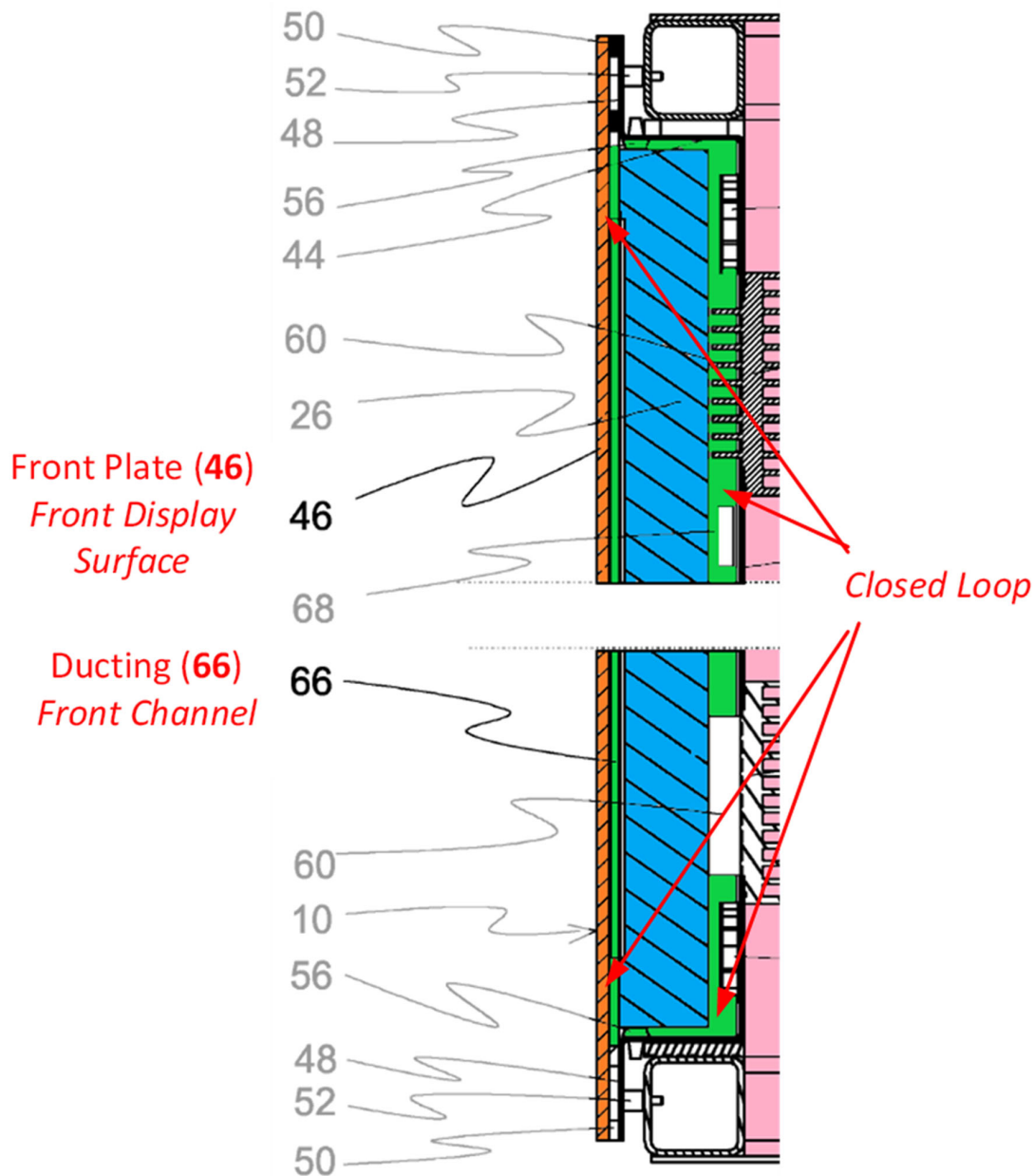
177. Karppanen teaches this claim element because the gap between the front plate **46** and the front of the display **26** is a “*front channel*.” A portion of the ducting **66**, which forms the “*closed loop gas circulation path*,” is disposed within the gap, and hence, the gap forms a “*part of the closed loop gas circulation path*.”

178. Karppanen states that “[s]uitable **ducting 66** has been arranged between the display casing and the display element so that an **air flow circulating the display element** and equalizing the temperatures can be arranged by means of the fans.” (Ex. 1004, 9:5-7, FIG. 2.) Karppanen also states: “[t]he fans **64 force the air** of the inner casing **to flow past the front plate 46** of the device.” (*Id.*, 9:7-8, FIG. 2.) Karppanen also states: “[i]nside the display casing [**10**] there is a display element **26**, which is supported at its edges by support elements **56** to the edge part of the display casing in a way that **there remains a gap** enabling the circulation of air between the walls of the display casing [**10**] and the outer surface of the display element [**26**].” (*Id.*, 4:29-32.) The transparent front plate **46** forms the front wall of the display casing [**10**], which is separated by a gap from the front outer surface of the display **26**.

179. A zoomed-in version of annotated Figure 2 below shows that a front portion of the ducting **66** (highlighted green) is disposed in the gap (a “*space*”)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

between the front plate **46** (highlighted orange) (“*the front display surface*”) and the front portion of the display **26** (highlighted blue) (“*the front portion of the electronic image assembly*”). Thus, the gap is “*a front channel defined by the space between the front display surface and the front portion of the electronic image assembly.*”



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

180. As discussed for claim element 1[c], a front portion of the ducting **66** that is located in front of the display element **26** but behind the front plate **46**

(highlighted orange), forms a part of the “*closed loop gas circulation path*” (highlighted green). (*See supra* § VI.B.1.4.) That front portion of the ducting 66 is disposed in the gap between the front plate 46 (“*the front display surface*”) and the front portion of the display element 26 (“*the electronic image assembly*”), so that forced air circulated in the closed loop can “flow[s] past the front plate 46.” (Ex. 1004, 9:7-8.) Therefore, the gap, i.e., “*the front channel*” that contains the front portion of the ducting 66, forms a “*part of the closed loop gas circulation path.*” Accordingly, Karppanen teaches this claim element.

5. Claim 6

181. Claim 6 recites: “The electronic display of claim 1, further comprising at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.”

182. Karppanen teaches this claim element because Karppanen discloses fans 64 within the closed loop pathway, and because a POSITA would have known that those fans include their motors.

183. As discussed above for claim element 1[c], within the closed display

casing **10**, the space between the display element **26** (highlighted blue) and the back wall **22**, and the ducting **66** in front of the display element **26** but behind the front plate **46** (highlighted orange), form the “closed loop gas circulation path” i.e., “the pathway of the closed loop gas circulation path” (highlighted green). (*See supra* § VI.B.1.4.)

184. In addition, Karppanen states that “[i]nside the display casing on the back wall **22** there are **fans 64**, which circulate air in the space between the display element and the walls of the display casing” and further that [t]he fans **64** force the air of the inner casing to flow past the front plate **46** of the device. (Ex. 1004, 9:3-8, FIG. 2.)

185. The fans **64** on the back wall **22** are within the space between the display element **26** and the walls of the display casing **10**. As such, and as seen in, Figure 2, the fans **64** are located within the “*closed loop*” (highlighted green). A POSITA would have known that a fan **64** has a motor. Additionally, a POSITA would understand that fans include a wiring harness to bring power to the fan motor. Likewise, the display screen is in the closed loop path and it too would include electrical components. Accordingly, Karppanen teaches a fan motor as “*at least one electronic component located in the pathway of the closed loop gas circulation path*” and this teaches this claim element.

6. Claim 7

186. Claim 7 recites “The electronic display of claim 1, further comprising a cooling device placed near an entrance to the open loop ambient air flow path for reducing the temperature of ambient air entering the open loop ambient air flow path.”

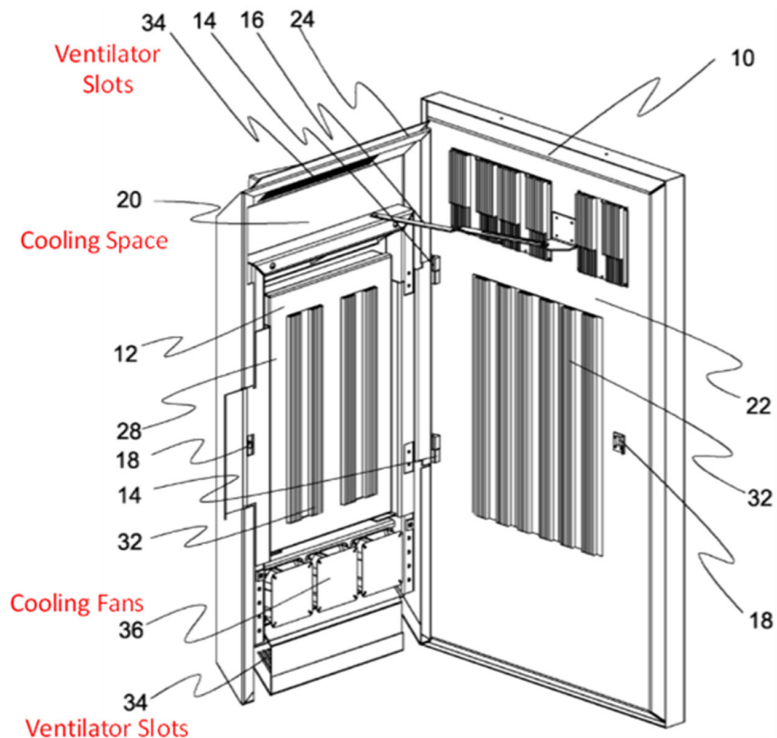
187. Karppanen teaches this claim element because Karppanen’s system includes cooling fans **36** (“*a cooling device*”) near ventilation slots **34** (“*an entrance*”) to the cooling space **20** (“*the open loop ambient air flow path*”).

188. As discussed above in connection with claim element 1[b], the cooling space **20**, along with the ventilator slots **34**, forms an “**open loop airflow pathway**.” (See *supra*, § VI.B.1.c.) Karppanen further discloses:

In the **first edge of the cover 24** pointed downward and the second edge pointed upward there are **ventilator slots 34**, which enable the **movement of air from the outside of the device to the cooling space** and from the cooling space back to the outside of the device. When required, the ventilator slots can be provided with filters in order to prevent the access of impurities to the ventilation space. In the cover **24** there are **cooling fans 36**, by which the **circulation of air through the cooling space [20]** is regulated.

(Ex. 1004, 7:16-22, FIG. 1.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 1 (annotated).)

189. The cooling fans **34** are “*a cooling device*” that are placed near the ventilator slots **34** to the cooling space **20**, i.e., “*an entrance to the open loop ambient air flow path.*” The cooling fans **34** can reduce the temperature of ambient air entering the open loop ambient air flow path. Thus, Karppanen teaches this claim element.

7. Claim 8

- a. Element 8[pre]: “An electronic display comprising:”**
- b. Element 8[a]: “an electronic image assembly having a front portion and a rear portion;”**

190. Claims elements 8[pre] and 8[a] are identical, respectively, to claim elements 1[pre] and 1[a]. Therefore, for the reasons provided under this Ground for claim elements 1[pre] and 1[a], Karppanen teaches claim elements 8[pre] and 8[a]. (*See supra* §§ VI.B.1.a-b.)

- c. Element 8[b]: “a closed loop gas circulation path encircling the electronic image assembly;”**

191. The difference between claim elements 8[b] and 1[c] is insubstantial, as shown below:

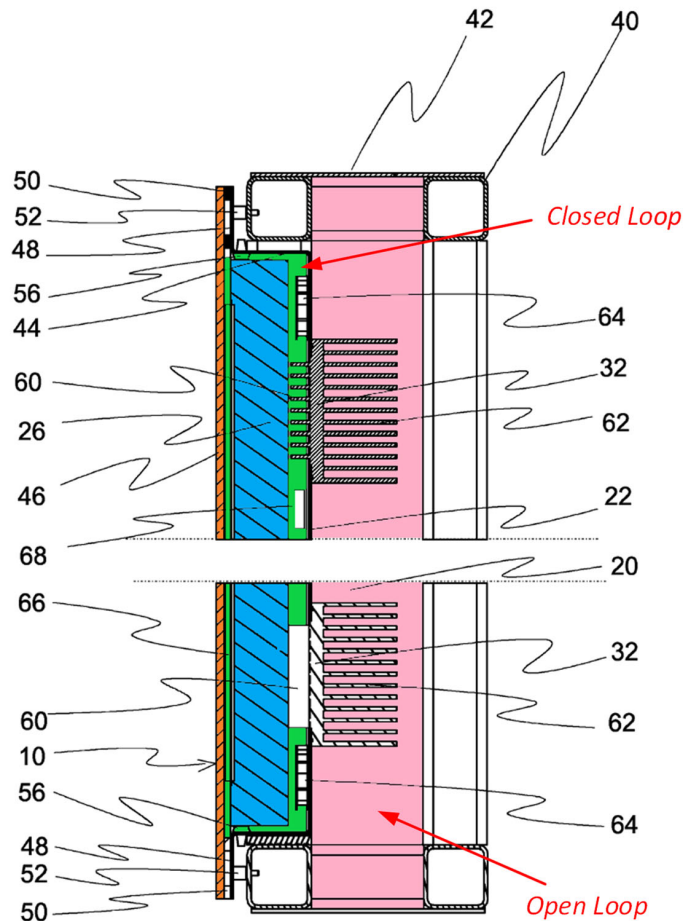
a closed loop gas circulation path ~~about~~encircling the electronic image assembly;

192. In the difference above and throughout this Declaration, additions in the claim element at issue are marked using the color blue and underlining. The deletions from the reference claim element are marked using the color red and a strike-through line. The words and phrases that are identical are shown in the color black.

193. The difference between a “path about” and a “path encircling” is insubstantial. Moreover, as seen in the annotated Figure 2 below, Karppanen’s

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

“closed loop gas circulation path,” highlighted green, encircles the display 26 (“the electronic image assembly”).



(Ex. 1004, FIG. 2 (annotated).)

194. In addition, Karppanen states: “[p]referably, there are **fans inside the display casing for circulating air** in the space between the walls of the display element and the display casing, and ducting has been arranged between the walls of the casing and the display element for **directing the circulation of air around the**

display element.” (*Id.*, 4:32-36.) Karppanen also states: “[s]uitable ducting **66** has been arranged between the display casing and the display element so that an **air flow circulating the display element** and equalizing the temperatures can be arranged by means of the fans.” (*Id.*, 9:5-7, FIG. 2.)

195. Therefore, for the reasons provided under this Ground for claim element 1[c], Karppanen teaches this claim element. (*See supra* § VI.B.1.4.)

d. Element 8[c]: “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”

196. Claims elements 8[c] and 1[b] are identical. Therefore, for the reasons provided under this Ground for claim element 1[b], Karppanen teaches this claim element. (*See supra* § VI.B.1.c.)

e. Element 8[d]: “a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel;”

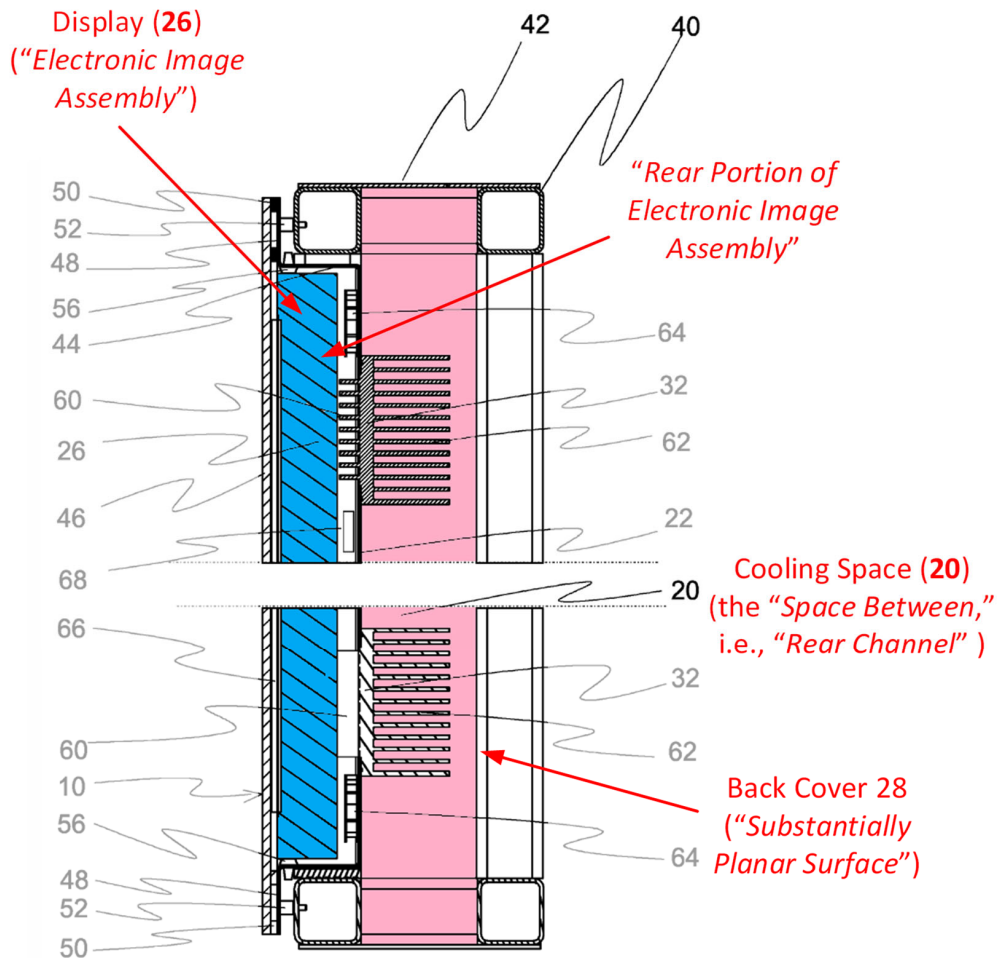
197. The difference between claim element 8[d] and claim elements 2[a] and 2[b] together is insubstantial, as shown below:

a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly; ~~and a, the~~ space ~~defined~~ between the substantially planar surface and the rear portion of the electronic image assembly ~~and the substantially planar surface~~ defining

a rear channel;

198. Claim element 2[b] recites “a space defined between the rear portion . . . and the substantially planar surface.” claim element 8[d] defines a space between the same two elements, recited in the reverse order. Additionally claim element 8[d] labels the space “*a rear channel*.”

199. As discussed for claim element 2[b], Karppanen discloses at least a portion of the cooling space **20** as at least a part of “*the space between*” the device casing’s back cover **28** (“*the substantially planar surface*”) and “*the rear portion of*” the display **26** “*the electronic image assembly*.” ((See *supra* § VI.B.2.b.) Ambient air flows through the cooling space **20**. (Ex. 1004, 7:16-19 (disclosing that “ventilator slots **34** [] enable the movement of air from the outside of the device to the cooling space [20] and from the cooling space [20] back to the outside of the device”).) Therefore, the cooling space **20** (“*the space between*”) is a “*rear channel*,” as shown below.



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

200. Thus, for the reasons provided under this Ground for claim elements 2[a] and 2[b], Karppanen teaches this claim element. (*See supra* §§ VI.B.2.a-b.)

f. **Element 8[e]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”**

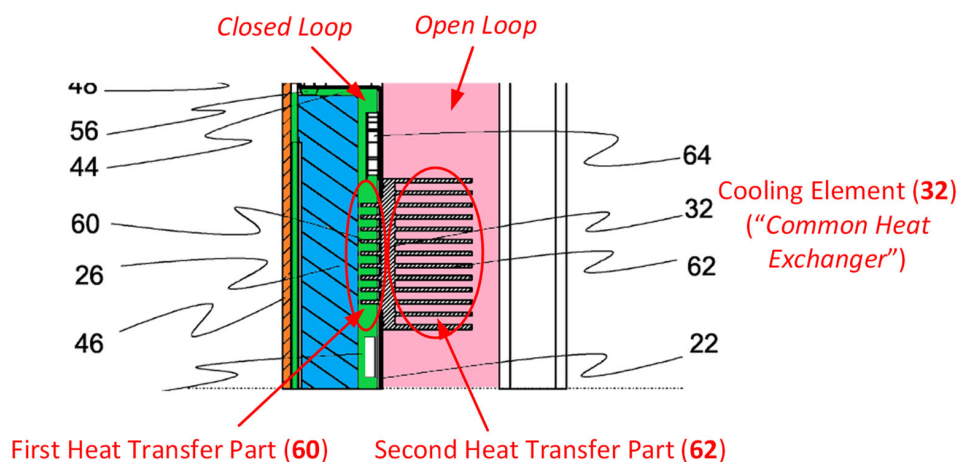
201. The difference between claim elements 8[e] and 1[d] is insubstantial,

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

as shown below:

a common heat exchanger ~~located in the pathway of~~ in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;

202. A heat exchanger “located in the pathway of” both the closed and open loops would be “in gaseous communication with” those two loops, when both loops circulate air. As discussed for claim elements 1[b] and 1[c], Karppanen’s closed and open loops both circulate air, which is a gas. (*See supra* §§ VI.B.1.c-d.) Moreover, as discussed for claim element 1[d], Karppanen’s cooling element **32** (the “*common heat exchanger*”) has two parts, namely, the first heat transfer part (e.g., fins) **60** and the second heat transfer part (e.g., fins) **62**. ((*See supra* § VI.B.1.e; Ex. 1004, 8:16-22, 9:1-5, Fig. 2.)



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

203. Fins **60** are within, and thus in gaseous communication with, the closed loop (highlighted green). Fins **62** are within, and thus in gaseous communication with, the open (loop highlighted pink). Therefore, the cooling unit **32** (the “*common heat exchanger*”) is in gaseous communication with “*both the closed loop gas circulation path and the open loop ambient air flow path.*”

204. Therefore, for the reasons provided under this Ground for claim element 1[d], Karppanen teaches this claim element.

g. Element 8[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path;”

205. Karppanen discloses this claim element because Karppanen’s system includes fans **64** that force the air circulating in the closed pathway (within the closed display casing **10**), i.e., “*to force circulating gas through the closed loop.*”

206. As discussed above for claim element 1[c], within the closed display casing **10**, the space between the display element **26** (highlighted blue) and the back wall **22**, and the ducting **66** in front of the display element **26** but behind the front plate **46** (highlighted orange), form the “*closed loop gas circulation path*” (highlighted green). (*See supra* § VI.B.1.d.)

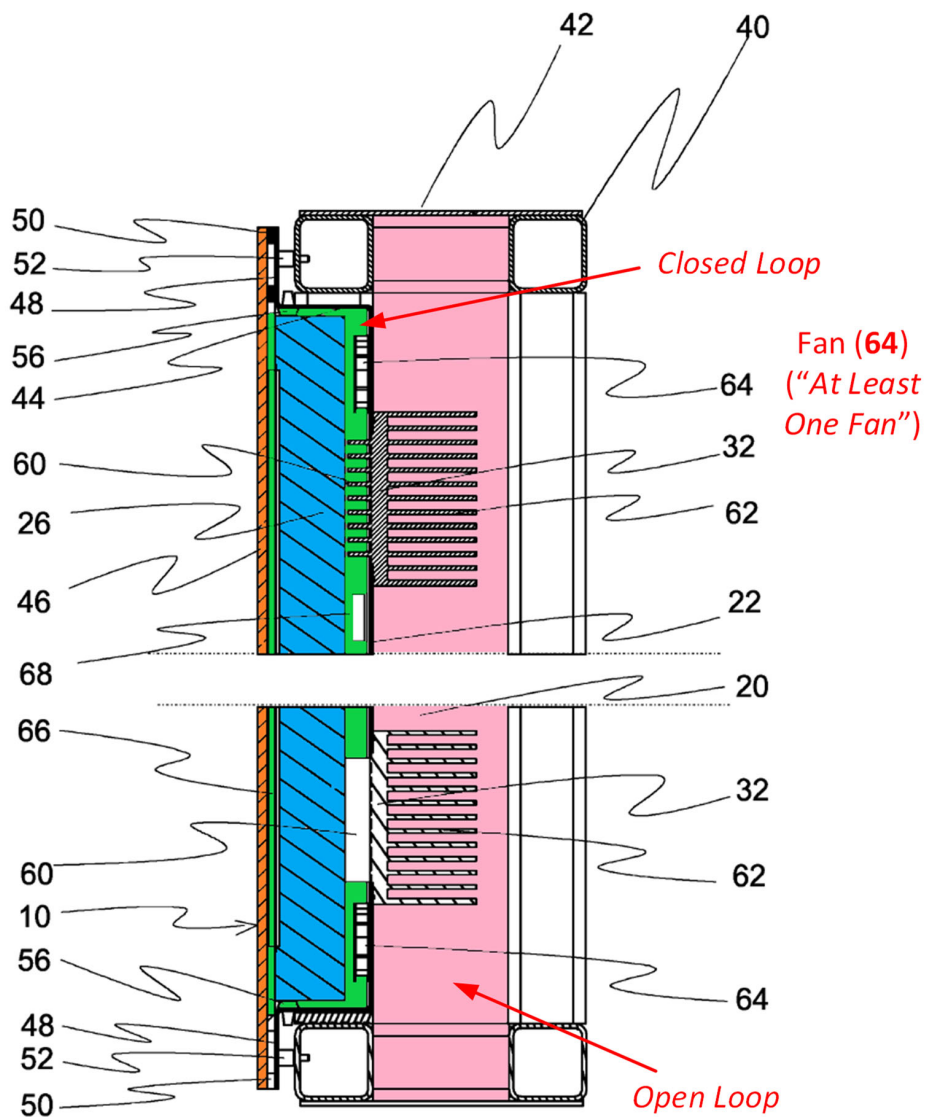
207. Additionally, Karppanen states:

Inside the display casing on the back wall **22** there are **fans 64, which circulate air** in the space between the display element [**26**] and the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

walls of the display casing. **Suitable ducting 66** has been arranged between the display casing and the display element so that **an air flow circulating the display element** and equalizing the temperatures can be **arranged by means of the fans**. The **fans 64** force the air of the inner casing to flow past the front plate **46** of the device.”

(Ex. 1004, 9:3-8, FIG. 2.)



Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

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

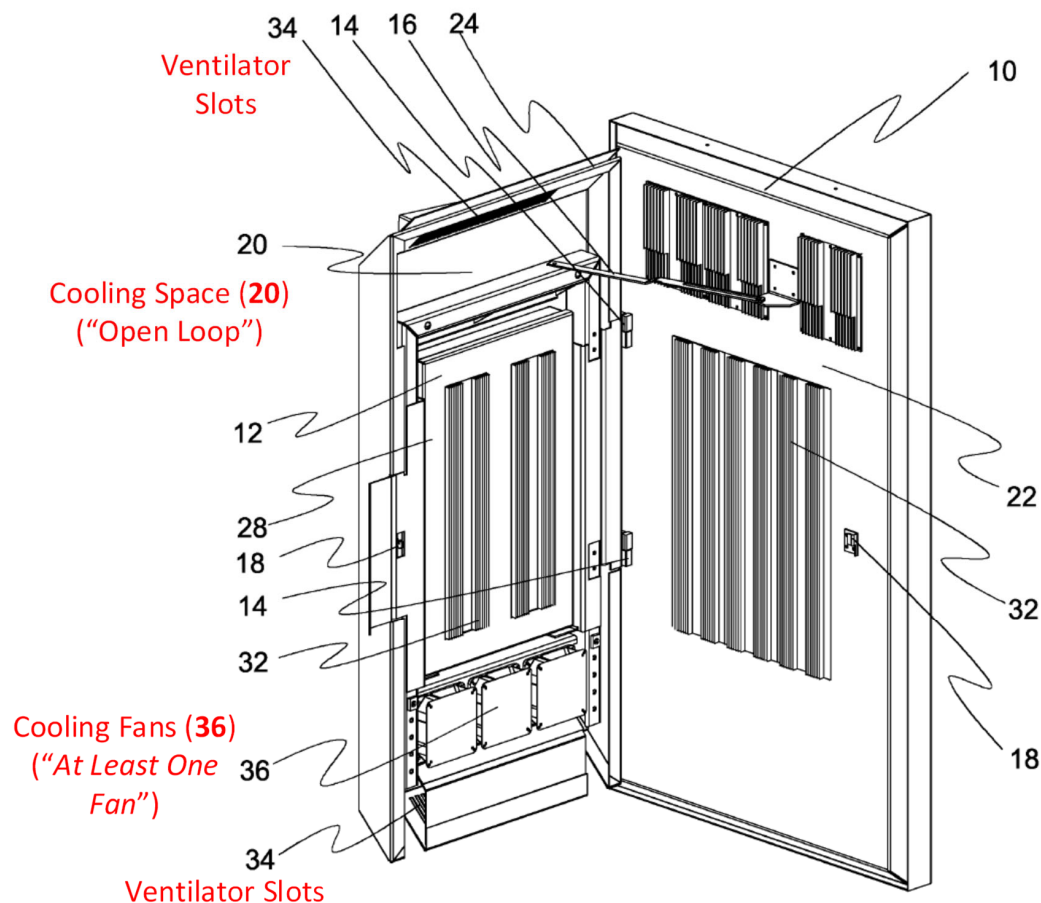
208. Thus, the fans **64** (“*at least one fan*”) are “*positioned to force circulating*” air, i.e., “*gas through*” the space between the display element [**26**] and the walls of the display casing and through the ducting **66**, i.e., “*the closed loop gas circulation path.*” Accordingly, Karppanen teaches this claim element.

h. Element 8[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path.”

209. Karppanen teaches this claim element because Karppanen’s system includes fans **36** to force ambient air through cooling space **20**.

210. As discussed for claim element 1[b], the cooling space **20** is “*the open loop ambient air flow path.*” (*See supra* § VI.B.1.c.)

Declaration of Robert Smith-Gillespie in Support of
 Petition for *Inter Partes* Review of
 U.S. Patent No. 10,506,740



(Ex. 1004, FIG. 1 (annotated).)

211. Karppanen further discloses:

In the first edge of the cover **24** pointed downward and the second edge pointed upward there are ventilator slots **34**, which enable the movement of air from the outside of the device to the cooling space and from the cooling space back to the outside of the device. When required, the ventilator slots can be provided with filters in order to prevent the access of impurities to the ventilation space. In the cover **24** there are cooling fans **36**, by which the circulation of air through the

cooling space [20] is regulated.

(*Id.*, 7:16-22, FIG. 1.)

212. Thus, the cooling fans 36 are “*at least one fan positioned to force ambient air through the open loop ambient air flow path,*” and thus, Karppanen teaches this claim element.

213. In summary, Karppanen discloses each and every element of claim 8, and renders claim 8 obvious.

8. Claim 9

214. Claim 9 recites: “The electronic display of claim 8, wherein the open loop ambient air flow path is also in gaseous communication with the rear channel.”

215. The difference between claim 9 and claim element 2[c] is insubstantial, as shown below:

wherein the ~~space is in gaseous communication with the open loop ambient air flow path~~ is also in gaseous communication with the rear channel.

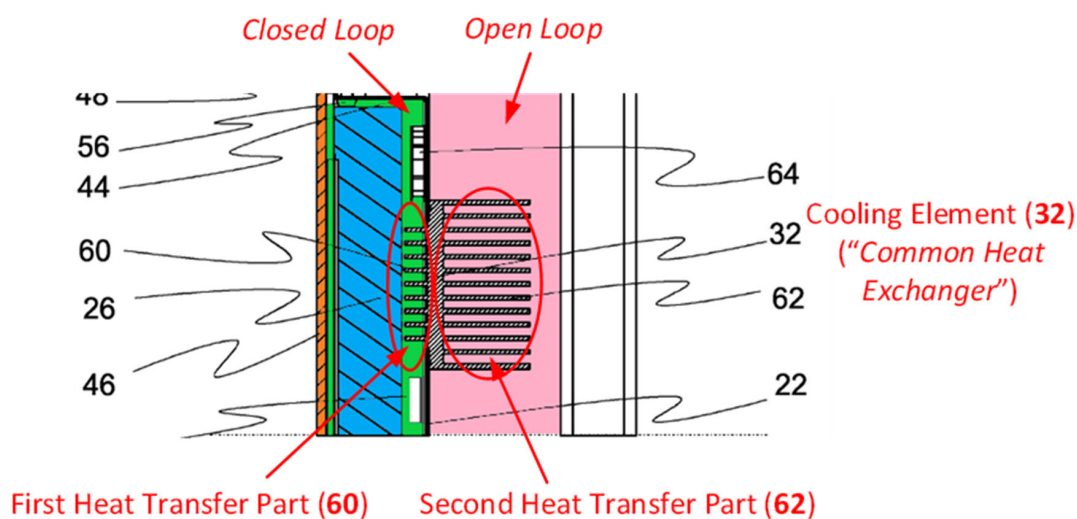
216. The phrase “in gaseous communication” is simply moved, and the order in which the two elements in gaseous communication are recited in claim element 2[c] is reversed in claim 9, but the elements remain the same. Therefore, for the reasons provided under this Ground for claim element 2[c], Karppanen teaches this claim. (*See supra* § VI.B.2.c.)

9. Claim 11

- a. Element 11[a]: “The electronic display of claim 8, wherein: the common heat exchanger includes first and second gas pathways, the first and second gas pathways being isolated from each other;”**

217. Karppanen teaches this claim element because Karppanen’s cooling element **32** (“*the common heat exchanger*”) includes two parts, namely, the first and second heat transfer parts, that provide two pathways that are isolated from each other.

218. As discussed for claim element 1[d], Karppanen’s system includes a cooling element **32** that has a “first heat transfer part **60**” that may have “cooling fins.” (Ex. 1004, 8:29-30, FIG. 2.) The cooling element **32** also includes a “second heat transfer part **62**” having “a number of plate-like cooling fins.” (*Id.*, 8:16-17, FIG. 2.)

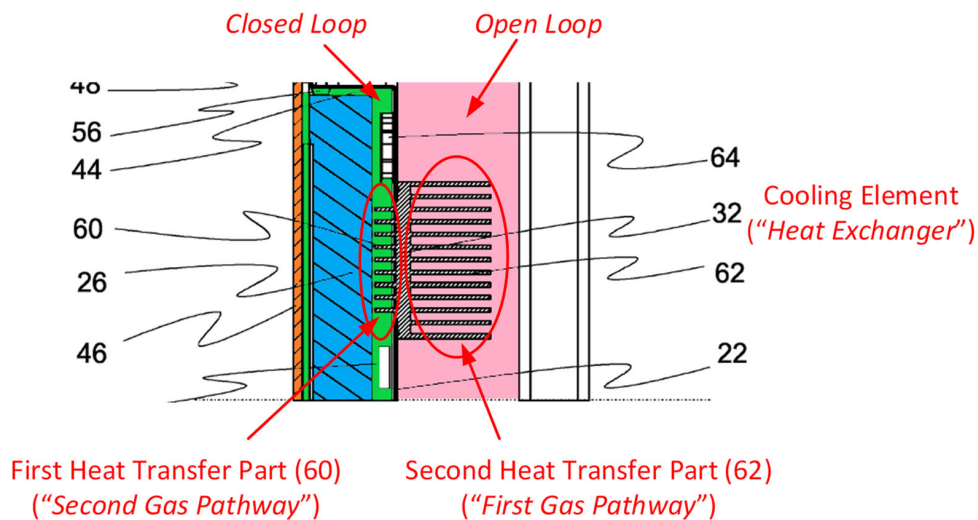


(*Id.*, FIG. 2 (partial, annotated).)

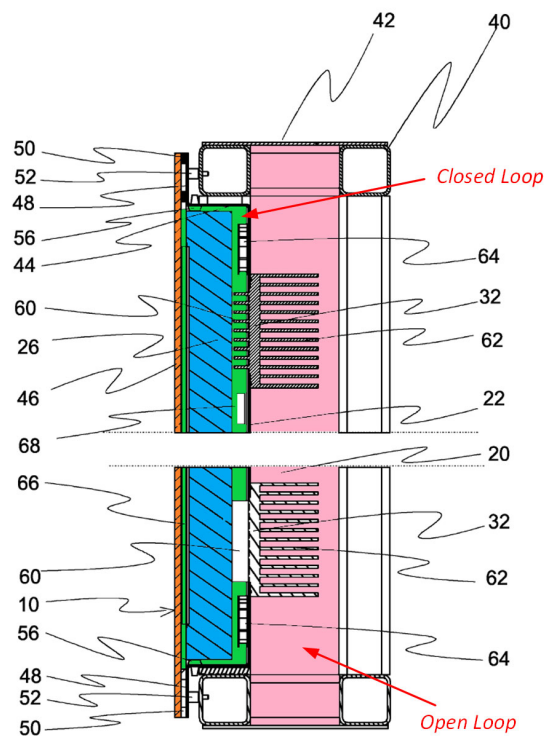
219. Additionally, referring to the annotated Figure 2 above, and as discussed above for claim element 1[c], within Karppanen's closed display casing **10**, the space between the display element **26** (highlighted blue) and the back wall **22**, and the ducting **66** form the "*closed loop gas circulation path*" (highlighted green). (*See supra* § VI.B.1.d.) As discussed above in connection with claim element 1[b], the cooling space **20**, along with the ventilator slots **34**, forms "*the open loop ambient air flow path*," highlighted pink in the annotated Figure 2 above. (*See supra* § VI.B.1.c.)

220. As shown below in annotated Fig. 2, the fins of the part **60** extend into Karppanen's closed loop, (highlighted green) in the annotated Figure 2, and the fins of the part **62** extend into Karppanen's open loop (highlighted pink) in the annotated Figure 2. Thus, the fins of the part **62** define an air flow pathway, i.e., a first gas pathway, within the cooling space **20**, i.e., the open loop. The fins of the part **60** define another air flow pathway, i.e., a second gas pathway, with the closed loop.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, Fig. 2 (annotated).)



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

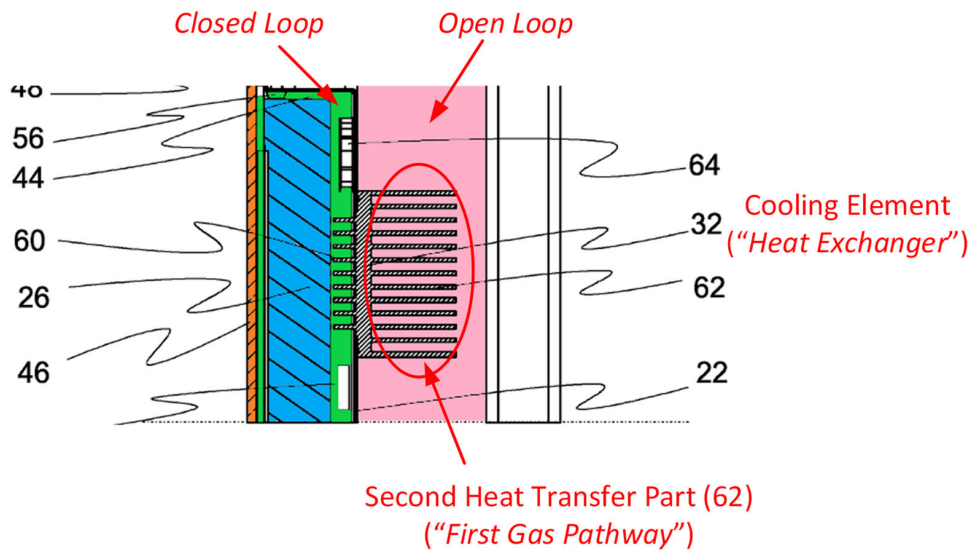
221. As discussed above for claim element 1[c], and as seen in the annotated

Figure 2 above, the closed loop pathway (highlighted green) is within the display casing **10**, which is “closed.” (*See supra* § VI.B.1.d; Ex. 1004, 6:17-19.) In fact, the display casing **10** can be “weatherproof.” (Ex. 1004, Abstract, 4:6-8, claim 6.) Therefore, the closed loop within the closed display casing **10** is isolated from the cooling space **20** (the “*open loop*”). Therefore, the first gas pathway formed within the cooling space **20**, i.e., the open loop, is isolated from the second gas pathway formed within the closed loop. Accordingly, Karppanen teaches this claim element.

b. Element 11[b]: “where the first gas pathway is in gaseous communication with the open loop ambient air flow path; and

222. Karppanen teaches this claim element. As discussed for claim element 11[a], the first gas pathway formed by the fins of the second part **62** is formed within the cooling space **20**, i.e., within the “*open loop ambient air flow path*.” (*See supra* § VI.B.9.a.) This is seen in the partial, annotated Figure 2 below, where the fins of the second part **62** extend into the cooling space **20** (highlighted pink) (“*the open loop ambient air flow path*”).

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

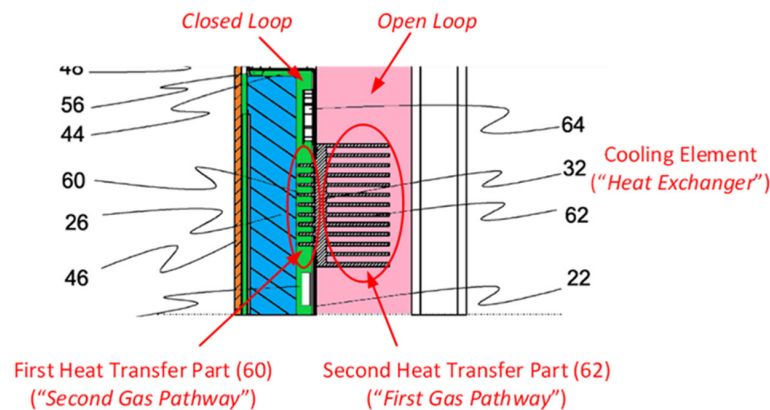


(Ex. 1004, FIG. 2 (partial, annotated).)

223. Thus, “the first gas pathway is in gaseous communication with the open loop ambient air flow path.” Accordingly, Karppanen teaches this claim element.

c. Element 11[c]: “where the second pathway is in gaseous communication with the closed loop gas circulation path.”

224. Karppanen teaches this claim element. As discussed for claim element 11[a], the second gas pathway formed by the fins of the first part **60** is formed within the “*closed loop gas circulation path*.” (See *supra* § VI.B.9.a.) This is seen in the partial, annotated Figure 2 below, where the fins of the first part **60** extend into “*closed loop gas circulation path*” (highlighted green).



(Ex. 1004, FIG. 2 (partial, annotated).)

225. Thus, “the second gas pathway is in gaseous communication with the closed loop gas circulation path.” Accordingly, Karppanen teaches this claim element.

10. Claim 12

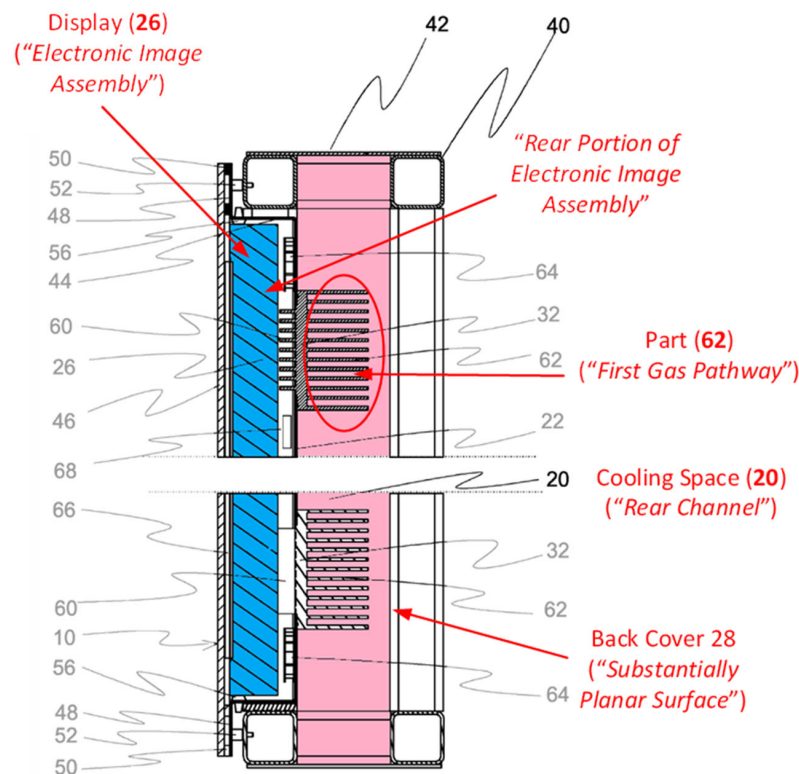
226. Claim 12 recites: “The electronic display of claim 11, wherein the first gas pathway is also in gaseous communication with the rear channel.”

227. Karppanen discloses this claim element. As discussed for claim elements 8[d], 2[a], and 2[b], the “*rear channel*” is defined by the space between the rear portion of the display **26** and the back cover **28** of the device casing **12**. (See *supra* §§ VI.B.2.a-b, VI.B.e.) As also discussed for claim elements 8[d], 2[a], and 2[b], at least a portion of the cooling space **20** is included in the “*rear channel*.” (See *id.*)

228. As discussed for claim element 1[b], the cooling space **20** is the “*open*

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

loop ambient air flow path.” (See supra § VI.B.1.c.) Finally, as discussed for claim element 11[b], the first gas pathway defined by the fins of the part 62 is within the cooling space 20, and in gaseous communication with the “open loop ambient air flow path.” (See supra § VI.B.9.b.) Thus, the cooling space 20 is part of both the “first gas pathway” and the “rear channel,” and as such, “the first gas pathway is also in gaseous communication with the rear channel.”



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

229. Accordingly, Karppanen teaches this claim.

11. Claim 13

230. Claim 13 recites: “The electronic display of claim 8, wherein the substantially planar surface is a plate.”

231. Claim 13 is identical to claim 3. Therefore, for the reasons provided under this Ground for claim 3, Karppanen discloses the limitations of claim 13. (*See supra* § VI.B.3.)

12. Claim 15

- a. **Element 15[a]: “The electronic display of claim 8, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and**
- b. **Element 15[b]: “a front channel defined by a 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.”**

232. Claims elements 15[a] and 15[b] are identical, respectively, to claim elements 5[a] and 5[b]. Therefore, for the reasons provided under this Ground for claim elements 5[a] and 5[b], Karppanen teaches claim elements 15[a] and 15[b]. (*See supra* § VI.B.4.)

13. Claim 16

233. Claim 16 recites: “The electronic display of claim 8, further comprising at least one electronic component located in the pathway of the closed loop gas

circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.”

234. Claim 16 is identical to claim 6. Therefore, for the reasons provided under this Ground for claim 6, Karppanen discloses the limitations of claim 16. (*See supra* § VI.B.5.)

14. Claim 17

a. Element 17[pre]: “A cooling system for an electronic image assembly, comprising:”

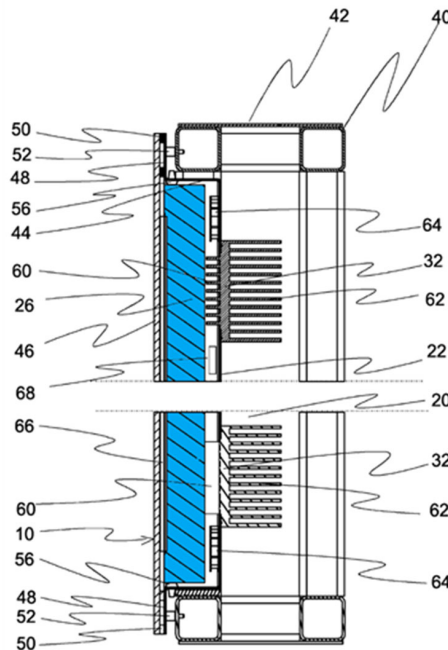
235. To the extent the preamble is limiting, Karppanen discloses this claim element. Karppanen’s system includes a display element **26** (e.g., a flat screen LCD display), i.e., an “*electronic image assembly*.” Karppanen’s system also includes a closed display casing **10** having cooling elements **32**, and an open cooling space **20**, for cooling the display element **26**. Thus, Karppanen provides a “*cooling system for*” cooling the display element **26**, i.e., for cooling the “*electronic image assembly*.”

236. In particular, Karppanen discloses “an electronic information board” having “a flat display element (**26**), such as a TFT LCD display or plasma display for presenting information, and electronic equipment for controlling the display

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

element.” (Ex. 1004, Abstract.) Karppanen also states: “[i]nside the display casing there is a display element **26**” that “is preferably a TFT **LCD display**.” (*Id.*, 8:5-9, FIG. 2.) Karppanen further states, “the display element can also be some other suitable, **flat electronic display element**, such as a plasma display, a LED display or an organic LED display.” (*Id.*, at 9-11.)

237. In addition, Karppanen states that “the electronic equipment needed in the control of the display element have been placed inside the device casing [12]” and that “this equipment includes . . . the power supplies of the **background light of the display**.” (*Id.*, 621-26, FIG. 1.) Thus, Karppanen discloses or at least suggests a background light or a backlight for the LCD display **26**.



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

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

238. The display element **26** (highlighted blue in annotated Figure 2 above), in itself, is “*an electronic image assembly*.” This is consistent with the ’740 patent, which states: “the image assembly **220** may comprise any form of electronic assembly for generating an image, including but not limited to: **LCD**, light emitting diode (LED), organic light emitting diode (OLED), field emitting displays (FED), light-emitting polymers (LEP), plasma displays, and any other **flat/thin panel displays**.” (Ex. 1001, 5:52-57, FIG. 2A.) Thus, like the ’740 patent, Karppanen also discloses a flat electronic display element, and in particular, an LCD display. In summary, the display element **26** individually, and also in combination with the background light, is “*an electronic image assembly*.”

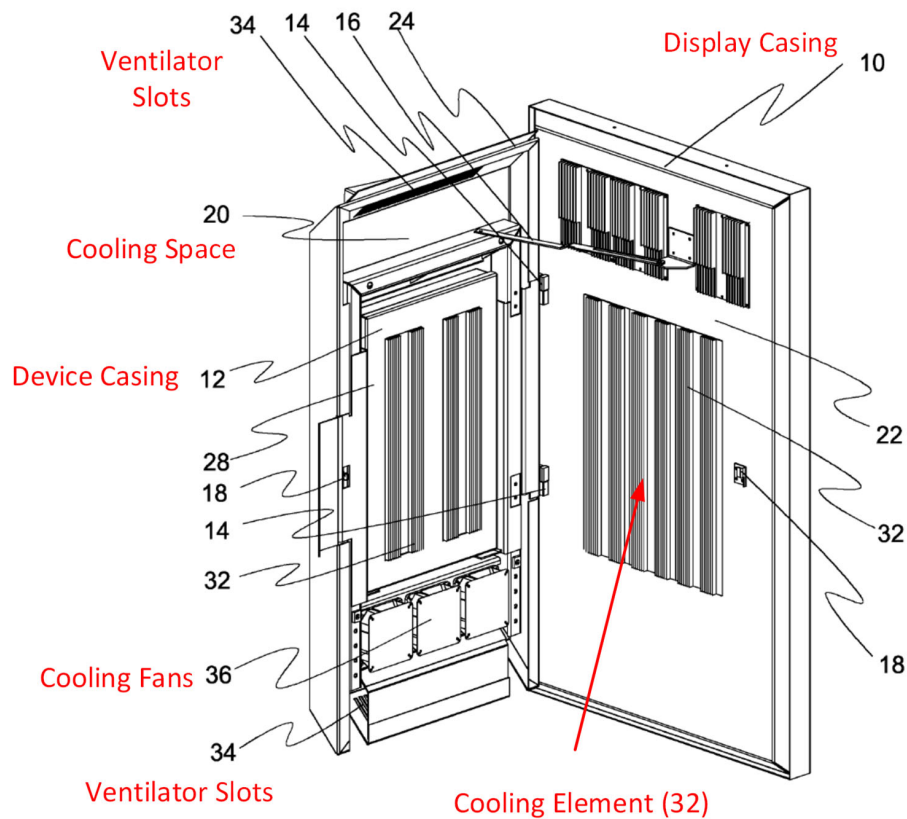
239. Karppanen also discloses a cooling system for the display element **26**. Specifically, referring to its Figure 1, Karppanen discloses “an electronic information board” that “has a closed display casing 10” and a “closed device casing 12.” (*Id.*, 6:16-21, FIG. 1.) Per Karppanen, the “display element **26** of the information board (Fig. 2) has been placed inside the display casing [10].” (*Id.*, 6:21-24, FIG. 1). Karppanen also states that “[i]n normal use, the display casing [10] and the device casing [12] are turned against each other to a closed position” where “there remains a **cooling space 20** between the display casing [10] and the device casing [12], delimited by the cover **24** and the display casing [10] (Fig. 2).”

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

(Ex. 1004, 7:7-11, FIG. 1).

240. In addition, Karppanen states that “[i]n the back wall **22** of the display casing and the back cover **28** of the device casing there are **cooling elements 32**, by which **heat is transferred from the inside of** the device casing and **the display casing [10]** to the cooling air in the cooling space **20**.” (*Id.*, 7:11-14.) Because the display element **26** is located within the display casing **10**, “heat [] transferred from the inside of . . . the display casing [10] to the cooling air in the cooling space **20**” cools the display element **26** (the “*electronic image assembly*”). Karppanen also discloses that in the cover **24** there ventilator slots **34** and “cooling fans **36**, by which the circulation of air through the cooling space [20] is regulated. (*Id.*, 7:16-22, FIG. 1.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 1 (annotated).)

241. Thus, Karppanen discloses “[a] cooling system for an electronic image assembly.”

b. Element 17[a]: “an open loop ambient air flow path at a rear portion of the electronic image assembly;”

242. The difference between claim elements 17[a] and 1[b] is insubstantial, as shown below:

an open loop ambient air flow path ~~behind the~~at a rear portion of the electronic image assembly;

243. It is described in connection with claim element 1[b] that Karppanen’s

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

“cooling space **20**” is an “*open loop ambient air flow path.*” (*See supra* § VI.B.1.c.)

The flow of ambient air through the cooling space **20** occurs behind, i.e., substantially “*at a rear portion of*” the display **26** (“*the electronic image assembly*”).

244. This is consistent with the ’740 patent. For example, with reference to its Figure 2B, the ’740 patent states:

A first open loop fan assembly **203** may be used to draw ambient gas **211** through the heat exchanger **201**. Optionally, a second open loop fan assembly **204** may be used to draw ambient gas **212** through the additional optional channel **225** for cooling the backlight assembly **222** (or image assembly **220** if no backlight is used).

(Ex. 1001, 6:35-41, FIGS. 2A and 2B.)

245. Referring to Figure 4, the ’740 patent states:

The heat exchanger **201** may accept circulating gas **400** in one direction while accepting ambient gas **310** in a substantially perpendicular direction such that heat may transfer between the two gases.

In this embodiment, an optional additional flow of ambient gas **300** is accepted through the inlet aperture **350** and directed along channel **225** in order to cool the rear portion of the image assembly **80** (possibly a backlight).

(*Id.*, 7:45-52, FIG. 4.)

246. In both embodiments disclosed in the ’740 patent, only the ambient gas in the respective first open loops passes through the heat exchanger **201**, so that the

heat exchanger is “in gaseous communication with . . . the open loop” as claim element 17[c] recites. The heat exchanger **201** is not in gaseous communication with the ambient gas in the channel **225** (the optional second open loop) in either embodiments.

247. To the extent the ’740 patent’s open loop ambient air flow path of ambient gas **211** (FIG. 2B) and **310** (FIG. 4) is “*at the rear portion of the electronic image assembly*” (e.g., **220** (FIG. 2A), **222** (backlight, FIG. 2B), or **80** (FIG. 4)), Karppanen’s cooling space **20** (the “*open loop ambient air flow path*”) is also “*at the rear portion of*” the display **26** “*the electronic image assembly.*” Therefore, for the reasons provided under this Ground for claim element 1[b], Karppanen teaches this claim element. (*See supra* § VI.B.1.c.)

c. Element 17[b]: “a closed loop gas circulation path encircling the electronic image assembly;”

Element 17[c]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”

248. Claims elements 17[b] and 17[c] are identical, respectively, to claim elements 8[b] and 8[e]. Therefore, for the reasons provided under this Ground for claim element 8[b] and 8[e], Karppanen teaches claim elements 17[b] and 17[c]. (*See supra* §§ VI.B.7.c, VI.B.7.f.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

- d. **Element 17[d]: “a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of and spaced apart from the front portion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path;”**

249. A side-by-side comparison of the limitations of claim element 17[d] and claim elements 5[a] and 5[b] is shown below:

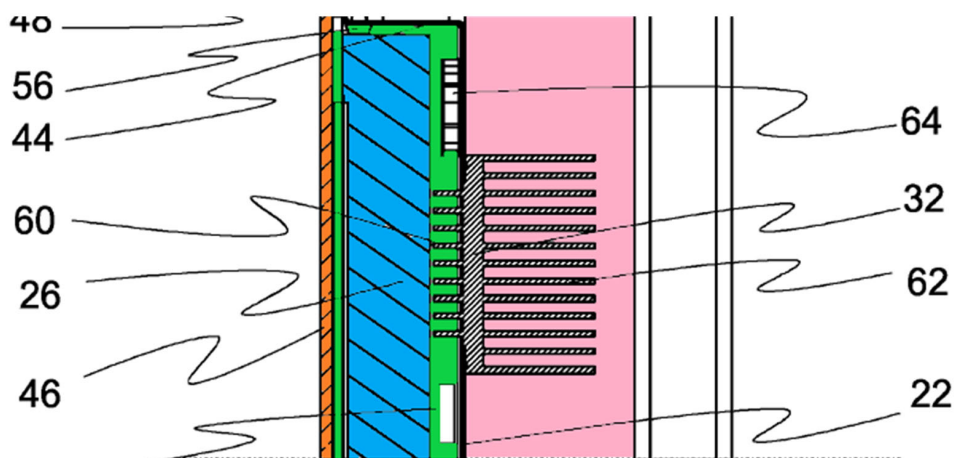
Limitations of 17[d]	Limitations of 5[a] and 5[b]
“a front channel defined by a space between a front portion of the electronic image assembly and a front display surface”	5[b] “a front channel defined by the space between the front display surface and the front portion of the electronic image assembly,”
“the front channel forming a part of the closed loop gas circulation path;”	5[b] “the front channel forming part of the closed loop gas circulation path.”
“a front display surface <u>located forward of and</u> spaced apart from the front portion of the electronic image assembly”	5[a] “a front display surface spaced apart from the front portion of the electronic image assembly”

250. As the table above shows, the differences between the corresponding

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

limitations are insubstantial. Specifically, with respect to claim element 5[b], simply the order in which “the front display surface” and “the front portion of the electronic image assembly” are recited in claim element 17[d] is reversed relative to claim element 5[b].

251. With respect to claim element 5[a], “a front display surface spaced apart from the front portion of the electronic image assembly” would be “located forward of” the electronic image assembly.



(Ex. 1004, FIG. 2 (annotated).)

252. As seen in the annotated Figure 2 above, in Karppanen’s system, the front plate 46 (highlighted orange) is located forward of and spaced apart from the front portion of the display 26 (highlighted blue) (“the electronic image assembly”). Therefore, for the reasons provided under this Ground in connection with claim elements 5[a] and 5[b], Karppanen discloses claim element 17[d]. (*See supra*

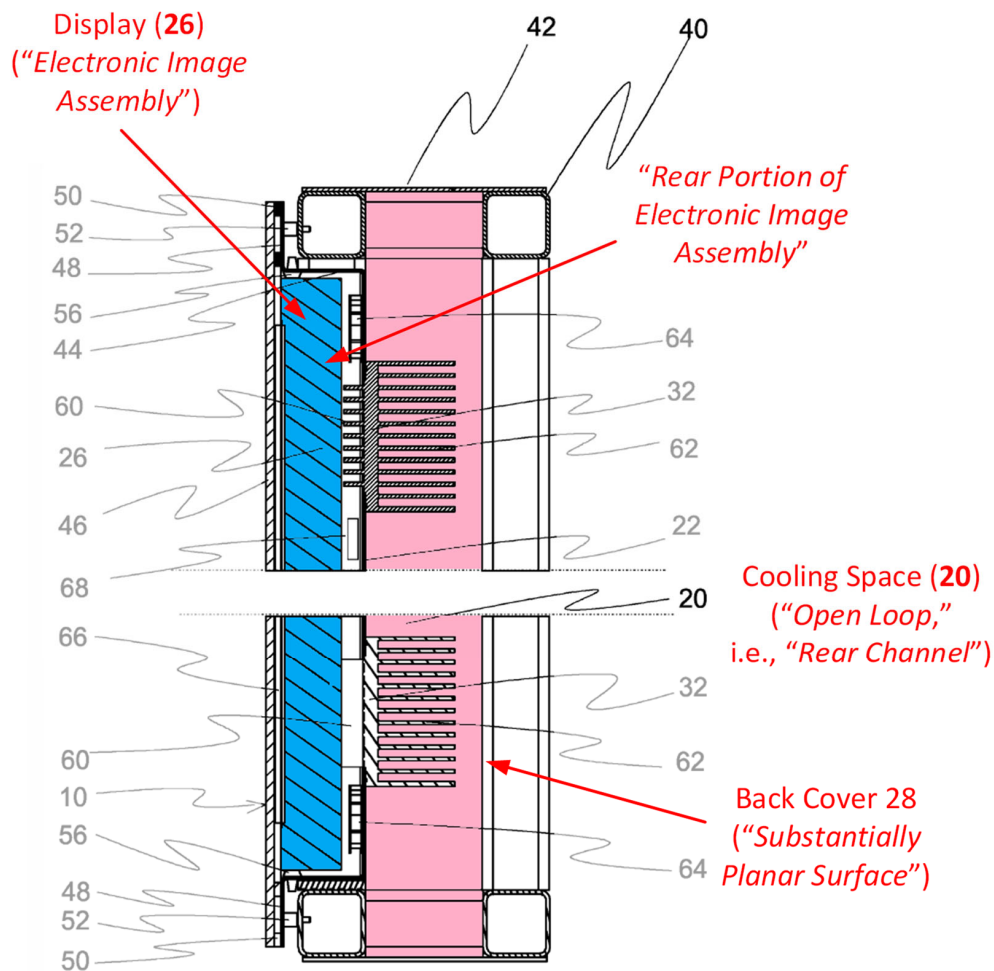
§ VI.B.4.)

- e. **Element 17[e]: “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;”**

253. The difference between claim elements 17[e] and 8[d] is shown below
(where, in addition to blue/red markings, the green phrases indicate a location shift):

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 ~~space between the substantially planar surface and the~~
~~rear portion of the electronic image assembly~~ ~~defining a~~ rear channel
forming a part of the open loop ambient air flow path;

254. Other than the addition of the limitation “*rear channel forming a part of the open loop ambient air flow path*” the rest of the differences are simply reordering of the claim terms and are thus insubstantial. As discussed for claim element 1[b], Karppanen’s cooling space **20** is the “*open loop ambient airflow path*,” and as discussed for claim element 8[d], the cooling space **20** is also the “*rear channel*.” (See *supra* §§ VI.B.1.c, VI.B.7.e.)



(Ex. 1004, Fig. 2 (annotated).)

255. Therefore, Karppanen teaches this claim element.

f. Element 17[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and”

256. The difference between claim elements 17[f] and 8[f] is shown below:

at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and

257. Claim element 17[f] additionally recites forcing the circulating gas through “*the common heat exchanger.*” But, claim element 1[e] recites “*a gas circulation device positioned to force circulating gas through the common heat exchanger.*” As discussed for claim elements 1[e], Karppanen’s “*gas circulation device*” is fans **64**, *see* Karppanen, Fig. 2, i.e., “*at least one fan.*” (*See supra* § VI.B.1.f.) Therefore, for the reasons provided under this Ground for claim elements 8[f] and 1[e], Karppanen discloses this claim element.

g. Element 17[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path and the common heat exchanger.”

258. The difference between claim elements 17[g] and 8[g] is shown below:

at least one fan positioned to force ambient air through the open loop
ambient air flow path and the common heat exchanger.

259. Claim element 17[g] additionally recites forcing the circulating gas through “*the common heat exchanger.*” But, claim element 1[f] recites “*an air circulation device positioned to force ambient air through the common heat exchange.*” As discussed for claim elements 1[f], Karppanen’s “*air circulation device*” is fans **36**, (Ex. 1004, Fig. 1), i.e., “*at least one fan.*” (*See supra* § VI.B.1.g.) Therefore, for the reasons provided under this Ground for claim elements 8[g] and 1[f], Karppanen discloses this claim element. (*See supra* §§ VI.B.1.g, VI.B.7.h.)

260. In summary, Karppanen discloses all of the elements of claim 17, and

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

renders claim 17 unpatentable as obvious.

15. Claim 18

261. Claim 18 recites: “The cooling system of claim 17, wherein the substantially planar surface is a plate.”

262. Claim 18 is identical to claim 3. Therefore, for the reasons provided under this Ground for claim 3, Karppanen discloses the limitations of claim 18. (*See supra* § VI.B.3.)

16. Claim 20

263. Claim 20 recites: “The cooling system of claim 17, further comprising at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.”

264. Claim 20 is identical to claim 6. Therefore, for the reasons provided under this Ground for claim 6, Karppanen discloses the limitations of claim 20. (*See supra* § VI.B.5.)

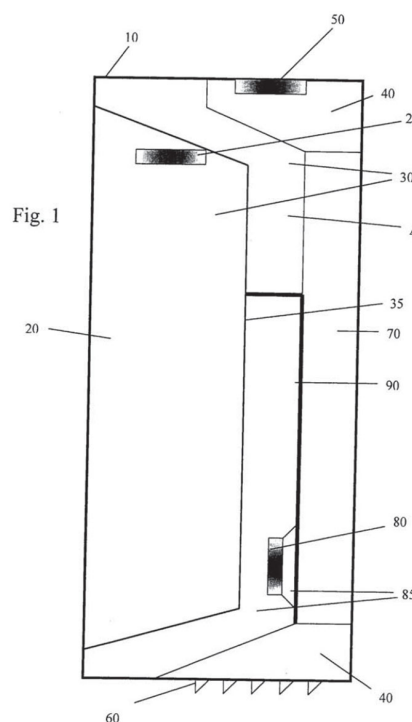
C. Ground 2: Claims 1-3, 5, 6, 8, 9, 11-13, 15-18, and 20 Are Obvious Over Yare in View of the Knowledge of a POSITA

1. Claim 1

a. Element 1[pre] “An electronic display comprising:”

265. Yare discloses an “*electronic display*.” To the extent it is limiting, Yare teaches the preamble because Yare discloses a cabinet **10** having “improved cooling facilities” and a display **20** (e.g., an LCD display).

266. Yare discloses “[a] cabinet **10** is arranged to contain a **display 20** for displaying information, advertisements or other visual media.” (Ex. 1005, 4:4-5, FIGs. 1, 4.)



(*Id.*, FIG. 1.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

267. Yare also states that “[t]he present invention relates to a cabinet for mounting a display system, the **cabinet having improved cooling facilities** and which is particularly suitable for use in **providing large scale displays in public places.**” (Ex. 1005, 7:4-6.) Additionally, Yare states that “[v]arious forms of display system may be used, for example plasma, **LCD**, TFT, CRT, LED, rear projection or any similar technology.” (Ex. 1005, 6:31-32.)

268. Accordingly, Yare’s cabinet **10** including its components is an “electronic display” and thus Yare teaches the preamble of claim 1.

b. Element 1[a] “an electronic image assembly having a front portion and a rear portion;”

269. Yare individually and in view of the knowledge of a POSITA discloses this claim element because Yare’s system includes a display **20** that may be an LCD display. A POSITA would have known that a typical LCD includes a liquid crystal panel and a backlight. Therefore, Yare’s LCD **20** is an “*electronic image assembly.*”

270. Yare states that “[a] cabinet **10** is arranged to contain a **display 20** for displaying information, advertisements or other visual media” and that the “display [**20**] is sealed within the cabinet in a sealed zone **30.**” (Ex. 1005, 4:4-6, FIGs. 1, 4.) Yare also states that “[v]arious forms of display system may be used, for example plasma, **LCD**, TFT, CRT, LED, rear projection or any similar technology.” (*Id.*, 6:31-32.) The LCD display **20** is “*an electronic image assembly.*” This is consistent

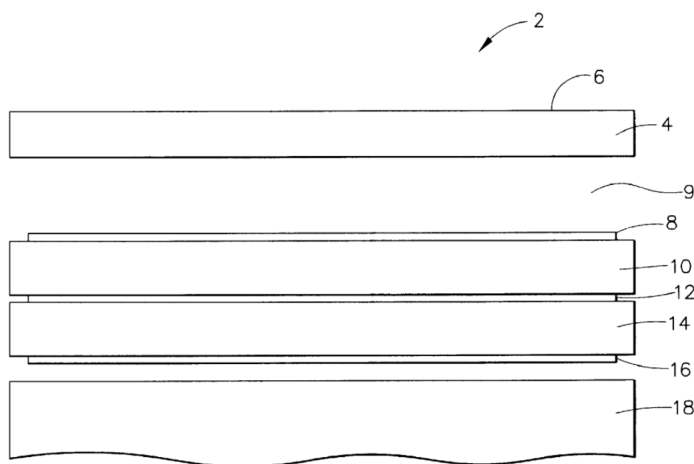
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

with the '740 patent, as discussed for this claim element under Ground 1.

271. Moreover, a POSITA would have known that an LCD display has a liquid crystal panel (“*front portion*”) and a backlight (“*rear portion*”). For example, Larson discloses a “**conventional**” display as follows:

Referring to FIG. 1, a **conventional** polarized display **2**, such as a **liquid crystal display (LCD)**, includes a cover glass **4** having an antireflective coating **6**. A front polarizer **8**, a first substrate **10**, a **liquid crystal layer 12**, a second substrate **14**, and a rear polarizer **16** are sandwiched between the cover glass **4** and a **backlight 18**.

(Ex. 1010, 1:22-27, FIG. 1.)

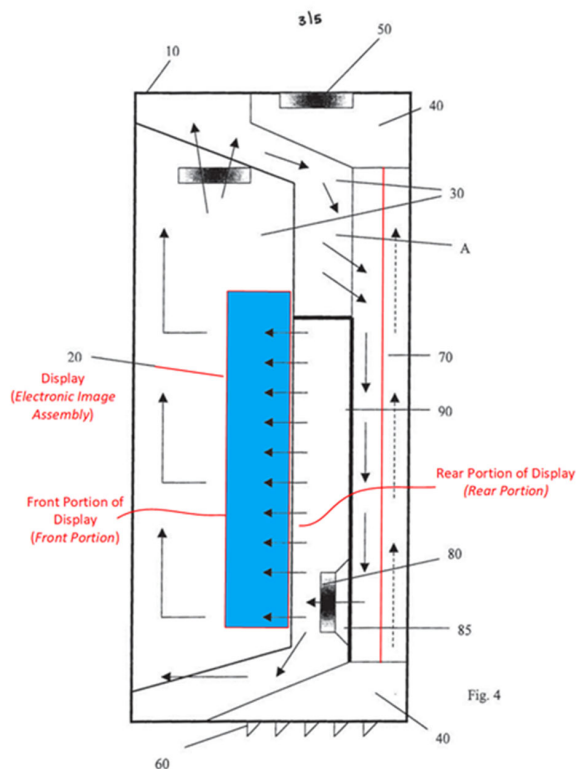


(*Id.*, FIG. 1.)

272. Yare’s LCD display **20** has a “*front portion*” and a “*rear portion*,” as shown in the annotated Figure 4 below. As discussed below for claim element 1[c], the front surface of the display **20** is spaced apart from the front surface of the cabinet

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

10, to allow circulation air through the gap between the front of the display **20** and the front surface of the cabinet **20**, as indicated by the “L”-shaped arrows in original Figure 4. (*See infra* § VI.C.1.d.)



(*Id.*, FIG. 4 (annotated).)

273. Thus, Yare individually, and in view of the knowledge of a POSITA, teaches this claim element.

- c. **Element 1[b] “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”**

274. Yare teaches this claim element because Yare’s system includes an

atmospheric air zone **40** for the flow of ambient air, which is located behind the display **20**.

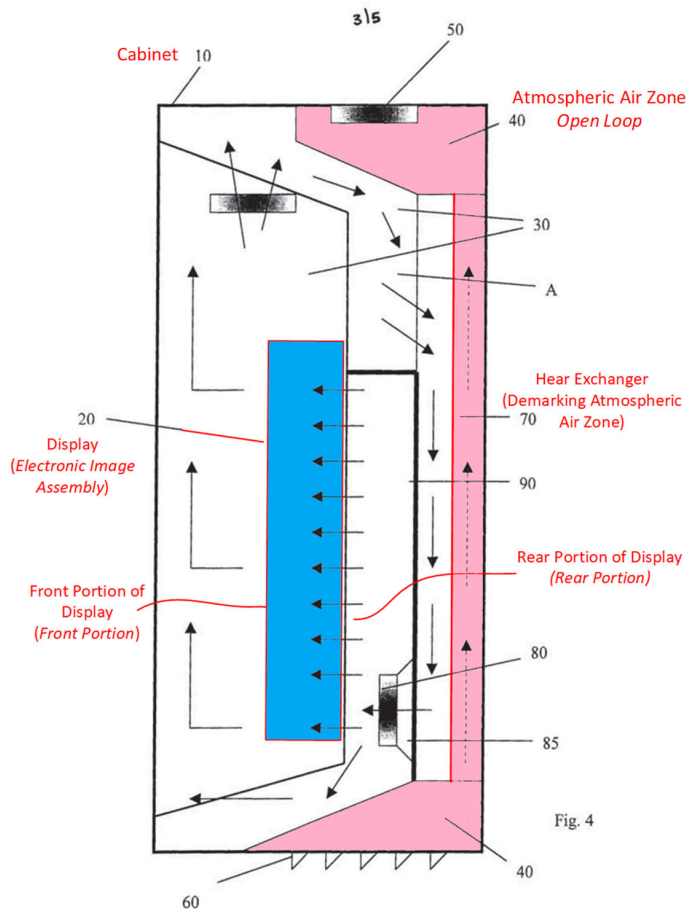
275. Yare states:

The cabinet **10** also includes an **atmospheric air zone 40**. Air from the outside of the cabinet **10** is drawn through vents **60** into the atmospheric air zone **40** by fans **50**. The fans **50** draw the air up through the atmospheric air zone **40**. The air is then expelled from the cabinet **10** through the fans **50**. Arrows in figures 2 and 3 show the passage of air **through the vents 60** into the atmospheric air zone **40** and out through the fans **50**, respectively.

(Ex. 1005, 4:11-16, Figures 1-4.)

276. Thus, the atmospheric air zone **40** is and functions as “*an open loop ambient airflow path*.” Yare also states that “[a]rrows in Figure 4 illustrate the movement of air in both the atmospheric air zone **40** and in the sealed zone **30** of the cabinet **10** in more detail. **Dotted arrows show movement of air in the atmospheric air zone 40** whilst solid arrows show movement of air in the sealed zone **30**.” (*Id.*, 4:24-27, FIG. 4.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 4 (annotated).)

277. In the annotated Figure 4 above, the display **20** is highlighted blue and the atmospheric air zone **40** (“*an open loop ambient airflow path*”) is highlighted pink. It can be seen in annotated Figure 4 that the atmospheric air zone **40** is behind the display **20** (“*said electronic image assembly*”). Thus, Yare teaches this claim element.

d. Element 1[c] “a closed loop gas circulation path about the electronic image assembly;”

278. Yare discloses this claim element because Yare’s system includes a sealed zone **30** wherein air is circulated within the sealed zone and around the display **20**, without contamination from atmospheric air, dust, etc.

279. Yare states:

A cabinet **10** is arranged to contain a display **20** for displaying information, advertisements or other visual media. The display is sealed within the cabinet in a **sealed zone 30**. In operation, the components of the display **20** create heat inside the display **20** in the sealed zone **30**. Vents and other venting means (not shown) allow air to travel through a rear portion **35** of the display **20**, although **the air is sealed within the sealed zone 30**.

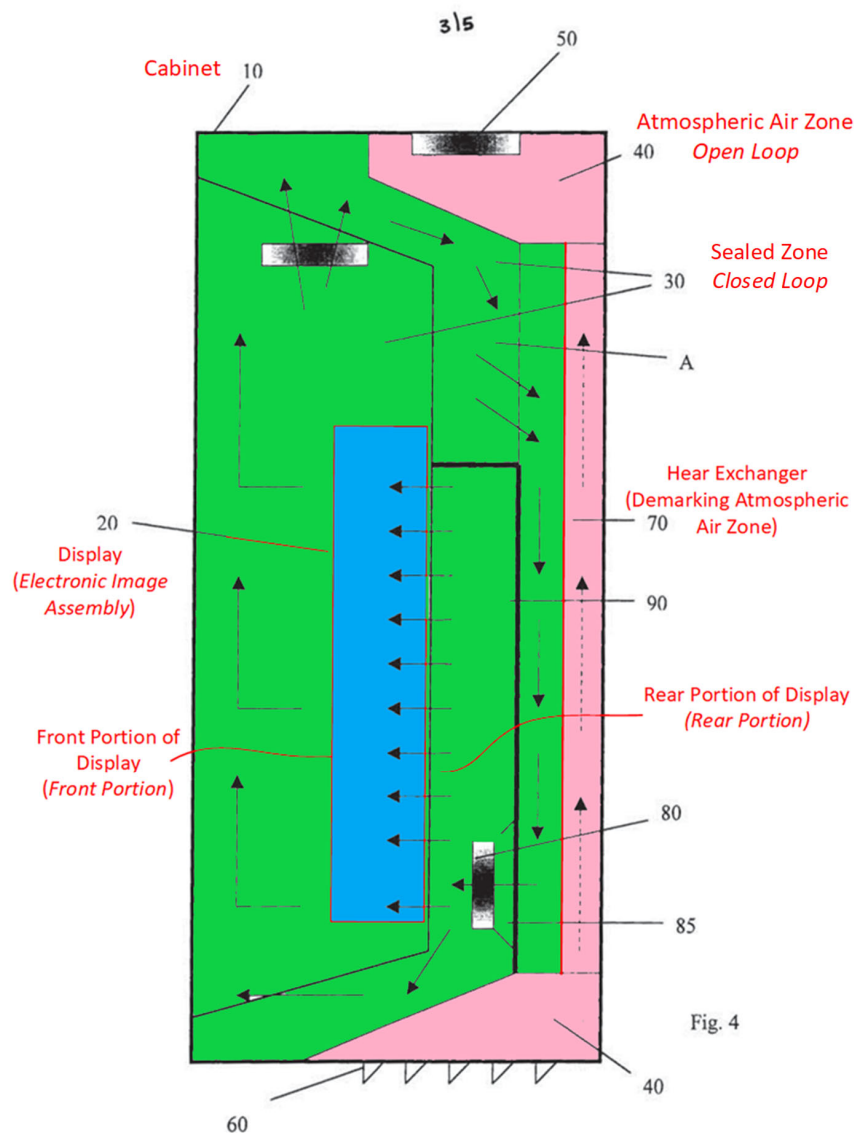
(Ex. 1005, 4:4-9, FIGs. 1, 4.)

280. In addition, Yare states that “the sealed zone **30** is cooled without the ingress of atmospheric air,” (*id.*, 6:1-2), and that “[t]he **sealed zone 30 and atmospheric air zone 40, are sealed from each other** to prevent the passage of air, dirt and the like.” (*Id.*, 4:19-20, Figures 1, 4). Per Yare, “[a]ir is circulated within the sealed zone **30** due to operation of the fans **80** within the cabinet and fans **25** within the display **20**.” (*Id.*, 5:1-2.)

281. Yare also states that the “[a]rrows in Figure 4 illustrate the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

movement of air in both the atmospheric air zone **40** and **in the sealed zone 30** of the cabinet **10** in more detail. Dotted arrows show movement of air in the atmospheric air zone **40** whilst **solid arrows show movement of air in the sealed zone 30.**” (*Id.*, 4:24-27, Figure 4.)



(*Id.*, FIG. 4 (annotated).)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

282. In the annotated Figure 4 above, the display **20** is highlighted blue, but is not actually illustrated in Figure 4. However, a POSITA would know that this is the most logical location for the display. From a design perspective this is seemingly the best, if not the only, option for where the unpictured LCD would be placed. Indeed, the front of the screen can be the hottest part of the display and thus the cooling space that is created in Yare would be intentionally designed to flow over the front of the screen, as it does in Karppanen above (disclosed in ground 1). Likewise, the screen could fog if placed directly adjacent to the front of the cabinet. A POSITA in 2008 would know that the LCD in Yare is placed within the cabinet at least some distance away from the front of the cabinet. Nevertheless, it would have also been obvious to do so in view of the predictable results above.

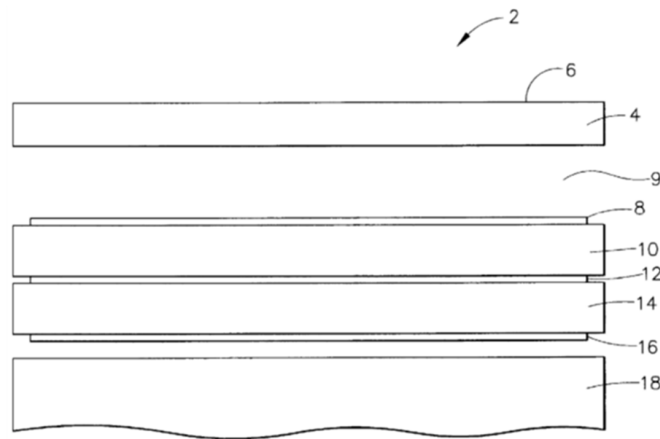
283. In addition, the atmospheric air zone **40** (the “*open loop ambient airflow path*”) in annotated Figure 4 above is highlighted pink, and the airflow pathway within the sealed zone **30** is highlighted green. This airflow pathway is “*a closed loop gas circulation path.*”

284. The solid arrows depicted in the original Figure 4 show the flow of air within the sealed zone **30**. (*Id.*, 4:24-27, Figure 4.) In particular, the “L”-shaped arrows show that the air flows in front of the display, in the space between the transparent outer surface of the cabinet **10** and the front of the display **20**. The

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

straight solid arrows show that the flow of air behind the display **20**. Thus, the flow of air within the sealed zone **30** encircles the display **20**.

285. To the extent Yare does not explicitly depict a space between the front surface of the display **20** and the front surface of the cabinet **20**, a POSITA would have known this to be a conventional configuration. For example, Larson discloses a “conventional” display, as discussed above for claim element 1[b]. (*See supra* § VI.C.1.c.) In Larson’s display, there is “**a gap 9 typically filled with air**” between the cover glass **4** and the front layer of the LCD stack, i.e., the polarizer **8**. (Ex. 1010, 1:22-28, FIG. 1.)



(*Id.*, FIG. 1.)

286. Therefore, as shown in the annotated Figure 4 above, a POSITA would have understood that in Yare’s system the air flow path within the sealed zone **30** (“*a closed loop gas circulation path*”) encircles the display **20**, passing through a

gap between the transparent front surface of the cabinet **10** and the front of the display **20**. Thus the air flow within the sealed zone is about the display **20** (and is thus “*about the electronic image assembly*”). The closed pathway is formed around the display **20** and is thus “*a closed loop gas circulation path about the electronic image assembly*,” as recited by this claim element. Accordingly, Yare individually and in view of the knowledge of a POSITA (as evidenced, e.g., by Larson) teaches this claim element.

e. **Element 1[d] “a common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path;”**

287. Yare discloses this claim element because Yare’s system includes a heat exchanger **70** that is common to both airflow pathways. The heat exchanger **70** is a “*common heat exchanger*” because the air flow pathway in the sealed zone **30**, (“*the closed loop gas circulation path*”), contacts the front side of the heat exchanger **70**, while the air flow pathway in the ambient air zone **40**, (“*the open loop ambient air flow path*”) contacts the rear side of the heat exchanger **70**. ”

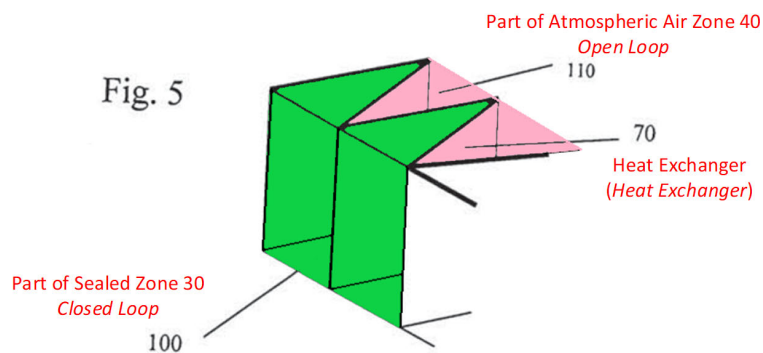
288. Yare states that “[t]he cabinet **10** includes a **heat exchanger 70 mounted on a baffle plate 90.**” (Ex. 1005, 4:18, Figures 1, 4, 6.) Yare further discloses:

In the illustrated embodiment of the present invention, the **heat exchanger 70** is formed from corrugated metal, thereby increasing the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

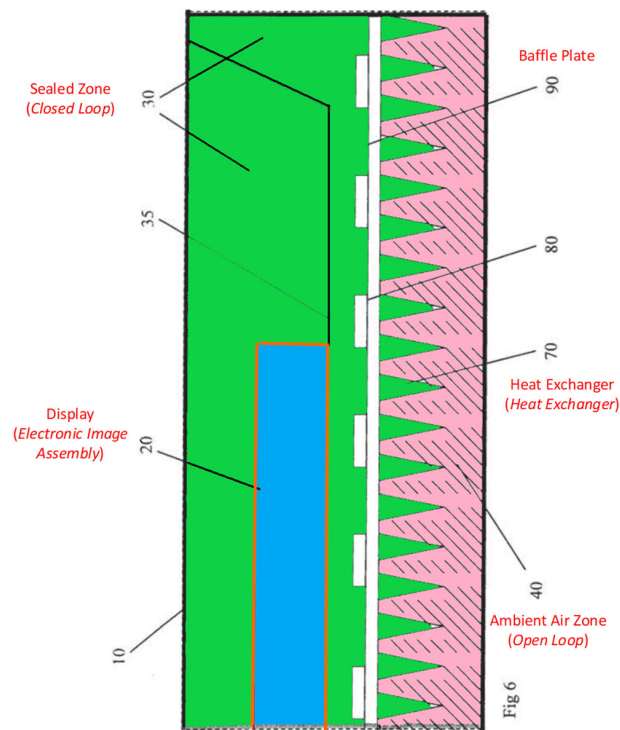
surface area **in contact with both the atmospheric air zone 40 and the sealed zone 30**. The heat exchanger is sealed at the top and the bottom on the inner side to **prevent atmospheric air 110 and the re-circulating air 100 within the sealed zone [30] from mixing**.

(*Id.*, 6:7-11, Figures 5, 6.)



(*Id.*, FIG. 5 (annotated).)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 6 (annotated).)

289. It is seen in the annotated Figure 6 above, that the front (left) part of the corrugated heat exchanger **70** defines in part a boundary of the air pathway within the sealed zone **30** (highlighted green) (“*the closed loop gas circulation path*”). The rear (right) part of the corrugated heat exchanger **70** defines in part a boundary of the ambient air pathway, i.e., the atmospheric air zone **40** (highlighted pink) (“*the open loop ambient air flow path*”). Accordingly, the heat exchanger **70** (the “*common heat exchanger*”) is “*located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path.*”

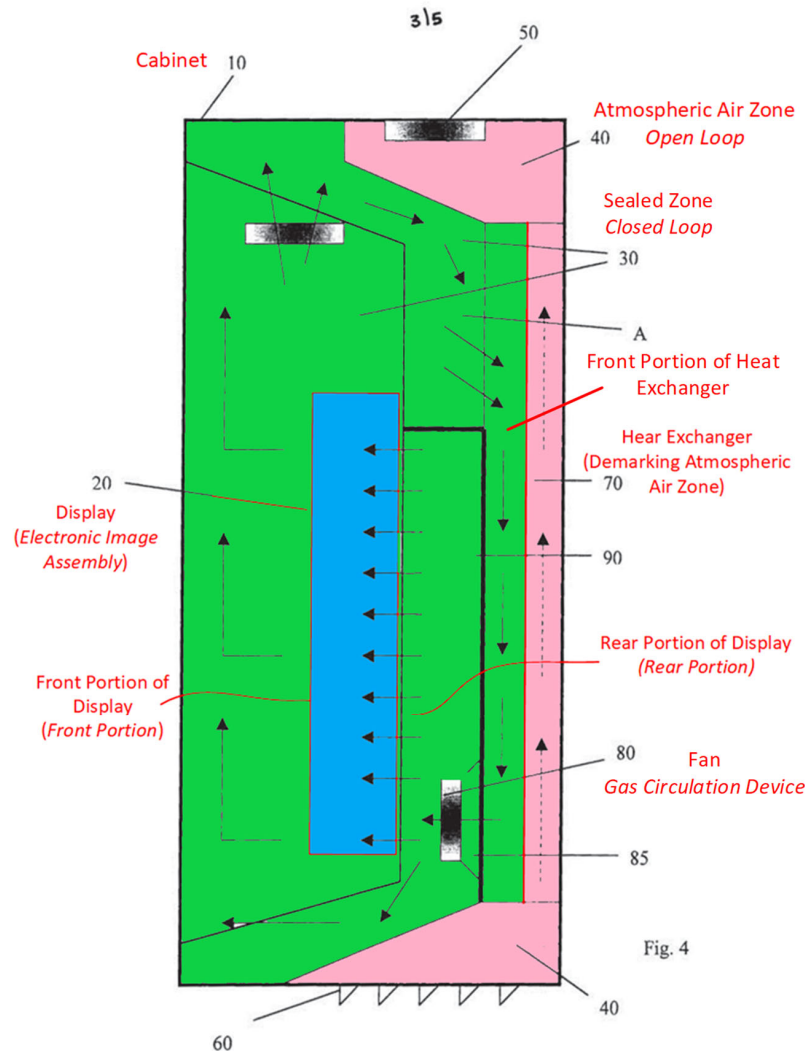
290. Thus, Yare teaches this claim element.

f. Element 1[e] “a gas circulation device positioned to force circulating gas through the common heat exchanger; and”

291. Yare discloses this claim element because Yare’s system includes fans **80** that force the air circulating in the closed loop pathway through the front side of the heat exchanger **70** (“*the common heat exchanger*”).

292. Yare states: “[t]he cabinet **10** includes a heat exchanger **70** mounted on a baffle plate **90**. Also mounted on the baffle plate **90** are **fans 80**.” (Ex. 1005, 4:18-19, Figures 1, 4.) Yare further states that “[a]ir is circulated **within the sealed zone 30 due to operation of the fans 80** within the cabinet and **fans 25** within the display 20.” (*Id.*, 5:1-2.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 4 (annotated).)

293. Because “[a]ir is circulated within the sealed zone **30** due to operation of the fans **80**,” (*id.*, 5:1-2), and because air is a gas, a fan **80** is “a gas circulation device positioned to force circulating gas” through the closed pathway within the sealed zone **30** (highlighted green) (“the closed loop gas circulation path”).

294. Moreover, as discussed for claim element 1[d], the front (left) part of

the corrugated heat exchanger **70** defines in part a boundary of the air pathway within the sealed zone **30** (“*the closed loop gas circulation path*”). (See *supra* § VI.C.1.e.) Therefore, the fan **80** is “*positioned to force circulating gas through* [the front portion of] *the common heat exchanger,*” as seen in the annotated Figure 4 above.

295. Additionally, “[t]he 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**.” (Ex. 1005, 5:29-32, FIG. 4.) Yare’s constraining of the air to “flow[] properly in the desired direction, along the heat exchanger” constitutes “*forc[ing] [the] circulating gas through the common heat exchanger.*” Additionally, a POSITA would have known orient the corrugated heat exchanger **70** features to optimize the passage of air through the space between the corrugations to maximize heat transfer and to reduce resistance to airflow around the closed loop. (See *e.g.*, Ex. 1020, Section 6.24 Pressure losses in multiple-fin heat exchangers.)

296. Thus, on the closed loop side of the heat exchanger, air blows by and between the fins created by the corrugated structure and is thus flowing “through” the heat exchanger as this claim element recites. Also, during prosecution the applicant did not disagree with the examiner who found that Thielemans teaches airflow “through” the heat exchanger even though Thielemans teaches “a heat sink

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

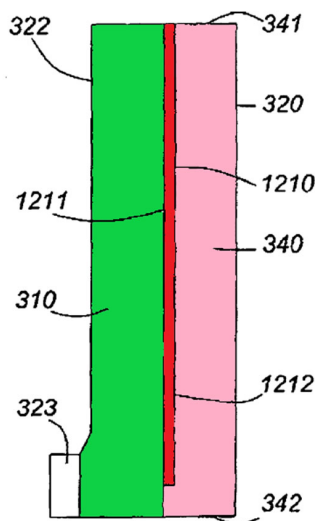
22 in the form of a heat transporting plate.” (Ex. 1022, p.239; Ex. 1030, ¶49.) To the extent this claim element is interpreted more narrowly than the plain meaning, such as requiring the precise heat exchanger as shown in the ’740 patent’s detailed embodiments and with a similar enclosure on the open loop side of the heat exchanger, such configurations would have also been obvious. For example, it would have been obvious to include a second baffle plate in the open air loop to further increase the surface area over which air touches the heat exchanger. This would have been a simple design choice well within the knowledge in the art in 2008. Indeed, it would yield the predictable result of increasing cooling using the known method of using a baffle plate, which is expressly illustrated in Yare with respect to the closed loop.

297. Other alternatives, such as disposing a heat exchanger within an enclosure, would have also been available and known in the art. For example, Bundza describes a “cabinet for electronics equipment,” such as electronic displays, that has a heat exchanger having a corrugated core similar to Yare’s heat exchanger **70**. (Ex. 1011, Abstract, FIGs. 9, 13.)

298. Bundza discloses a “heat exchanger **320** [that] has a[n] enclosed outer loop duct **340**” (annotated pink) and “an enclosed inner loop duct **310**” (annotated green). (*Id.*, 4:60-64, FIG. 13). Bundza also states that “[t]he outer loop duct **340**

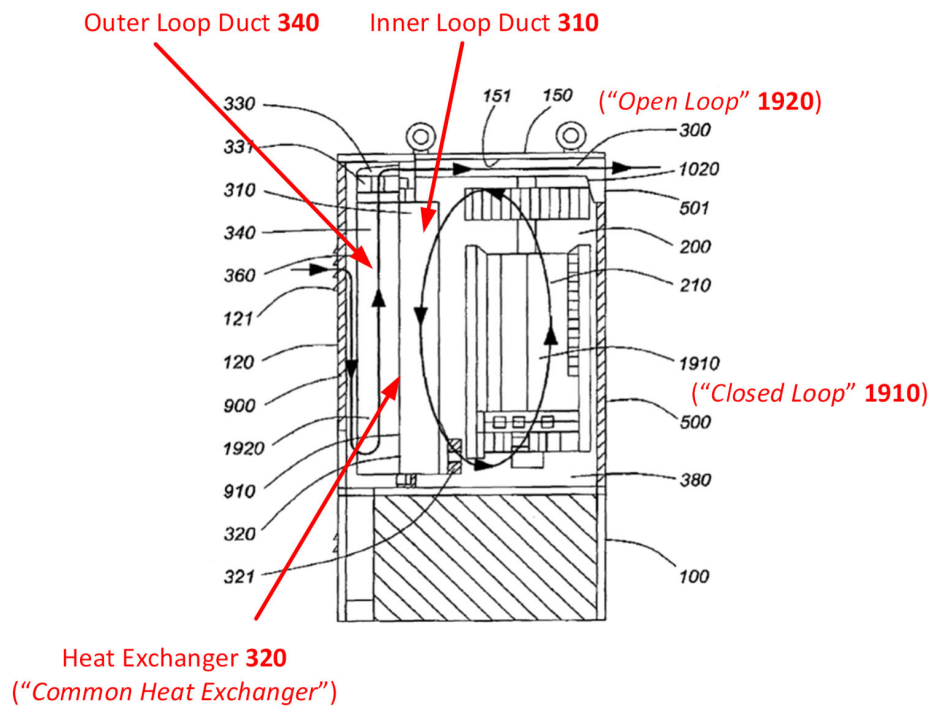
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

and the inner loop duct **310** are generally coextensive being **separated by a heat exchanger core 1210**” (highlighted red). (*Id.*, 4:64-67, FIG. 13.) Additionally, Bundza states that both the outer loop duct **340** and the inner loop duct **310** have fins **1220, 1120** “forming part of the heat exchanger core 1210 to improve heat transfer efficiency” where the fins **1220, 1120** may be “corrugated surfaces.” (*Id.*, 5:15-20, 5:27-32.) Bundza also states that “the fins **1120, 1220** may represent opposite sides of a corrugated surface forming the heater exchanger core **1210**.” (*Id.*, 5:43-45.)



(*Id.*, FIG. 13 (annotated).)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 19 (annotated) (depicting closed loop and open loop flows through the inner loop and outer loop ducts, respectively, of the heat exchanger).)

299. Thus, Bundza's heat exchanger is substantially the same as Yare's in that they both allow passage of air from the closed (inner) loop and the open (outer loop), wherein the heat exchanger core separates the two loops and keeps them isolated, and the heat exchanges include a corrugated surface in-between the two loops.

300. Bundza's Figure 13 shows that its heat exchanger **320** includes an outer casing that contains the core **1210**, where the inner loop duct **310** passes through the heat exchanger **320**, along the core **1210** that may be corrugated. In light of the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

knowledge of a structure of a heat exchanger substantially the same as Yare's, a POSITA would have understood that the air circulated through the closed pathway within the sealed zone **30**, (*see* Ex. 1005, 5:1-2) and along the front (left) side of the heat exchanger **70** having a corrugated core (*see id.*, 5:7-11) passes through the front (left) side of the heat exchanger **70**.

301. Providing Yare's corrugated heat exchanger **70** within an enclosure would have been a straightforward modification to a POSITA. A POSITA would have recognized it to be simply an addition of a known component (an enclosure encasing a corrugated heat exchanger, as evidenced by Ex. 1011), or a simple substitution of Yare's heat exchanger with a better one having an enclosure (as evidenced by Ex. 1011).

302. This modification was also well within the scope of a POSITA, because it required noting more than providing an enclosure, which can be accomplished using a number of common techniques such as making straightforward modifications to sheet metal enclosures and/or fastening a pre-configured element to existing elements. For example, Yare's heat exchanger would be easily modified by affixing an improved heat exchanger to the baffle plate **90** in the same way the heat exchanger **70** is affixed. As such a POSITA would have known that this modification would succeed and would provide the expected benefits discussed

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

above. Accordingly, Yare individually and in the light of the knowledge of a POSITA (as informed, e.g., by Bundza) teaches this claim element.

g. Element 1[f] “an air circulation device positioned to force ambient air through the common heat exchanger.”

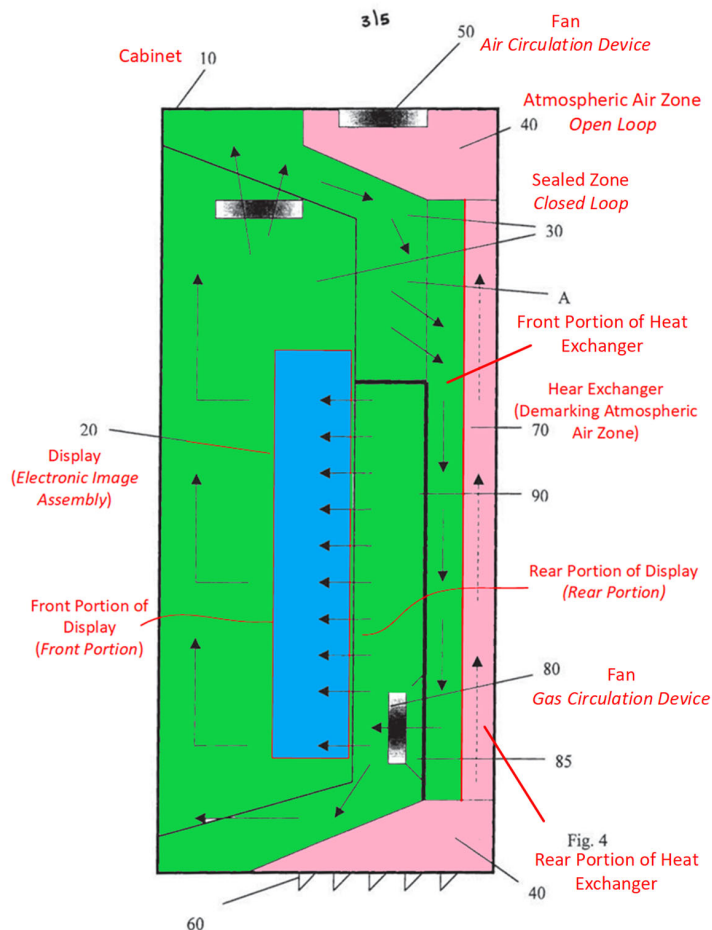
303. Yare teaches this claim element because Yare’s system includes fans **50** to force ambient air through the atmospheric air zone **40**, and through the heat exchanger **70** (“*the common heat exchanger*”).

304. Yare states:

The cabinet **10** also includes an atmospheric air zone **40**. **Air from the outside of the cabinet 10 is drawn through vents 60 into the atmospheric air zone 40 by fans 50.** The fans **50** draw the air up through the atmospheric air zone **40**. The air is then **expelled** from the cabinet **10 through the fans 50**. **Arrows in figures 2 and 3 show the passage of air through the vents 60 into the atmospheric air zone 40 and out through the fans 50, respectively.**

(Ex. 1005, 4:11-16, Figures 1-4.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 4 (annotated).)

305. As discussed above in connection with claim element 1[b], Yare’s atmospheric air zone 40 is “an open loop ambient air flow path.” Because “[a]ir from the outside . . . is drawn . . . into the atmospheric air zone 40 by fans 50,” is “draw[n] . . . through the atmospheric air zone 40” and “is then expelled . . . through the fans 50,” (*id.*, 4:11-16), a fan 50 is “an air circulation device positioned to force ambient air through” through the atmospheric zone 40 (highlighted pink). (See

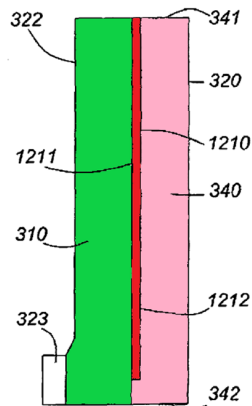
supra § VI.C.1.c.)

306. Moreover, as discussed for claim element 1[d], the rear (right) part of the corrugated heat exchanger **70** defines in part a boundary of the atmospheric air zone **40** (“*the open loop ambient airflow path*”). Therefore, the fan **50** is “*positioned to force circulating gas through [the rear portion of] the common heat exchanger,*” as seen in the annotated Figure 4 above. (*See supra* § VI.C.1.e.) Additionally, a POSITA would have known to orient the corrugated heat exchanger **70** features to optimize the passage of air through the space between the corrugations to maximize heat transfer and to reduce resistance to airflow through the open loop. (*See, e.g.,* Ex. 1020.)

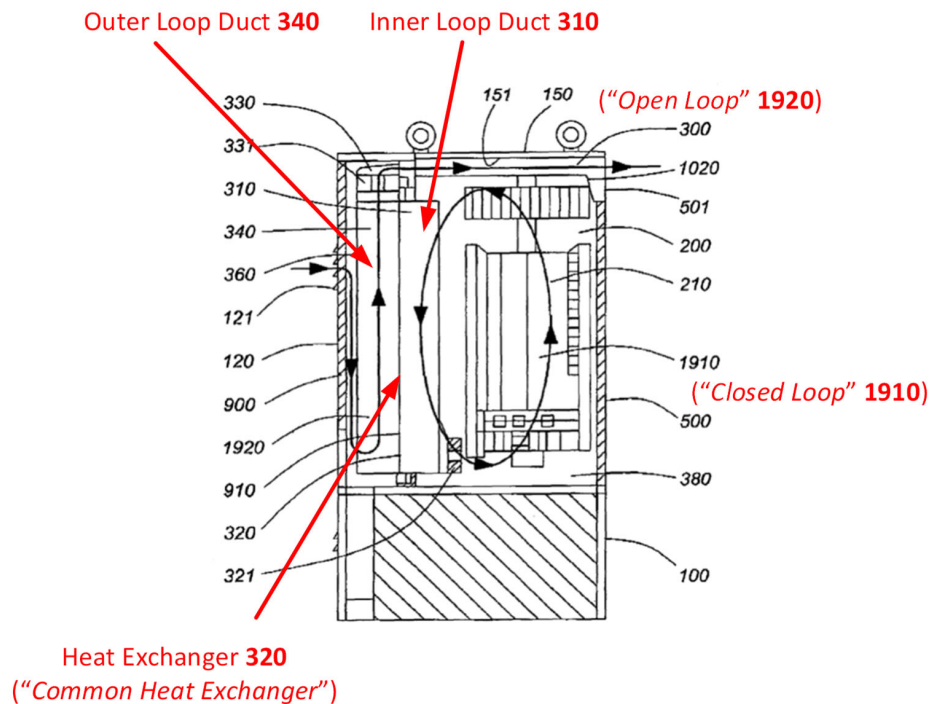
307. As discussed above for claim element 1[e], to the extent that through the common heat exchanger is interpreted more narrowly than the plain meaning and requiring a heat exchanger that matches the detailed embodiments in the ’740 patent, a POSITA would have known the Yare’s baffle plate could be applied on the open loop side of its heat exchanger just as it is applied on the closed loop side. Thus, the more narrow interpretation would have been obvious. Additionally, the structure of Yare’s heat exchanger **70** is substantially similar to that of Bundza’s heat exchanger **320**. (*See supra* § VI.C.1.f.) Bundza’s Figure 13 shows that its heat exchanger **320** includes an outer casing that contains the core **1210** (highlighted red), where the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

outer loop duct **340** (highlighted pink) passes through the heat exchanger **320**, along the core **1210** that may be corrugated.



(Ex. 1011, FIG. 13 (annotated).)



(*Id.*, FIG. 19 (annotated) (depicting closed loop and open loop flows through the

inner loop and outer loop ducts, respectively, of the heat exchanger).)

308. In light of the knowledge of a structure of a heat exchanger substantially the same as Yare's, a POSITA would have understood that the air circulated through the open pathway in the atmospheric air zone **40**, and along the rear (right) side of the heat exchanger **70** having a corrugated core, (*see* Ex. 1005, 4:11-16), passes through the rear (right) side of the heat exchanger **70**.

309. Accordingly, Yare individually, and in view of the knowledge of a POSITA (as informed, e.g., by Bundza) teaches this claim element.

310. In summary, Yare in view of the knowledge of a POSITA discloses each and every element of claim 1, and renders obvious claim 1.

2. Claim 2

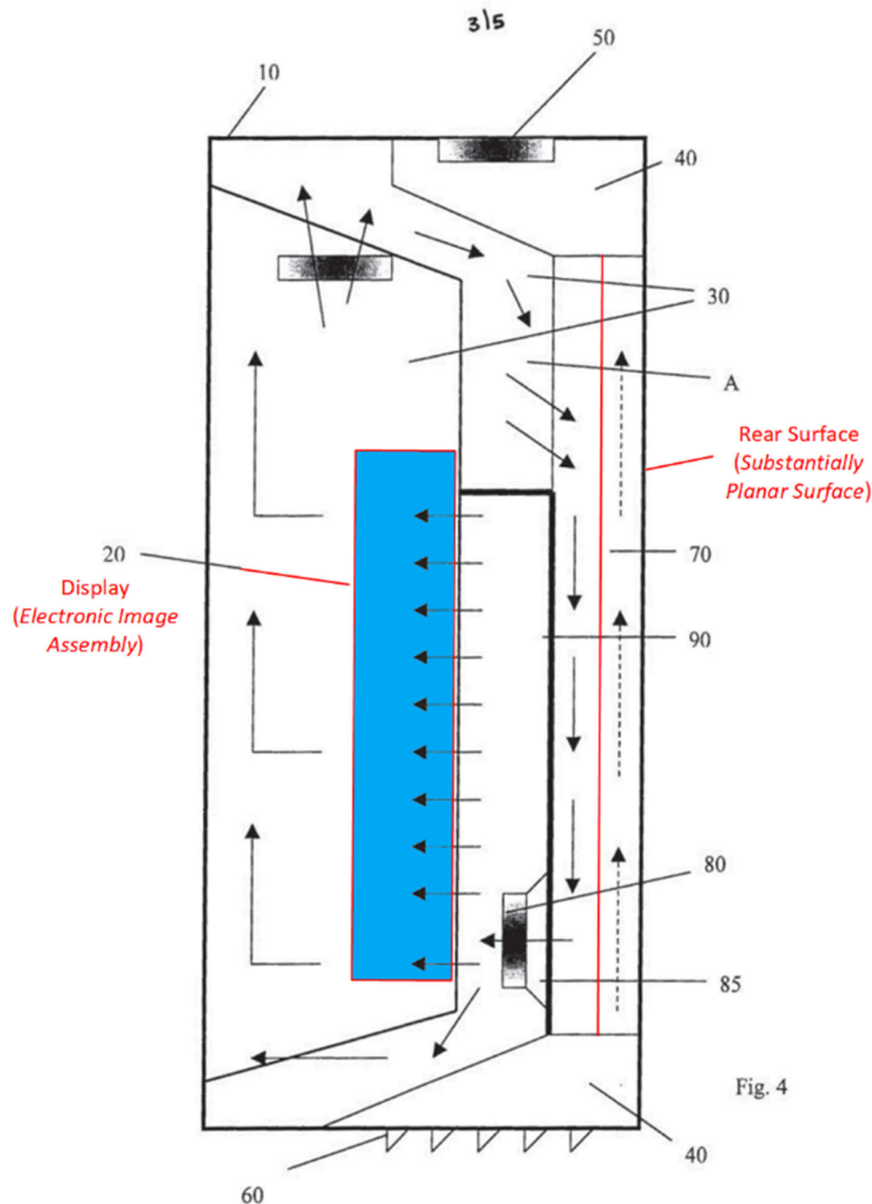
- a. **Element 2[a]: “The electronic display of claim 1, further comprising: a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly; and”**

311. Yare teaches this claim element because Yare's cabinet **10** has a rear surface (“*a substantially planar surface*”) that is located behind and spaced apart from the display **20** (“*the electronic image assembly*”).

312. Yare states that “Figure 1 is a cross section of a display system according to an embodiment of the present invention.” (Ex. 1005, 3:25-26, Figure 1.) Figure 1 depicts the cabinet **10** and its components. (*See id.*, at 4:4-11, FIG. 1.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

Because Figure 1 is a cross-section, the rear (right) edge of the cabinet **10** that is depicted in Figure 1 indicates a rear surface, i.e., “a substantially planar surface,” of the cabinet **10**.



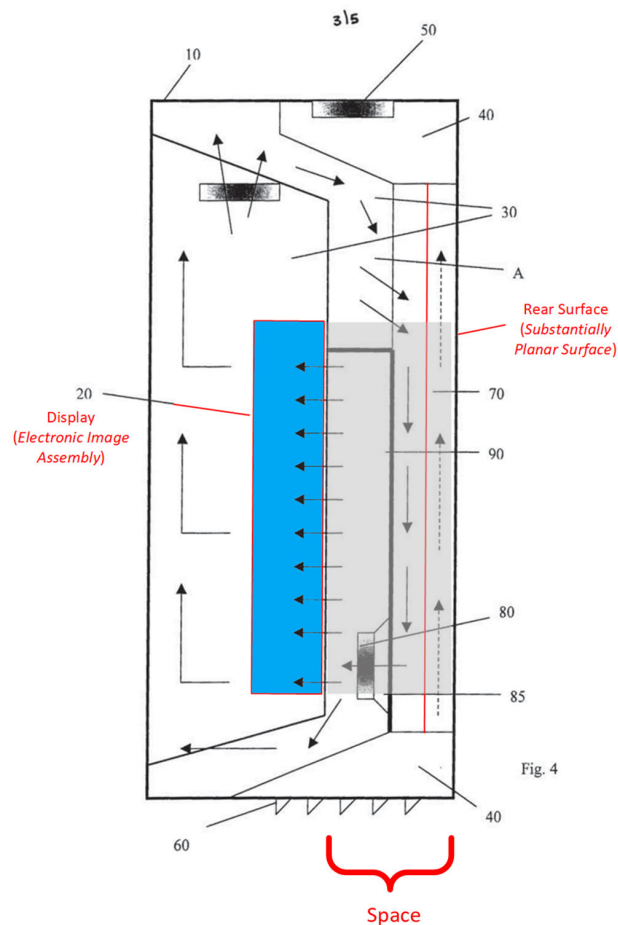
(*Id.*, FIG. 1 (annotated).)

313. As discussed for claim element 1[a], the display **20** (“*the electronic image assembly*”) is disposed within the sealed zone **30** within the cabinet **10**. (*See supra* § VI.C.1.b.) It is seen in Figure 1, that the rear surface of cabinet **10** (“*a substantially planar surface*”) is located behind and spaced apart from the display **20** (“*the electronic image assembly*”). Accordingly, Yare teaches this claim element.

b. Element 2[b]: “a space defined between the rear portion of the electronic image assembly and the substantially planar surface;”

314. Yare teaches this claim element. As seen in the annotated Figure 1 below, the rear portion of the display **20** and the rear surface of the cabinet **10** (“*the substantially planar surface*”) are spaced apart.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

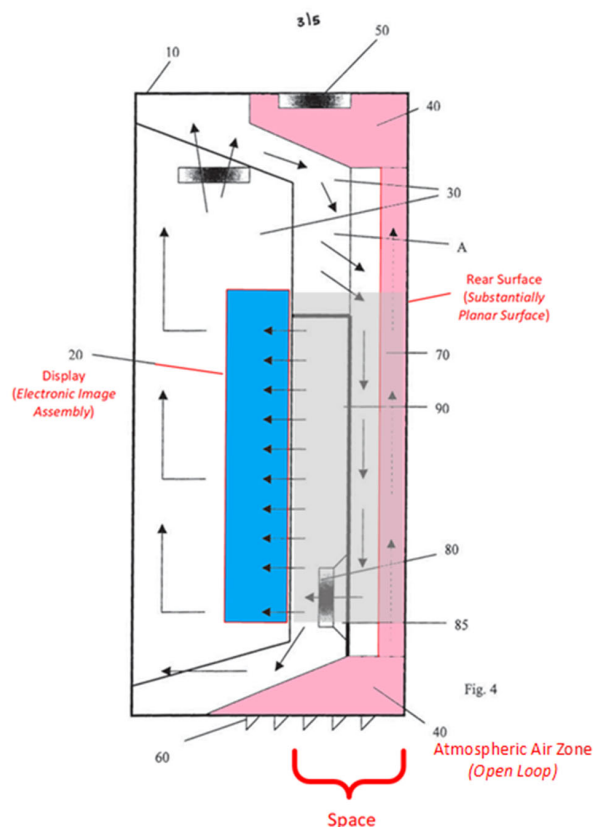


(Ex. 1005 , Figure 1 (annotated).)

315. Thus, “a space is defined between” the rear portion of the display **20** (“the rear portion of the electronic image assembly”) and the rear surface of the cabinet **10** (“substantially planar surface”). In the annotated Figure 1 above, that space is highlighted gray. Accordingly, Yare teaches this claim element.

c. Element 2[c]: “wherein the space is in gaseous communication with the open loop ambient air flow path.”

316. Yare teaches this claim element. As discussed for claim element 1[b], the atmospheric air zone **40** is the “*open loop ambient air flow path*.” As seen in the annotated Figure 1 below, the “*space defined*” (highlighted gray) between the rear portion of the display **20** and the rear surface of the cabinet **10** includes a portion of the atmospheric air zone **40** (highlighted pink). (See *supra* § VI.C.1.c.)



(Ex. 1005, Figure 1 (annotated).)

317. As such, the “*space defined*” “*is in gaseous communication with*” the

atmospheric air zone **40** (“*the open loop ambient air flow path*”). Therefore, Yare teaches this claim element.

318. In summary, Yare teaches all of the elements of claim 2, and renders claim 2 obvious.

3. Claim 3

319. Claim 3 recites: “The electronic display of claim 2, wherein the substantially planar surface is a plate.”

320. Yare in view of the knowledge of a POSITA discloses this claim element. In particular, well before 2008, it was well-known to use metal plates to form the outer surfaces of an outdoor cabinet holding electronic displays modules, as such LCD displays. Therefore, a POSITA would have understood the rear surface of the cabinet **10** (the “*substantially planar surface*”) to be a metal plate. Thus, Yare discloses or at least suggests, in view the knowledge of a POSITA, the limitation of claim 3.

4. Claim 5

- a. Element 5[a]: “The electronic display of claim 1, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and”**

321. Yare individually, and in view of the knowledge of a POSITA, discloses this claim element because Yare’s cabinet **10** has a transparent front

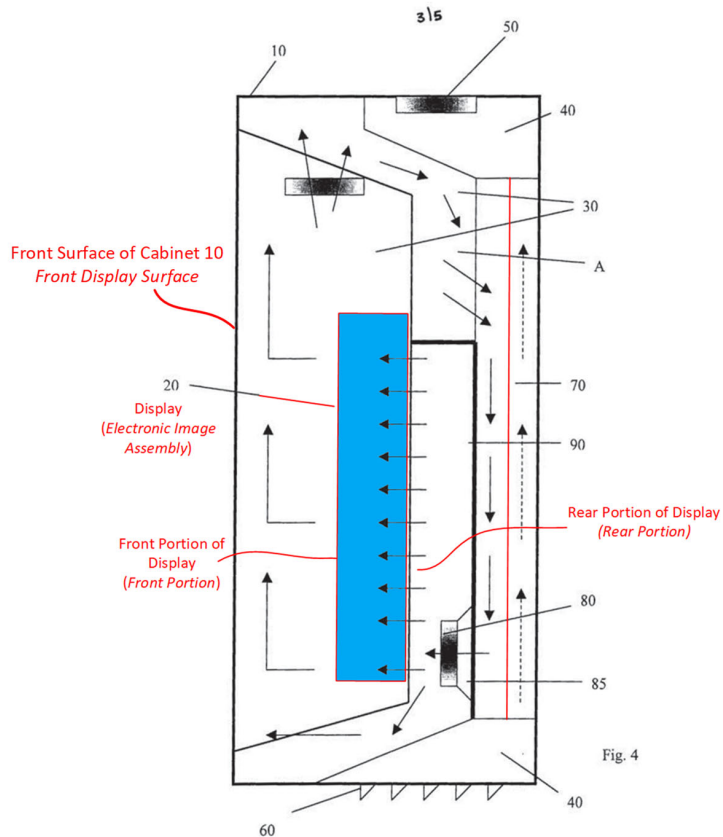
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

surface (“*a front display surface*”) to allow viewing images displayed by the display

20. The cabinet’s front surface is spaced apart from the front portion of the display **20** (“*the electronic image assembly*”).

322. Yare states that “Figure 1 is a cross section of a display system according to an embodiment of the present invention.” (Ex. 1005, 3:25-26, Figures 1, 4.) Figure 4 depicts the cabinet **10** and its components. (*See id.*, 4:4-11, 3:27 (stating that “Figure[s] 2, 3, and 4 [] show parts of the cross section of Figure 1 in more detail”), Figures 1 and 4. Because Figure 4 is a cross-section, the front (left) edge of the cabinet **10** that is depicted in Figure 4 indicates a front surface of the cabinet **10**. Because the display **20** is located behind the front surface, the cabinet’s front surface is transparent, and allows view of the images displayed on the display **20**. As such, the front surface of cabinet **10** is a “*front display surface*.”

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 4 (annotated).)

323. Yare states:

Arrows in Figure 4 illustrate the **movement of air in** both the atmospheric air zone **40** and in **the sealed zone 30** of the cabinet **10** in more detail. Dotted arrows show movement of air in the atmospheric air zone **40** whilst **solid arrows show movement of air in the sealed zone 30**.

(*Id.*, 4:24-27, FIG. 4.)

324. The “L”-shaped arrowed in original Figure 4 indicate that a part of the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

air flow within the sealed zone **30** occurs in front of the display **20**. A POSITA would have known this configuration to be a typical one, as evidenced by Larson (Ex. 1010), Pandolfi (Ex. 1012), and Heady (Ex. 1013). In particular, a POSITA would have known that the display **20** would typically not be disposed in the cabinet **10** such that the front surface of the display **20** is in contact with the outer surface of the cabinet **10**, e.g., to minimize the risk of damage to the display **20**.

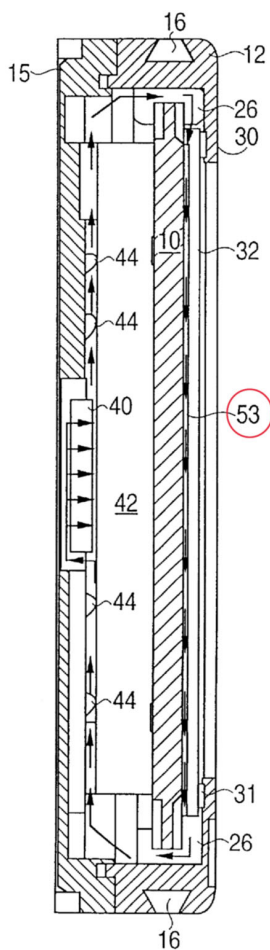
325. Specifically, a POSITA would have known that an outdoor cabinet would be subject to vibrations or impacts, e.g., due to wind, traffic, vandalism, etc., and that if placed in contact, these disturbances of the outer surface of the cabinet would readily transfer to the display **20**, which can cause the display **20** to crack and be damaged. Additionally, a POSITA would have known that because air is a thermal insulator, an air gap between the outer surface of the cabinet **10** and the front surface of the display **20** can minimize heating of the display due to the incident sunlight in an outdoor environment.

326. Larson, for example, discloses a configuration in which a front cover is spaced apart from an LCD, and describes the configuration is “conventional” and the spacing as “typical.” Referring to its Figure 1, Larson discloses “a **conventional** polarized display **2**, such as a liquid crystal display (**LCD**), [that] includes a cover glass **4**” that is “separated from the front polarizer **8** [of the LCD stack] by a **gap 9**,

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

typically filled with air.” (Ex. 1010, 1:22-28, FIG. 1.)

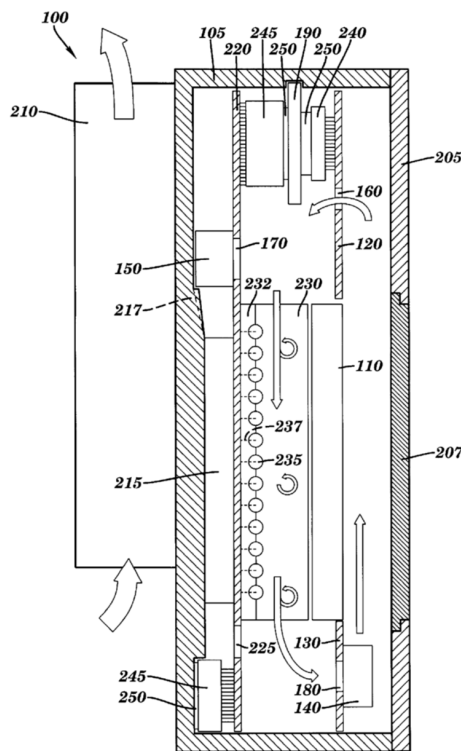
327. Pandolfi discloses a “display module” having “a flat panel display **10**” such as an LCD display. (Ex. 1012, 2:9-12, 2:34-37, FIG. 3.) Pandolfi further discloses that “stand-offs **31** mount a touch screen panel **32** in front of the display panel **10**, forming an **air gap 53** between the front surface of the display panel and the rear surface of the touch screen panel **32** through which air can be circulated.” (*Id.*, 2:42-47, FIG. 3.)



Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

(*Id.*, FIG. 3.)

328. Likewise, Heady discloses a display unit **100** having a “display housing **105**” having “a display window **207**” to “allow viewing of electronic display **110**.” (Ex. 1013, 5:49-53, FIG. 2.) The display **110** can be an LCD display having backlights. (*Id.*, 2:28-31, 7:60-64, FIG. 2.) Heady also discloses “a fan **140**” that blows air “in front of electronic display **110**.” (*Id.*, 5:30-33, FIGS. 3, 4.) Thus, Heady’s display window **207** is spaced apart from the front of the display **110**.

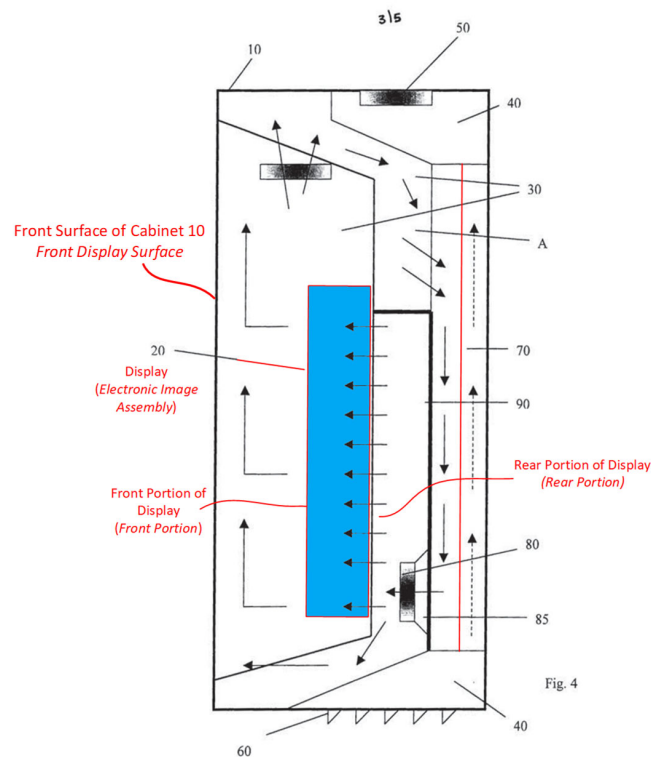


(*Id.*, FIG. 3 (depicting an upward arrow indicating air flow in front of the display **110**).)

329. In light of such typical configurations, a POSITA would have

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

understood that the transparent front surface of Yare's cabinet **10** ("*front display surface*") is not in contact with, but is spaced apart from the front portion of display **20**, which would allow an airflow in the front of the display **20**, as indicated by the "L"-shaped arrows in Yare's original Figure 4.



(Ex. 1005, FIG. 4 (anotated).)

330. Therefore, as shown in the annotated Figure 4 above, a POSITA would have understood that in Yare's system the front surface of cabinet **10** ("*a front display surface*") is "*spaced apart from*" the front portion of display **20** ("*the front portion of the electronic image assembly*"). Thus, Yare individually, and in view of

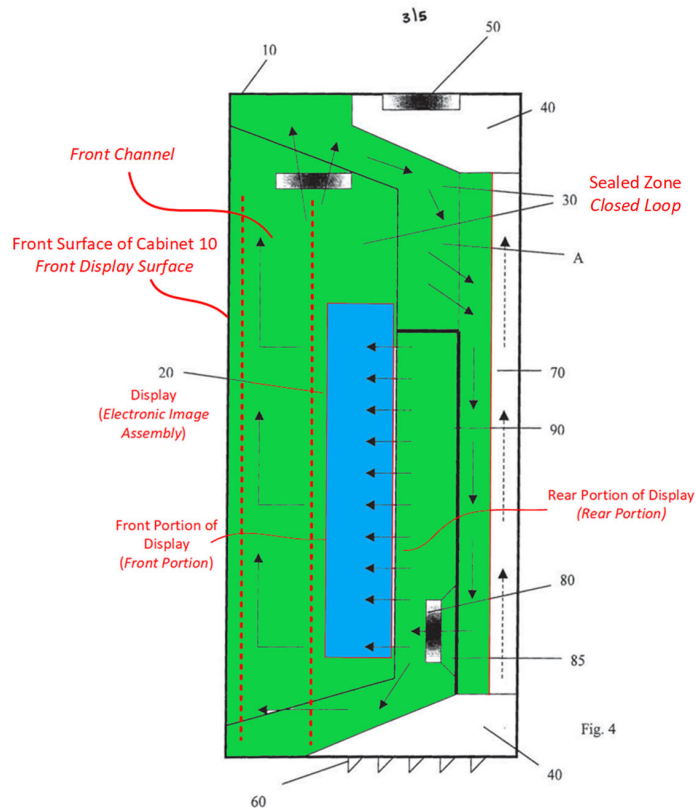
the knowledge of a POSITA, teaches this claim element.

- b. Element 5[b]: “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.”**

331. Yare individually, and in view of the knowledge of a POSITA, teaches this claim element because in Yare’s system, the gap between the transparent front surface of cabinet **10** and the front of the display **20** is a “*front channel*.” Yare also shows that the closed loop path of air flow within the sealed chamber **30** (the “*closed loop gas circulation path*”) passes through the gap, so that it forms a “*part of the closed loop gas circulation path*.”

332. As discussed above for claim element 5[a], Yare discloses, and a POSITA would have understood, that there is spacing between the cabinet’s front surface (“*front display surface*”) and the front of the display **20** (“*front portion of the electronic image assembly*”). (See *supra* § VI.C.4.a.) As Figure 4 shows, air flow within the closed loop passes in front of the display **20** via that spacing. (Ex. 1005, 4:24-27 (stating that “solid arrows” including “L”-shaped arrows “show movement of air in the sealed zone 30), FIG. 4.) Therefore, the spacing is “*a front channel*.”

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 4 (annotated).)

333. As discussed for claim element 1[c], the closed pathway within the sealed zone **30** is the “*closed loop gas circulation path*” (highlighted green). (See *supra* § VI.C.1.d.) The annotated Figure 4 above shows that the spacing between the front surface of cabinet **10** and the front of the display **20** (the “*front channel*”) is part of the “*closed loop gas circulation path.*” Accordingly, Yare individually and in view of the knowledge of a POSITA, teaches this claim element.

5. Claim 6

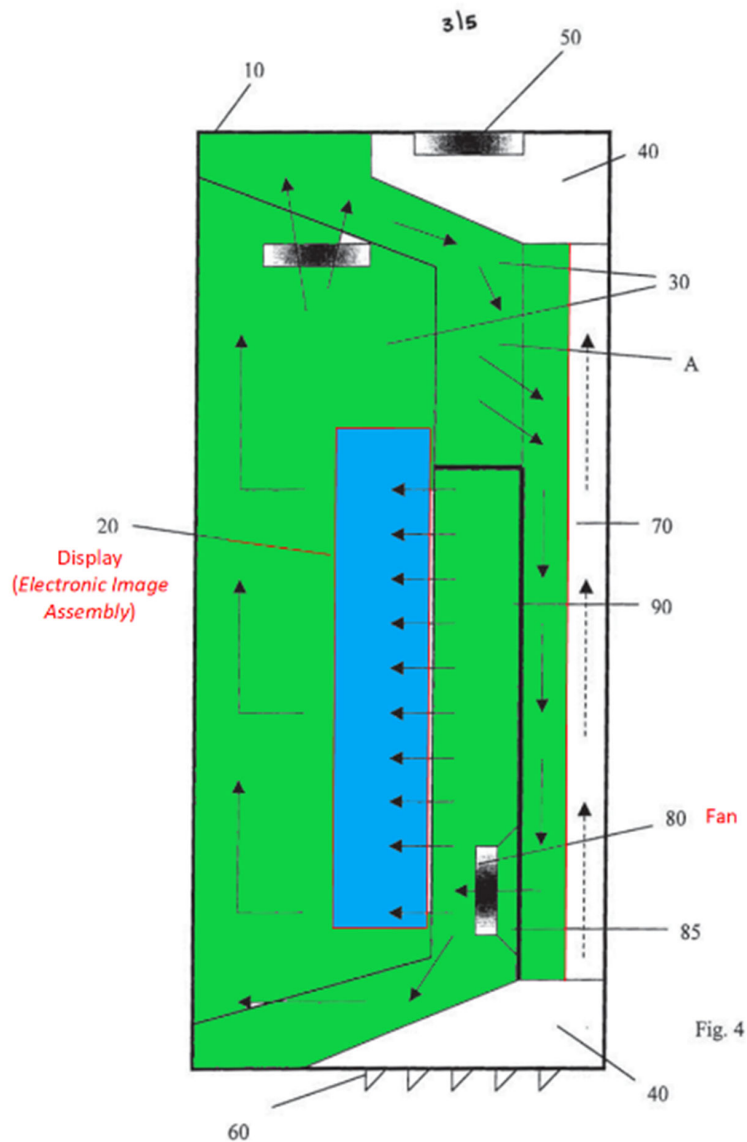
334. Claim 6 recites: “The electronic display of claim 1, further comprising

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.”

335. Yare teaches this claim element because Yare discloses fans **80** within the closed loop pathway, and because a POSITA would have known that those fans include their motors.

336. As discussed above for claim element 1[c], an ai pathway within the sealed zone **30** is the “closed loop gas circulation path” i.e., “the pathway of the closed loop gas circulation path.” (*See supra* § VI.C.1.d.) Yare states: “[t]he cabinet **10** includes a heat exchanger **70** mounted on a baffle plate **90**. Also mounted on the baffle plate **90** are fans **80**.” (Ex. 1005, 4:18-19, Figures 1, 4.) Yare further states that “[a]ir is circulated **within the sealed zone 30 due to operation of the fans 80** within the cabinet and fans **25** within the display **20**.” (*Id.*, 5:1-2.)



(*Id.*, FIG. 4 (annotated).)

337. Thus, Yare discloses that fans **80**, which have motors (and their wiring harnesses), are located in the sealed zone **30** on a baffle plate **90**. Thus, the fans **80** and their motors and the motor wiring harnesses are located in the “*the pathway of*

the closed loop gas circulation path.” Further, the electronic display in the sealed zone has numerous electric components. Accordingly, Yare teaches a fan motor as “*at least one electronic component located in the pathway of the closed loop gas circulation path*” and this teaches this claim element.

6. Claim 8

- a. Element 8[pre]: “An electronic display comprising:”**
- b. Element 8[a]: “an electronic image assembly having a front portion and a rear portion;”**

338. Claims elements 8[pre] and 8[a] are identical, respectively, to claim elements 1[pre] and 1[a]. Therefore, for the reasons provided under this Ground for claim elements 1[pre] and 1[a], Yare individually, and in view of the knowledge of a POSITA, teaches claim elements 8[pre] and 8[a]. (*See supra* §§ VI.C.1.a-b.)

- c. Element 8[b]: “a closed loop gas circulation path encircling the electronic image assembly;”**

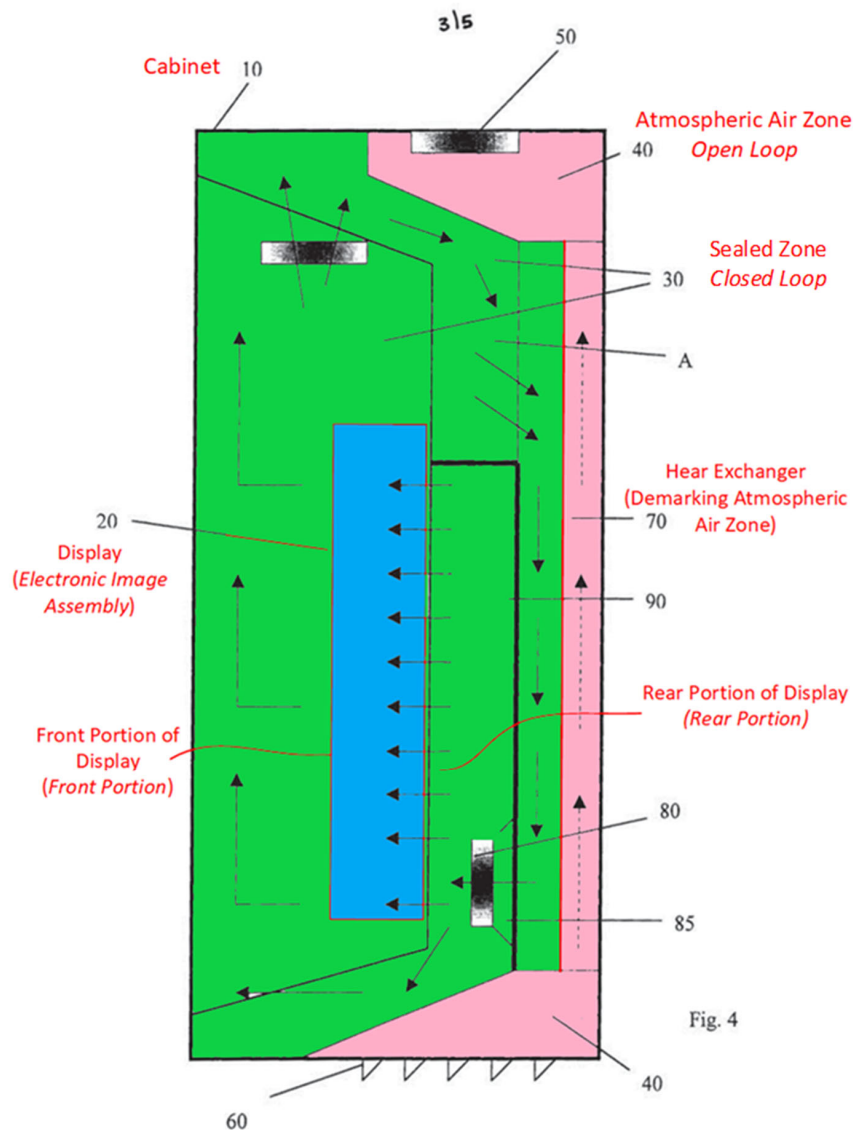
339. The difference between claim elements 8[b] and 1[c] is insubstantial, as shown below:

a closed loop gas circulation path ~~about~~encircling the electronic image assembly;

340. The difference between a “path about” and a “path encircling” is insubstantial. Moreover, as discussed for claim element 1[c], and as seen below in annotated Figure 4, Yare’s “*closed loop gas circulation path*” encircles the display

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

20 (“the electronic image assembly”). (See *supra* § VI.C.1.d.)



(Ex. 1005, FIG. 4 (annotated).)

341. Therefore, for the reasons provided under this Ground for claim element 1[c], Yare individually, or in combination with Larson, teaches this claim element. (See *supra* § VI.C.1.d.)

- d. **Element 8[c]: “an open loop ambient air flow path behind the rear portion of the electronic image assembly;”**

342. Claims element 8[c] and 1[b] are identical. Therefore, for the reasons provided under this Ground for claim element 1[b], Yare teaches this claim element.

(*See supra* § VI.C.1.c.)

- e. **Element 8[d]: “a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel;”**

343. The difference between claim element 8[d] and claim elements 2[a] and 2[b] together is insubstantial, as shown below:

a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly; ~~and a, the~~ space ~~defined~~ between the substantially planar surface and the rear portion of the electronic image assembly ~~and the substantially planar surface~~ defining a rear channel;

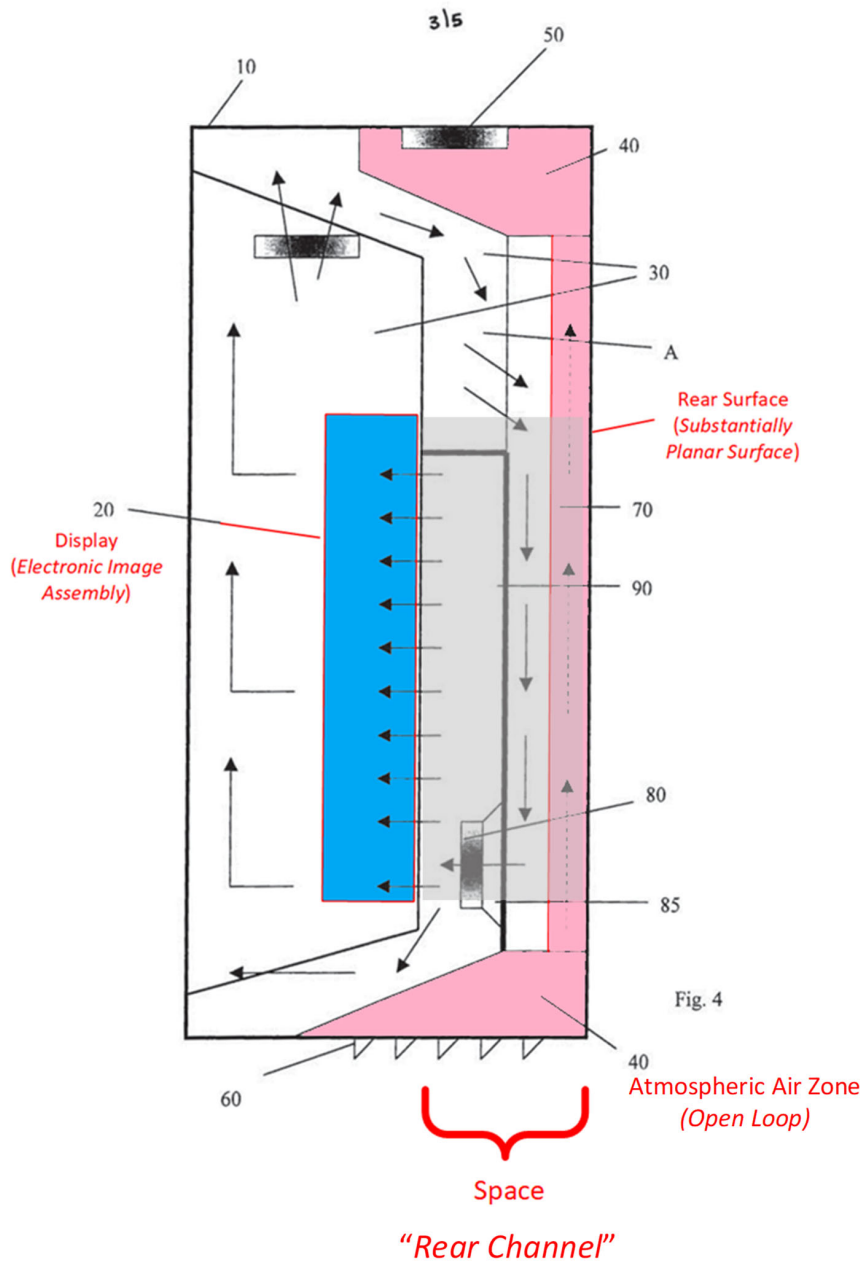
344. Claim element 2[b] recites “a space defined between the rear portion . . . and the substantially planner surface.” claim element 8[d] defines a space between the same two elements, recited in the reverses the order. Additionally claim element 8[d] labels the space “*a rear channel*.”

345. Claim element 2[b] discloses that the atmospheric air zone **40** is

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

included in “*the space between*” the cabinet’s back surface (“*the substantially planar surface*”) and “*the rear portion of*” the display **20** “*the electronic image assembly.*” (See *supra* § VI.C.2.b.) Ambient air flows through the atmospheric zone **40**. (Ex. 1005, 4:16-19 (stating that “[a]ir from the outside . . . is drawn . . . into the atmospheric air zone **40** by fans **50**,” is “draw[n] . . . through the atmospheric air zone **40**” and “is then expelled . . . through the fans **50**”).) Therefore, “*the space between*” is a “*rear channel.*”

Declaration of Robert Smith-Gillespie in Support of Petition for *Inter Partes* Review of U.S. Patent No. 10,506,740



(Ex. 1005, FIG. 4 (annotated).)

346. Thus, for the reasons provided under this Ground for claim elements 2[a] and 2[b], Yare teaches this claim element. (*See supra* §§ VI.C.2.a-b.)

f. **Element 8[e]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”**

347. The difference between claim elements 8[e] and 1[d] is insubstantial, as shown below:

a common heat exchanger ~~located in the pathway of~~in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;

348. The heat exchanger **70** “*located in the pathway of*” both the closed and open loops is “*in gaseous communication with*” those two loops. As discussed for claim elements 1[b] and 1[c], Yare’s closed and open loops both circulate air, which is a gas. (*See supra* §§ VI.C.1.c-d.) Moreover, as discussed for claim element 1[d], Yare’s corrugated heat exchanger **70** (the “*common heat exchanger*”) has two parts, namely, a front (left) part through which the air in the sealed zone **30** passes. (*See supra* § VI.C.1.e.) The corrugated heat exchanger has a rear (right) part through which the air in the atmospheric air zone **40** passes. (Ex. 1005, 6:7-11, FIGs. 5, 6.)

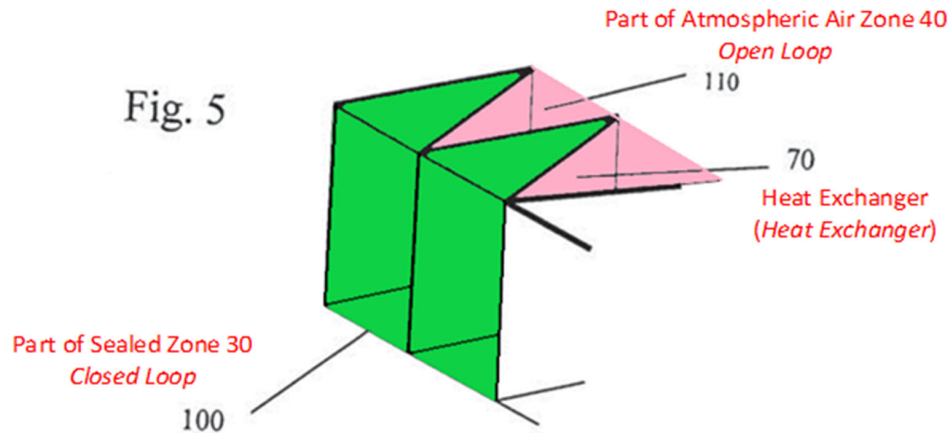
349. Specifically, Yare states:

In the illustrated embodiment of the present invention, the **heat exchanger 70** is formed from corrugated metal, thereby increasing the surface area **in contact with both the atmospheric air zone 40 and the sealed zone 30**. The heat exchanger is sealed at the top and the

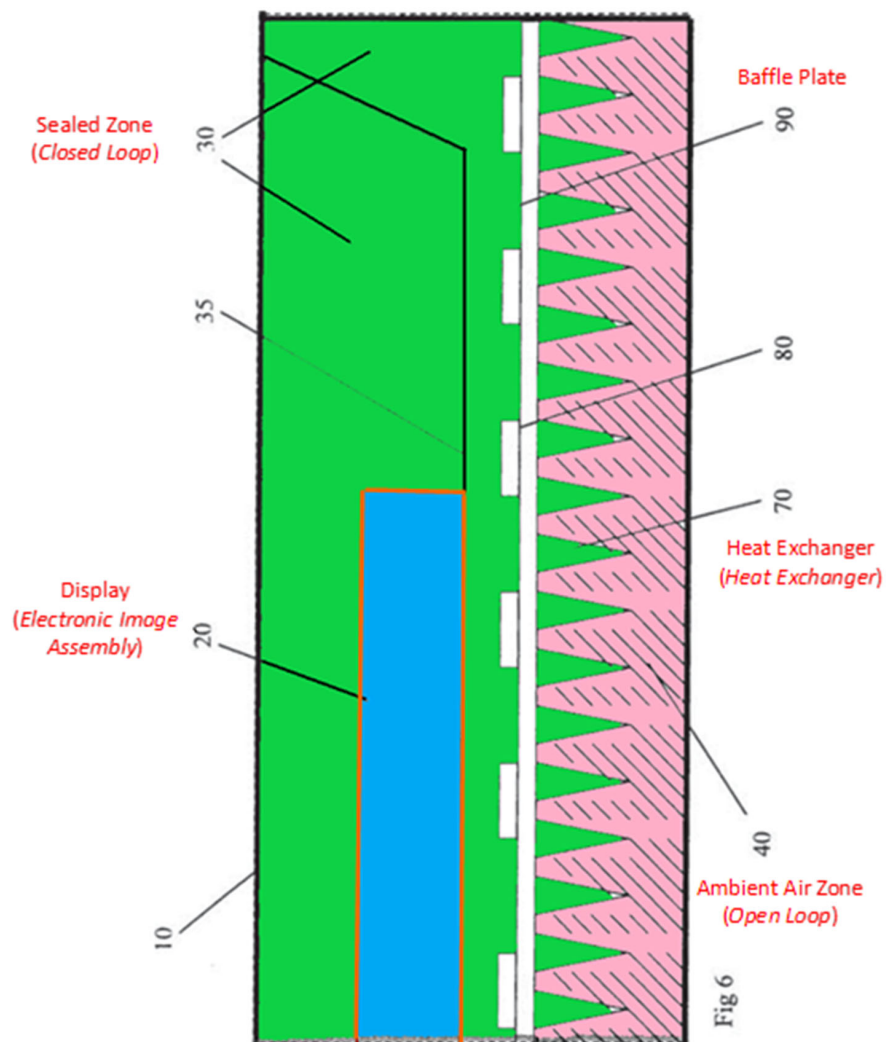
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

bottom on the inner side to **prevent atmospheric air 110 and the re-circulating air 100 within the sealed zone [30] from mixing.**

(*Id.*, 6:7-11, FIGs. 5, 6.)



(*Id.*, FIG. 5 (annotated).)



(*Id.*, FIG. 6 (annotated).)

350. Because the front part allows the passage of the air in the sealed zone **30**, where the closed loop is formed, the front part is in gaseous communication with the closed loop (highlighted green). Because the rear part allows the passage of the ambient air in the atmospheric air zone **40**, where the open loop is formed, the rear part is in gaseous communication with the open loop (highlighted pink). Therefore,

the heat exchanger **70** (the “*common heat exchanger*”) is in gaseous communication with “*both the closed loop gas circulation path and the open loop ambient air flow path.*”

351. Therefore, for the reasons provided under this Ground for claim element 1[d], Yare teaches this claim element. (*See supra* § VI.C.1.e.)

g. Element 8[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path;”

352. Yare discloses this claim element because Yare’s system includes fans **80** that force the air circulating in the closed pathway formed in the sealed zone **30**, i.e., “*to force circulating gas through the closed loop.*”

353. As discussed above for claim element 1[c], the “*closed loop gas circulation path*” (highlighted green) is formed around the display **20** within the sealed zone **30**. (*See supra* § VI.C.1.d.) Additionally, Yare states: “[t]he cabinet **10** includes a heat exchanger **70** mounted on a baffle plate **90**. Also mounted on the baffle plate **90** are **fans 80**.” (Ex. 1005, 4:18-19, Figures 1, 4.) Yare further states that “[a]ir is circulated **within the sealed zone 30 due to operation of the fans 80** within the cabinet and **fans 25** within the display **20**.” (*Id.*, 5:1-2.)

354. Thus, the fans **80** (“*at least one fan*”) are “*positioned to force circulating*” air, i.e., “*gas through*” the closed pathway within the sealed zone **30**,

i.e., “*the closed loop gas circulation path.*” Accordingly, Yare teaches this claim element.

h. Element 8[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path.”

355. Yare teaches this claim element because Yare’s system includes fans **50** to force ambient air through the atmospheric air zone **40**.

356. As discussed for claim element 1[b], the atmospheric air zone **40** is “*the open loop ambient air flow path.*” (See *supra* § VI.C.1.c.) Yare further discloses:

The cabinet **10** also includes an atmospheric air zone **40**. **Air from the outside of the cabinet 10 is drawn through vents 60 into the atmospheric air zone 40 by fans 50.** The fans **50** draw the air up through the atmospheric air zone **40**. The air is then **expelled** from the cabinet **10 through the fans 50**. **Arrows in figures 2 and 3 show the passage of air through the vents 60 into the atmospheric air zone 40 and out through the fans 50,** respectively.

(Ex. 1005, 4:11-16, Figures 1-4.)

357. Thus, the fans **50** are “*at least one fan positioned to force ambient air through*” the atmospheric air zone **40** (“*the open loop ambient air flow path,*”) and thus, Yare teaches this claim element.

358. In summary, Yare discloses each and every element of claim 8, and renders claim 8 obvious.

7. Claim 9

359. Claim 9 recites: “The electronic display of claim 8, wherein the open loop ambient air flow path is also in gaseous communication with the rear channel.”

360. The difference between claim 9 and claim element 2[c] is insubstantial, as shown below:

wherein the ~~space is in gaseous communication with the open loop ambient air flow path~~ is also in gaseous communication with the rear channel.

361. The phrase marked in green is simply moved, and the order in which the two elements in gaseous communication are recited in claim element 2[c] is reversed in claim 9, but the elements remain the same. Therefore, for the reasons provided under this Ground for claim element 2[c], Yare teaches this claim. (*See supra* § VI.C.2.c.)

8. Claim 11

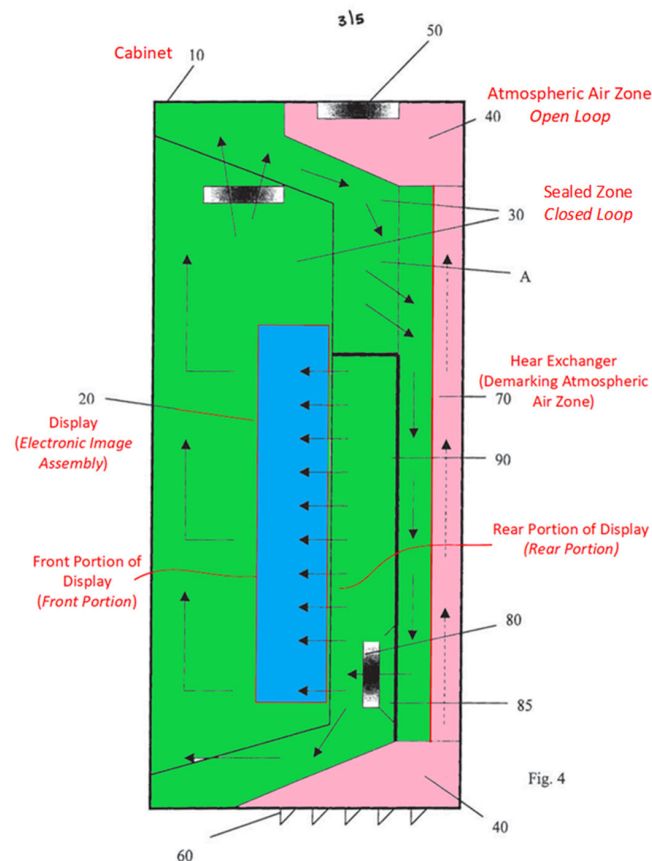
- a. Element 11[a]: “The electronic display of claim 8, wherein: the common heat exchanger includes first and second gas pathways, the first and second gas pathways being isolated from each other;”**

362. Yare teaches this claim element because Yare’s heat exchanger 70 (“*the common heat exchanger*”) includes a first, rear part and a second, front part that provide two pathways that are isolated from each other.

363. As discussed for claim element 1[d], Yare’s corrugated heat exchanger

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

70 (the “common heat exchanger”) has two parts: a first (rear, right) part through which the air in the atmospheric air zone 40 passes; and a second (front, left) part through which the air in the sealed zone 30 passes. (*See supra* § VI.C.1.e; Ex. 1005, 6:7-11, FIGs. 4-6.)



(Ex. 1005, FIG. 4 (annotated).)

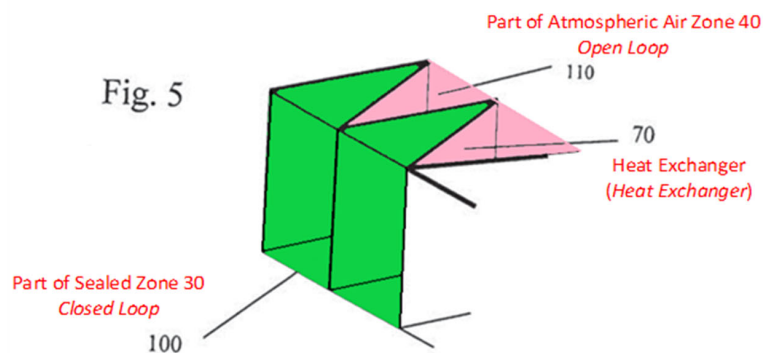
364. Specifically, Yare states:

In the illustrated embodiment of the present invention, the **heat exchanger 70** is formed from corrugated metal, thereby increasing the

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

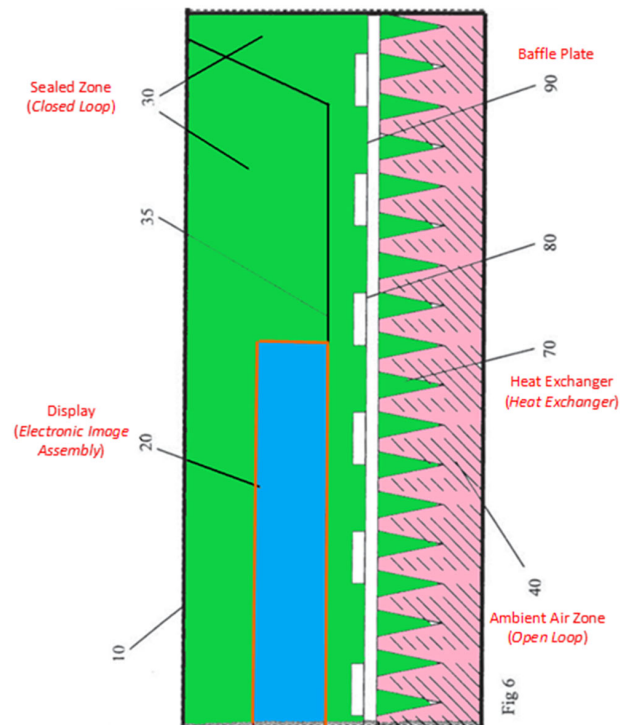
surface area **in contact with both the atmospheric air zone 40 and the sealed zone 30**. The heat exchanger is sealed at the top and the bottom on the inner side to **prevent atmospheric air 110 and the re-circulating air 100 within the sealed zone [30] from mixing**.

(*Id.*, 6:7-11, FIGs. 5, 6.)



(*Id.*, FIG. 5 (annotated).)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 6 (annotated).)

365. As seen in the annotated Figures 4-6, the first (rear, right) part allows the passage of the ambient air, a gas, in the atmospheric air zone **40**, and forms the first gas pathway therewithin, i.e., within the “*open loop ambient air flow path*” (highlighted pink). The second (front, left) part allows the passage of the air, a gas, in the closed path within the sealed zone **30**, and thus forms a second gas pathway therewithin, i.e., within the “*the closed loop gas circulation path*” (highlighted green).

366. In addition, Yare states that “[t]he heat exchanger is sealed at the top and the bottom on the inner side to **prevent atmospheric air 110 and the re-**

circulating air 100 within the sealed zone [30] from mixing.” (*Id.*, 6:9-11, FIG. 5.) Thus, the heat exchanger **70** (“*the common heat exchanger*”) “*includes first and second gas pathways, the first and second gas pathways being isolated from each other.*”

367. Accordingly, Yare teaches this claim element.

b. Element 11[b]: “where the first gas pathway is in gaseous communication with the open loop ambient air flow path; and

368. Yare teaches this claim element. As discussed for claim element 11[a] and as seen in the annotated Figures 4-6 above, in the heat exchanger **70**, the first gas pathway (rear, right) allows the passage of the ambient air, a gas, in the atmospheric air zone **40**, i.e., the “*open loop ambient air flow path*” (highlighted pink). (*See supra* § VI.C.8.a.) Thus, “*the first gas pathway is in gaseous communication with the open loop ambient air flow path.*” Accordingly, Yare teaches this claim element.

c. Element 11[c]: “where the second gas pathway is in gaseous communication with the closed loop gas circulation path.”

369. Yare teaches this claim element. As discussed for claim element 11[a] and as seen in the annotated Figures 4-6 above, in the heat exchanger **70**, the second gas pathway (front, left) allows the passage of the air, a gas, in the closed path within

the sealed zone **30**, i.e., the “*the closed loop gas circulation path*” (highlighted green). (See *supra* § VI.C.8.a.) Thus, “*the second gas pathway is in gaseous communication with the closed loop gas circulation path.*” Accordingly, Yare teaches this claim element.

9. Claim 12

370. Claim 12 recites: “The electronic display of claim 11, wherein the first gas pathway is also in gaseous communication with the rear channel.”

371. Yare discloses this claim element. As discussed for claim elements 8[d], 2[a], and 2[b], the “*rear channel*” is defined by the space between the rear portion of the display **20** and the back surface of the cabinet **10**. (See *supra* §§ VI.C.2.a-b, VI.C.6.e.) As also discussed for claim elements 8[d], 2[a], and 2[b], the atmospheric air zone **40** is included in the “*rear channel*.” (See *id.*)

372. As discussed for claim element 1[b], the atmospheric air zone **40** is the “*open loop ambient air flow path*.” (See *supra* § VI.C.1.c.) Finally, as discussed for claim element 11[b], the first, rear gas pathway forms a part of the atmospheric air zone **40**, and hence, is in gaseous communication with the “*open loop ambient air flow path*.” (See *supra* § VI.C.8.b.) Thus, the atmospheric air zone **40** is part of both the “*first gas pathway*” and the “*rear channel*,” and as such, “*the first gas pathway is also in gaseous communication with the rear channel.*” Accordingly, Yare teaches

this claim.

10. Claim 13

373. Claim 13 recites: “The electronic display of claim 8, wherein the substantially planar surface is a plate.”

374. Claim 13 is identical to claim 3. Therefore, for the reasons provided under this Ground for claim 3, Yare discloses the limitations of claim 13. (*See supra* § VI.C.3.)

11. Claim 15

- a. **Element 15[a]: “The electronic display of claim 8, further comprising: a front display surface spaced apart from the front portion of the electronic image assembly; and**
- b. **Element 15[b]: “a front channel defined by a 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.”**

375. Claims elements 15[a] and 15[b] are identical, respectively, to claim elements 5[a] and 5[b]. Therefore, for the reasons provided under this Ground for claim element 5[a] and 5[b], Yare teaches claim elements 15[a] and 15[b]. (*See supra* § VI.C.4.)

12. Claim 16

376. Claim 16 recites: “The electronic display of claim 8, further comprising

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.”

377. Claim 16 is identical to claim 6. Therefore, for the reasons provided under this Ground for claim 6, Yare discloses the limitations of claim 20. (*See supra* § VI.C.5.)

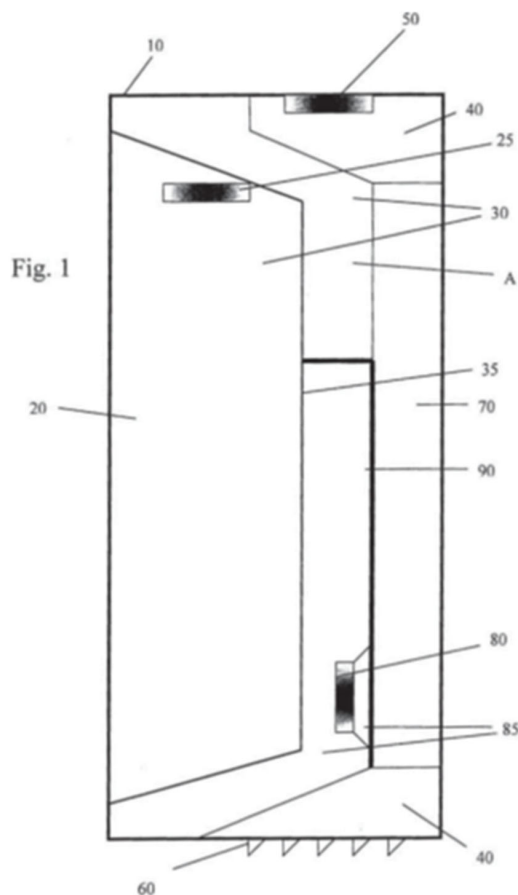
13. Claim 17

a. Element 17[pre]: “A cooling system for an electronic image assembly, comprising:”

378. To the extent it is limiting, Yare teaches the preamble because Yare discloses a cabinet **10** having “improved cooling facilities” (i.e., a “*cooling system*”) and a display **20**, e.g., an LCD display (“*an electronic image assembly*”).

379. Yare discloses “[a] cabinet **10** is arranged to contain a **display 20** for displaying information, advertisements or other visual media. The display [**20**] is sealed within the cabinet in a sealed zone **30**.” (Ex. 1005, 4:4-6, Figures 1, 4.) Yare also states that “[t]he present invention relates to a cabinet for mounting a display system, the **cabinet having improved cooling facilities** and which is particularly suitable for use in providing large scale displays in public places.” (*Id.*, 7:4-6.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(*Id.*, FIG. 1.)

380. Additionally, Yare states that “[v]arious forms of display system may be used, for example plasma, **LCD**, TFT, CRT, LED, rear projection or any similar technology.” (*Id.*, 6:31-32.) A POSITA would have known that an LCD is an assembly of several components including a liquid crystal layer and a backlight. (*See, e.g.*, Ex. 1010, 1:22-27, FIG. 1.) Therefore, a POSITA would have understood Yare’s display **20**, that can be an LCD, as “*an electronic image assembly.*”

381. Thus, Yare discloses a cabinet **10** having improved cooling facilities,

i.e., “[a] *cooling system*” for a display **20** such as an LCD display, i.e., “*an electronic image assembly*.” Accordingly, Yare teaches the preamble of claim 1.

b. Element 17[a]: “an open loop ambient air flow path at a rear portion of the electronic image assembly;”

382. The difference between claim elements 17[a] and 1[b] is insubstantial, as shown below:

an open loop ambient air flow path ~~behind the~~at a rear portion of the electronic image assembly;

383. It is described in connection with claim element 1[b] that Yare’s “atmospheric air zone **40**” is an “*open loop ambient air flow path*.” (See *supra* § VI.C.1.c.) The flow of ambient air through the atmospheric air zone **40** occurs behind, i.e., substantially “*at a rear portion of*” the display **20** (“*the electronic image assembly*”).

384. This is consistent with the ’740 patent, as discussed for this claim element under Ground 1. Therefore, for the reasons provided under this Ground for claim element 1[b], Yare teaches this claim element. (See *supra* § VI.C.1.c.)

c. Element 17[b]: “a closed loop gas circulation path encircling the electronic image assembly;”

d. Element 17[c]: “a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;”

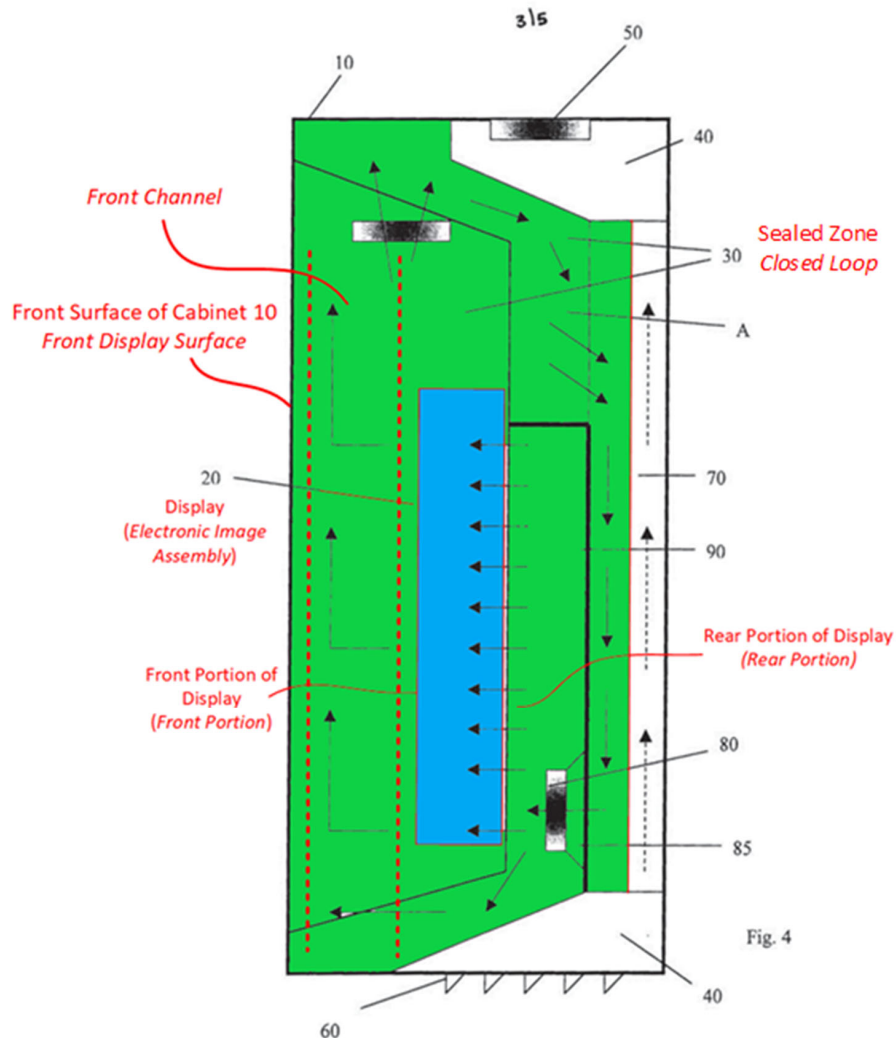
Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

385. Claims elements 17[b] and 17[c] are identical, respectively, to claim elements 8[b] and 8[e]. Therefore, for the reasons provided under this Ground for claim elements 8[b] and 8[e], Yare teaches claim elements 17[b] and 17[c]. (*See supra* §§ VI.C.6.c, VI.C.6.f.)

- e. **Element 17[d]: “a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of and spaced apart from the front portion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path;”**

386. Yare individually, and in view of the knowledge of a POSITA, teaches this claim element. As discussed for this claim element under Ground 1, the differences between the corresponding limitations of claim element 17[d] and claim elements 5[a] and 5[b] are insubstantial.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(Ex. 1005, FIG. 4 (annotated).)

387. As seen in the annotated Figure 4 above, in Yare's system, the front transparent surface of the cabinet **10** is located forward of and spaced apart from the front portion of the display **20** (highlighted blue) ("*the electronic image assembly*").

388. Therefore, for the reasons provided under this Ground in connection with claim elements 5[a] and 5[b], Yare individually, and in combination with

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

Larson, teaches this claim element. (*See supra* § VI.C.4.)

- f. **Element 17[e]: “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;”**

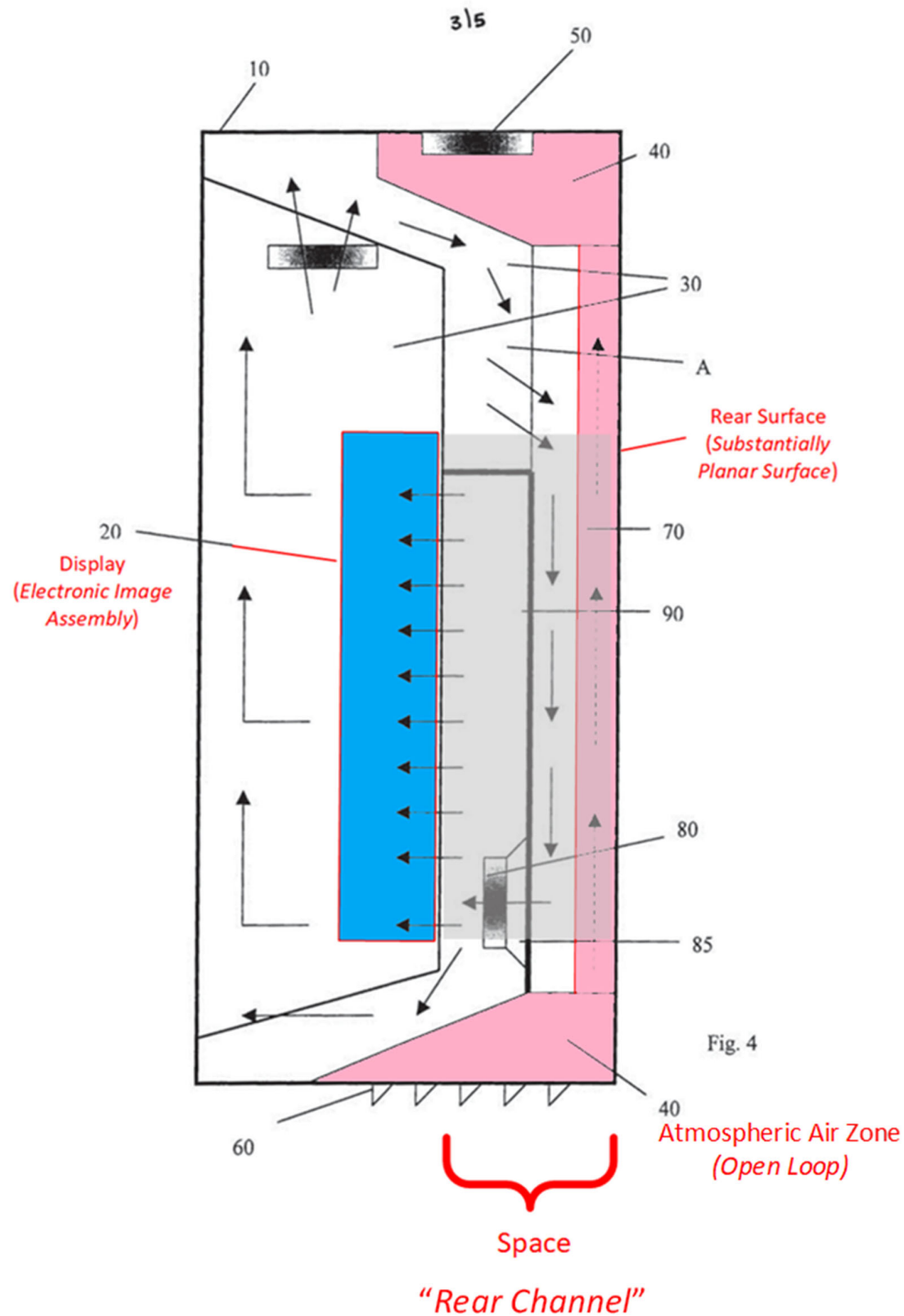
389. The difference between claim elements 17[e] and 8[d] is shown below:

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 ~~space between the substantially planar surface and the rear portion of the electronic image assembly defining a~~ rear channel forming a part of the open loop ambient air flow path;

390. Other than the addition of the limitation “*rear channel forming a part of the open loop ambient air flow path*” the rest of the differences are simply reordering of the claim terms and are thus insubstantial.

391. As discussed for claim elements 1[b] and 8[d], Yare’s atmospheric air zone **40** is both the “*open loop ambient airflow path*,” and forms at least a part of the “*rear channel*.” (*See supra* §§ VI.C.1.c, VI.C.6.e.)

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740



(Ex. 1005., FIG. 4 (annotated).)

392. Therefore, Yare teaches this claim element.

- g. Element 17[f]: “at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and”**

393. The difference between claim elements 17[f] and 8[f] is shown below:

at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and

394. Claim element 17[f] additionally recites forcing the circulating gas through “*the common heat exchanger.*” But, claim element 1[e] recites “a gas circulation device positioned to force circulating gas through the common heat exchanger.” As discussed for claim elements 1[e], Yare’s “*gas circulation device*” is fans **80**, (*see* Ex. 1005, Figs. 1, 4), i.e., “*at least one fan.*” Therefore, for the reasons provided under this Ground for claim elements 8[f] and 1[e], Yare teaches this claim element. (*See supra* §§ VI.C.1.f, VI.C.6.g.)

- h. Element 17[g]: “at least one fan positioned to force ambient air through the open loop ambient air flow path and the common heat exchanger.”**

395. The difference between claim elements 17[g] and 8[g] is shown below:

at least one fan positioned to force ambient air through the open loop ambient air flow path: and the common heat exchanger.

396. Claim element 17[g] additionally recites forcing the circulating gas through “*the common heat exchanger.*” But, claim element 1[f] recites “*an air*

circulation device positioned to force ambient air through the common heat exchange.” As discussed for claim elements 1[f], Yare’s “*air circulation device*” is fans 50, *see* Yare, Figs. 1 and 4, i.e., “*at least one fan.*” Therefore, for the reasons provided under this Ground for claim elements 8[g] and 1[f], Yare teaches this claim element. (*See supra* §§ VI.C.1.g, VI.C.6.h.)

397. In summary, Yare discloses all of the elements of claim 17, and renders claim 17 unpatentable as obvious.

14. Claim 18

398. Claim 18 recites: “The cooling system of claim 17, wherein the substantially planar surface is a plate.”

399. Claim 18 is identical to claim 3. Therefore, for the reasons provided under this Ground for claim 3, Yare discloses the limitations of claim 18. (*See supra* § VI.C.3.)

15. Claim 20

400. Claim 20 recites: “The cooling system of claim 17, further comprising at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights,

thermo-electric devices, and switches.”

401. Claim 20 is identical to claim 6. Therefore, for the reasons provided under this Ground for claim 6, Yare discloses the limitations of claim 20. (*See supra* § VI.C.5.)

VII. NO SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

402. I understand from counsel that the Patent Owner in the underlying district court litigation has not yet identified any evidence with respect to secondary considerations of non-obviousness.

403. To the extent the Patent Owner cites any evidence of sales or any praise or any industry recognition of products that the Patent Owner asserts to implement the claimed invention, I am not aware of any information demonstrating that any purported increased sales, commercial success, praise, or any other secondary factor (that the Patent Owner may assert) was a result of the particular features recited in the '740 patent's claims. Since the Patent Owner has not yet identified any evidence of secondary considerations, the Patent Owner cannot demonstrate that the limitations of the claimed invention in particular, as opposed to other features of the products at issue, were the factors that caused any increased sales, praise, or any other asserted secondary considerations.

404. Thus, based on my review of the evidence to date, I can summarize my

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

opinions regarding any alleged secondary considerations of non-obviousness relating to the '740 patent, as follows:

405. *No commercial success of the claimed invention.* The Patent Owner has not cited any evidence of particular commercial success of products embodying the '740 patent as opposed to products that do not embody the '740 patent. The Patent Owner has not cited any evidence that any commercial success of any products is particularly a result of the claimed inventions recited in the '740 patent's claims and not due to any other facts.

406. *No long-felt but unsolved need.* The Patent Owner has not cited any evidence of any long-felt need that remained unsolved in the prior art before the '740 patent. To the contrary, as discussed above, the prior art solved the problems that the '740 patent purported to address.

407. *No failure of others.* The Patent Owner has not cited any evidence of anyone who tried, but failed, to solve the problems addressed by the '740 patent. As shown by my analysis above, there existed prior art references that successfully disclosed and rendered obvious the subject matter claimed by the '740 patent.

408. *No copying of the claimed invention.* The Patent Owner has not cited any evidence that any other party (including Facebook or third parties) ever copied from the '740 patent and its claimed invention.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

409. *No unexpected results of the claimed invention.* The Patent Owner has not cited any evidence of unexpected results achieved by the '740 patent's claimed invention. To the contrary, the prior art disclosed the predictable, expected results that show why the '740 patent's claims are obvious as discussed in my Declaration.

410. *No praise for the claimed invention.* The Patent Owner has not cited any evidence of praise for the claimed invention recited in the '740 patent.

411. *No surprise or skepticism at the claimed invention.* The Patent Owner has not cited any evidence that observers were surprised by, or skeptical of, the claimed invention recited in the '740 patent.

412. *No departure from the wisdom of the prior art.* The Patent Owner has not cited any evidence that the claimed inventions of the '740 patent departed from the wisdom of the prior art. The '740 patent claims subject matter that was already present in the prior art, including in the references discussed in my analysis above.

413. Moreover, with respect to the considerations discussed above, I also refer to and incorporate my opinions stated throughout this Declaration, including my analysis showing that the '740 patent is directed to techniques known in the prior art and does not provide any inventive technology.

414. To the extent the Patent Owner at a later date cites or provides any other evidence regarding secondary considerations, including any expert opinions,

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

I reserve the right to supplement my analysis and opinions to comment on it.

VIII. CONCLUSION

415. In my opinion, based on my review of the '740 patent, the materials referenced herein, and my knowledge of what a person of ordinary skill in the art would have known at and before the '740 patent's priority date about the technology at issue, a POSITA would have understood all of the limitations of the Challenged Claims to be present and described in the prior art discussed above. Accordingly, it is my opinion that Challenged Claims should be found unpatentable, and should be cancelled.

416. Furthermore, I reserve the right to supplement my opinions in the future to respond to any arguments or positions that the Patent Owner may raise, taking account of new information as it becomes available to me.

417. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 10,506,740

Respectfully submitted,

Dated: December 12, 2022


Robert Smith-Gillespie