

**UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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

v.

MANUFACTURING RESOURCES INTERNATIONAL, INC.,
Patent Owner

U.S. Patent Nos. 10,506,740 & 11,013,142

Title: Electronic Display with Cooling

Inter Partes Review Nos. IPR2023-00221 and -00254

MRI's Outdoor Display Products



Ex. 2054

The '740 and '142 Patents



US011013142B2

(12)

United States Patent

Dunn et al.

(10) Patent No.:

US 11,013,142 B2

(45) Date of Patent:

May 18, 2021

(54) ELECTRONIC DISPLAY WITH COOLING

(71) Applicant: Manufacturing Resources International, Inc., Alpharetta, GA (US)

(72) Inventors: William Dunn, Alpharetta, GA (US); Tim Hubbard, Alpharetta, GA (US)

(73) Assignee: Manufacturing Resources International, Inc., Alpharetta, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 16/933,932

(22) Filed: Jul. 20, 2020

(65) Prior Publication Data
US 2020/0352049 A1 Nov. 5, 2020

(63) Related U.S. Application Data
Continuation of application No. 16/708,260, filed on Dec. 9, 2019, now Pat. No. 10,721,836, which is a (Continued)

(51) Int. CL
H05K 7/20 (2006.01)
G02F 1/1333 (2006.01)
(Continued)

(52) U.S. CL
CPC H05K 7/202 (2013.01); G02F 1/133385 (2013.01); H05K 7/20136 (2013.01);
(Continued)

(58) Field of Classification Search
CPC ... G02B 5/30; G02B 6/0055; G02F 1/133528; G02F 2001/133388; G02F 1/133308;
(Continued)

(56) References Cited

U.S. PATENT DOCUMENTS

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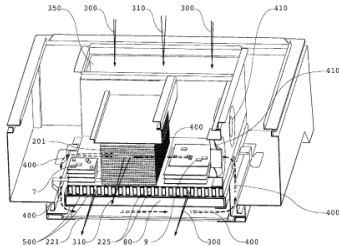
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Mentley, David E., State of Flat-Panel Display Technology and Future Trends, Proceedings of the IEEE, Apr. 2002, vol. 90, No. 4, pp. 453-459.

(Continued)

(57) ABSTRACT

Systems and methods for cooling an electronic image assembly are provided. A transparent panel forms a front portion of a housing for the electronic image assembly. The transparent panel is located forward of, and at least some distance from the electronic image assembly. An airflow pathway passes through the housing between said electronic image assembly and said transparent panel. An air circulation device forces air through the airflow pathway. At least one polarizer is located at the transparent panel is configured to reduce solar energy entering said airflow pathway.





US010506740B2

(12)

United States Patent

Dunn et al.

(10) Patent No.:

US 10,506,740 B2

(45) Date of Patent:

Dec. 10, 2019

(54) ELECTRONIC DISPLAY WITH COOLING

(71) Applicant: Manufacturing Resources International, Inc., Alpharetta, GA (US)

(72) Inventors: William Dunn, Alpharetta, GA (US); Tim Hubbard, Alpharetta, GA (US)

(73) Assignee: Manufacturing Resources International, Inc., Alpharetta, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 15/789,331

(22) Filed: Oct. 20, 2017

(65) Prior Publication Data
US 2018/0042134 A1 Feb. 8, 2018

(63) Related U.S. Application Data
Continuation of application No. 14/834,034, filed on Aug. 24, 2015, now Pat. No. 9,801,305, which is a (Continued)

(51) Int. CL
H05K 7/20 (2006.01)
G02F 1/1333 (2006.01)
(Continued)

(52) U.S. CL
CPC H05K 7/202 (2013.01); G02F 1/133385 (2013.01); H05K 7/20136 (2013.01);
(Continued)

(58) Field of Classification Search
CPC H05K 7/202; H05K 7/20136; H05K 7/20163; H05K 7/20972; G02F 1/133385
See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

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4,593,978 A 6/1986 Mourey et al.

(Continued)

FOREIGN PATENT DOCUMENTS

AU 2011248190 B2 5/2011

CN 2702363 Y 5/2005

(Continued)

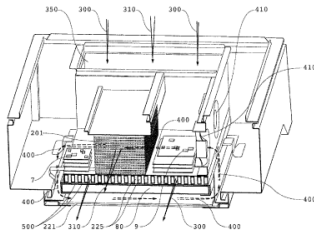
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Zedff, T.M., EMC analysis of an 18" LCD monitor, 2000, 1 page.

(Continued)

(57) ABSTRACT

An electronic display including an electronic image assembly and a cooling system for an electronic image assembly. A closed loop gas circulation path and an open loop ambient air flow path are provided to effectuate cooling. A common heat exchanger is located in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path. The open loop ambient air flow path facilitates removal of heat from gas circulating within the closed loop gas circulation path. A cooling channel may be located behind a rear portion of the electronic image assembly to further enhance cooling via the circulation of ambient air therein.



Ex. 1001

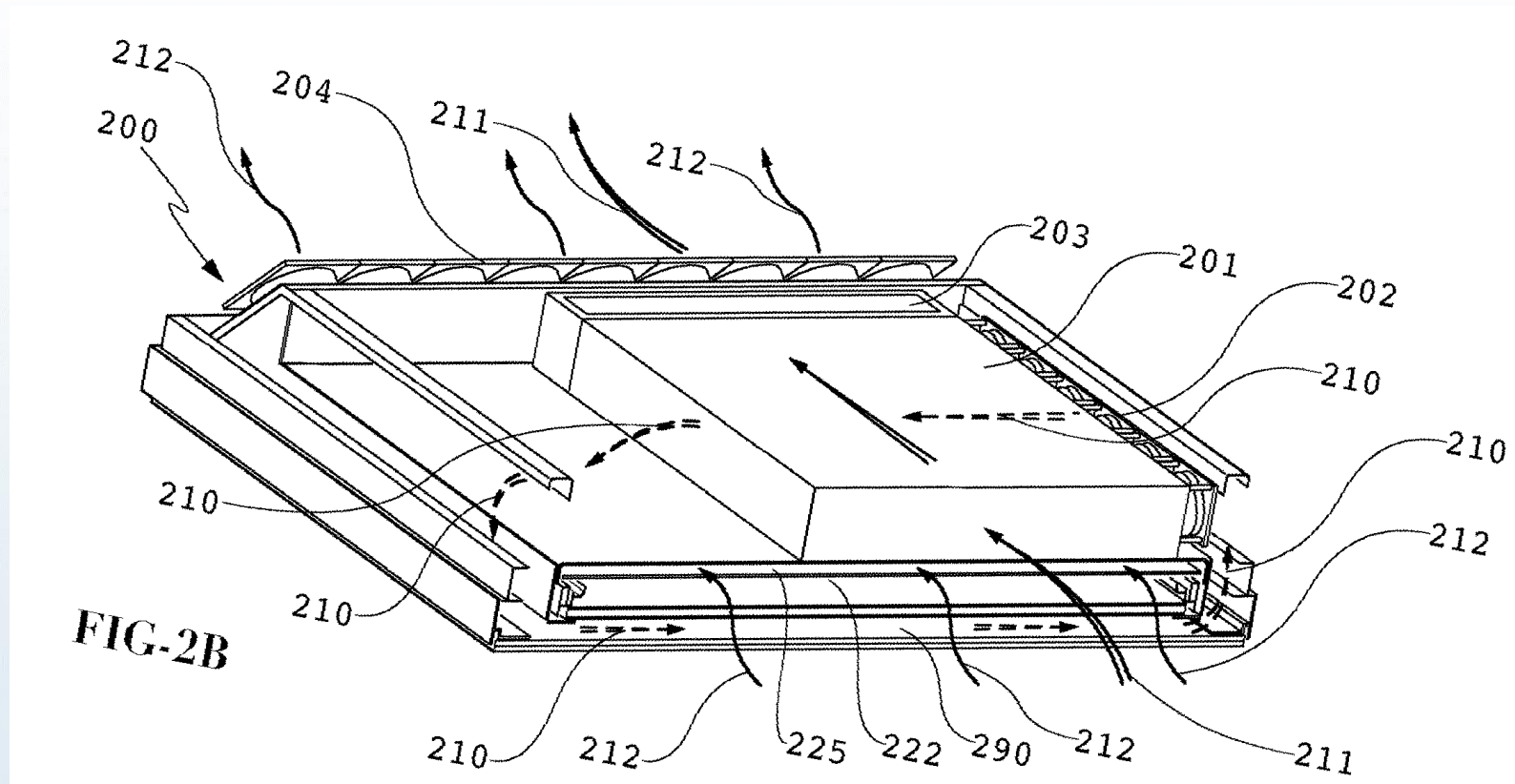
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MRI
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DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

Patent Owner Manufacturing Resources International, Inc.
Exhibit 2059 - Page 3 of 29

The '740 and '142 Patents



'740 Patent, Claim 1

1. An electronic display comprising:
an electronic image assembly having a front portion and a rear portion;
an ***open loop ambient air flow path*** behind the rear portion of the electronic image assembly;
a ***closed loop gas circulation path*** about the electronic image assembly;
a ***common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path***;
a gas circulation device positioned to ***force circulating gas through the common heat exchanger***; and
an air circulation device positioned to force ambient air through the common heat exchanger.

'142 Patent, Claim 6

6. A cooling system for an electronic image assembly, the cooling system comprising:

a housing for the electronic image assembly;

a transparent cover panel forming a front portion of the housing, the transparent cover panel located forward of, and at least some distance from, the electronic image assembly;

an ***open loop airflow pathway*** passing through the housing behind the electronic image assembly;

a ***closed loop gas circulation pathway*** contained within the housing, wherein a portion of said closed loop gas circulation pathway passes between said transparent cover panel and said electronic image assembly;

an inlet located at a first portion of said housing for ingesting ambient air into said open loop airflow pathway;

an exhaust located at a second portion of said housing for exhausting said ambient air from said open loop airflow pathway;

an air circulation device positioned along said open loop airflow pathway between said inlet and said exhaust, wherein said air circulation device is configured to force said ambient air through the open loop airflow pathway when activated;

a gas circulation device positioned along said closed loop gas circulation pathway to force circulating gas around the closed loop gas circulation pathway when activated;

a ***heat exchanger located rearward of the electronic image assembly***, wherein ***a first portion of said heat exchanger forms part of said open loop airflow pathway, and wherein a second portion of said heat exchanger forms part of said closed loop gas circulation pathway***; and

one or more ***solar energy reduction layers located at said transparent cover panel***, wherein each of said one or more solar energy reduction layers is configured to prevent a portion of solar energy entering said transparent cover panel from thermally interacting with the circulating gas at said portion of said closed loop gas circulation pathway passing between said transparent cover panel and said electronic image assembly or thermally interacting with said electronic image assembly.



MANUFACTURING RESOURCES
INTERNATIONAL

DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

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Petitioner's Grounds

'142 Patent (IPR2023-00221)

Ground I	Claims 1-15	Karppanen (Ex. 1004) and Larson (Ex. 1005)
Ground II	Claims 1-15	Yare (Ex. 1006) and Larson (Ex. 1005)

'740 Patent (IPR2023-00254)

Ground I	Claims 1-3, 5-9, 11-13, 15-18, and 20	Karppanen (Ex. 1004)
Ground II	Claims 1-3, 5-9, 11-13, 15-18, and 20	Yare (Ex. 1005)

Karppanen

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 October 2007 (18.10.2007)

PCT

(10) International Publication Number
WO 2007/116116 A1

(51) International Patent Classification:
G09F 9/31 (2006.01) *G09F 9/35* (2006.01)
G09F 9/31 (2006.01) *G09F 19/22* (2006.01)

(21) International Application Number:
PCT/JP2006/050145

(22) International Filing Date: 11 April 2006 (11.04.2006)

(25) Filing Language: Finnish

(26) Publication Language: English

(71) Applicant (for all designated States except US): SYMBI-
CON OY [FI/3]; Viestitie 2, FI-87700 Kajaani (FI).

(72) Inventors; and
(75) Inventors/Applicants (for US only): KARPPANEN,
Pasi [FI/1]; Kämpine 2 A/ 3, FI-87150 Kajaani (FI);
SUOMELA, Niko [FI/1]; Karolinantie 2B A7, FI-87200
Kajaani (FI); PYYKÖNEN, Markku [FI/1]; Karhun-
polku 2 B, FI-88900 Kuluho (FI).

(74) Agent: BERGGREN OY AB; Lemskatu 2, FI-90460
Oulunsalo (FI).

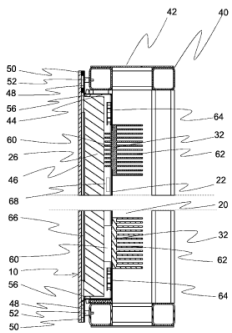
(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, GR, HU, ID, IL, IN, IS, JP, KE,
KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV,
LY, MA, MD, MG, MK, MN, MW, MX, MY, NA, NG, NI,
NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG,
SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US,
UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,
RO, SI, SK, TR), OAPI (BF, BJ, CI, CG, CM, GA,
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
with international search report

[Continued on next page]

(54) Title: ELECTRONIC INFORMATION BOARD



(57) Abstract: The invention relates to an electronic in-
formation board comprising a frame (40), a flat display ele-
ment (26), such as a TFT LCD display or plasma display for
presenting information, and electronic equipment for con-
trolling the display element. The information board has a
weatherproof device casing (10) for the display element and
a weatherproof device casing (12) for the electronic equip-
ment needed for controlling the display element. Between
the casings, there is a common cooling space (20) for cool-
ing the devices in the display casing and the device casing.
The display casing and the device casing can be separated
from each other for opening the cooling space for the du-
ration of the updating and maintenance of the information
board. The display casing has a back wall (22) bordered to
the cooling space, having cooling elements for transferring
heat from the display casing to the cooling space. Similarly,
the device casing has a back cover bordered to the cooling
space, having cooling elements for transferring heat from
the device casing to the cooling space. On the opposite sides
of the cooling space there are ventilator slots, and inside the
cooling space there are cooling fans for enabling air flow
through the cooling space. There may be vertical or hori-
zontal flow ducts in the cooling space for controlling the air
flow.

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Patent Owner Manufacturing Resources International, Inc.
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Ex. 1004

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“Heat Exchanger”

Petitioner	“plain and ordinary meaning”	“a device used to transfer heat from the closed loop pathway, i.e. the circulating gas, to the open loop pathway, i.e. the ambient gas, which includes finned heat sinks as disclosed by Karppanen.”
Patent Owner	“plain and ordinary meaning”	“a device that uses alternating, enclosed channels or tubes of fluid.”

Paper 17 at 20;
Paper 28 at 5.

“Heat Exchanger”

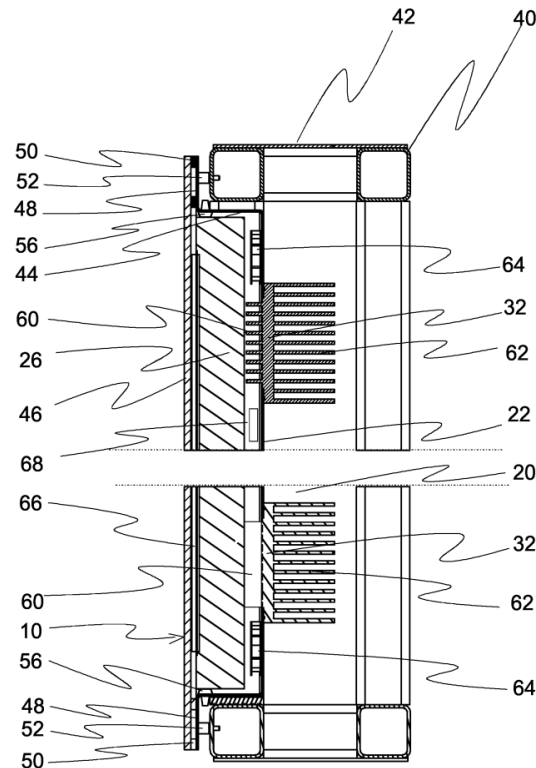


Fig. 2

In 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. The second heat transfer part comprises a number of plate-like cooling fins placed side by side.

The second cooling element 32, the first heat transfer part of which comprises a conduction element set against the surface of the display element 26, is shown by way of example in the lower part of Fig. 2. The conduction element has been fastened to the surface of the display plate preferably by glueing. Either conduction elements or cooling elements comprising cooling fins, or both, can be used in the display casing according to need. The cooling elements are preferably so-called Peltier elements.

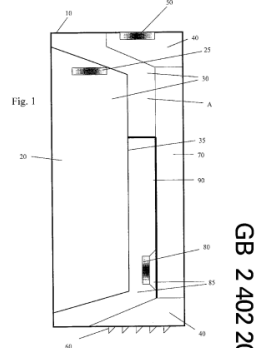
Yare

UK Patent Application GB 2 402 205 A

(21) Application No:	0911575.5	(51) INT CL:	H04N 5/04, F25D 23/12, F28D 3/00 11/02 16/02, F28F 3/00
(22) Date of Filing:	20.05.2003	(52) UK CL (Edition W):	F4U U22X U25B F4H H2F H2H H2L F4S S4B U1B S22B S22B
(71) Applicant:	Densitron Technologies PLC (Incorporated in the United Kingdom) Unit 4 Airport Industrial Estate, BIGN HILL, Kent, TN16 3BW, United Kingdom	(56) Documents Cited:	CN 001110463 A JP 060307257 A US 6614419 A
(72) Inventor:	Leslie John Yare	JP 100042226 A JP 060288388 A US 6039111 A	
(74) Agent and/or Address for Service:	Williams Powell Morley House, 25-30 Holborn Viaduct, LONDON, EC1A 2BP, United Kingdom	(58) Field of Search:	UK CL (Edition V) F4H, F4U INT CL: A47F, F24F, F25B, F25D, F28B, F28C, F28D, F28F, H04N Other: ON-LINE: WPI; EPDOC; JAPIO; EPOQUE English Full TXTE

(54) Abstract Title: A display system cabinet and display system including heat removal means

(57) A display cabinet 10 has a sealed airtight compartment 30 for mounting a display system 20, and includes heat transfer means 70, such as a corrugated heat exchanger, to dissipate heat from the airtight compartment to the surrounding environment via thermal communication with an unsealed atmospheric zone 40. Heat is dissipated by air drawn through vents 60 and the atmospheric air zone 40 by at least one fan 50, which passes across one or more surfaces of the heat exchanger 70. Within the sealed compartment at least one fan 25 circulates air through a rear portion 35, behind a baffle plate 90 and also across the heat exchanger 70. The airtight compartment may include a pressurised zone 85 created by at least one fan 80, and the heat transfer means may alternatively include a heat pipe, a refrigeration unit, a flat plate heat exchanger, or a heat wheel. The display system may include one or more of a plasma display, an LCD display, a TFT display, a CRT display, an LED display, a projection display.



GB 2 402 205 A

This print incorporates corrections made under Section 117(1) of the Patents Act 1977. Original Printed on Recycled Paper

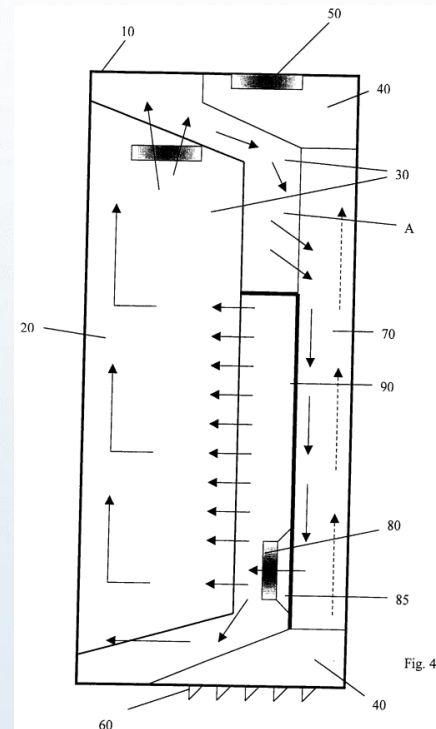
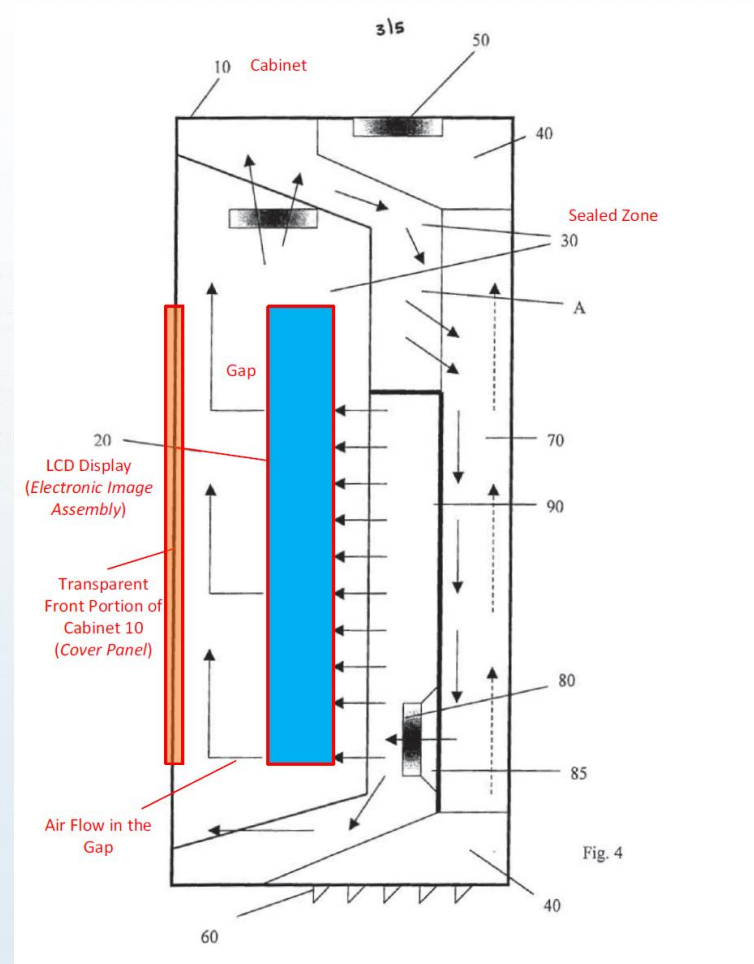
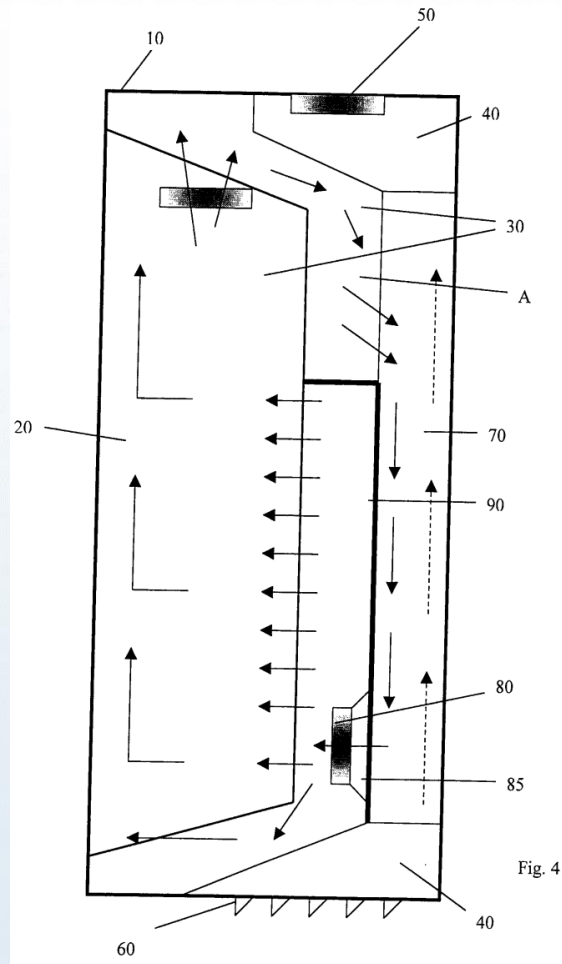


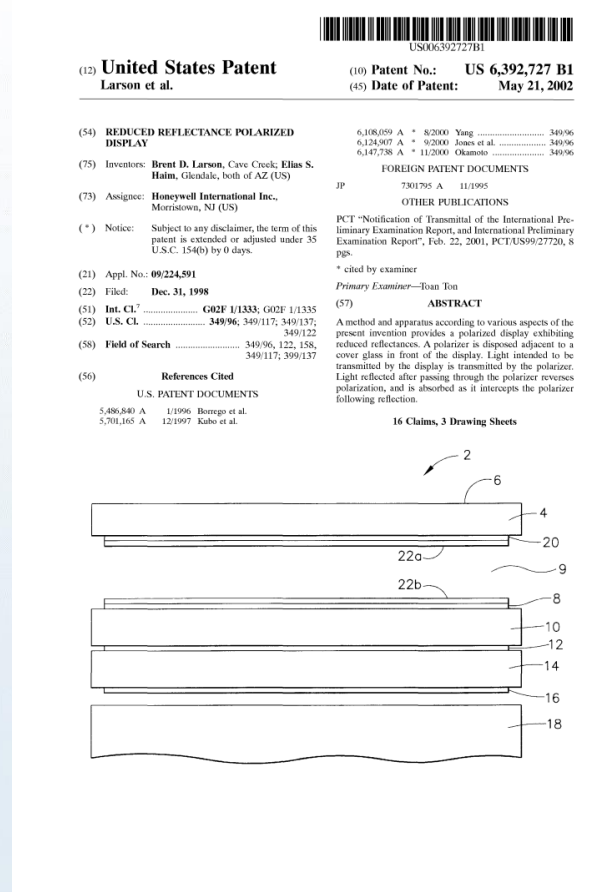
Fig. 4

Yare



Ex. 1005/1006 at Fig. 4;
Paper 9 at 69

No Motivation to Modify Karppanen and Yare



Real-World Facts Demonstrate Nonobviousness

Companies “wanted their messages outdoors,” but heat was a big obstacle



CONQUERING THE CHALLENGES

Display specialists focused on providing solutions for companies that wanted their messages outdoors were challenged by a variety of issues during the early years of a still-emerging specialty.

The biggest obstacle was heat – from inside and from the sun. Direct sunlight and its amplified heat could alter the properties of LCD crystals – the display layer of screens – and discolor or cause black blotches. Inside,

the challenge was even greater, as heat build-up also affected the state of the LCD layer and shortened the operating lifespans of the electronics.

Specialists resorted to tearing apart LCD panels and re-engineering them with different lighting and electronics to amplify the brightness and better tolerate the heat. In most cases, notably those where high temperatures were an issue, they built air

conditioned, sealed enclosures designed to move air through and keep the electronics inside their heat tolerance ratings. They were, effectively, their own micro-environments.

All that engineering was reflected in the final cost to customers – meaning most outdoor installations were done as tests and trials, or only at signature or high volume locations of retail and media clients.

Ex. 2025 ('740 POR at 56; '142 POR at 53-54).

Mother Nature presented an “enormous engineering challenge”



The **early days** of outdoor and outdoor-facing digital signage displays were characterized by finding the right components and reliable suppliers, and then conquering the **enormous engineering challenges** of keeping displays running no matter what Mother Nature threw at them.

Many early adopters – media companies and restaurant operators – saw screens and systems fail because the components and engineering put together by inexperienced suppliers weren't up to the task of working in heat and blazing sun, high humidity or wild temperature swings from deep freezes to heat waves.

Ex. 2025 ('740 POR at 56; '142 POR at 54).

Samsung failed despite its expertise and enormous resources



Leader in Innovation

Our relentless innovation has helped transform the way the world interacts with information and with each other. Samsung is dedicated to creating scalable technology that securely and seamlessly integrates with a business' infrastructure. Our comprehensive B2B product portfolio helps people to be more productive, safer and more ingenious each and every workday.

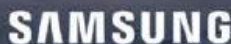
\$15.6B Invested in R&D 2019
#2 Patent Holder in US and Europe



Expertise

Samsung has advanced the field of digital signage by introducing leading-edge hardware, including video walls featuring the world's narrowest bezel, and the world's first TIZEN-powered signage. Samsung has enhanced its extensive portfolio by developing powerful all-in-one software solutions that include content creation and scheduling (MagicINFO), Remote Management (RMS) in-house hotel media management (LYNK HMS, LYNK SINC, LYNK REACH).





2021

Ex. 2028 at 4 ('740 POR at 56-57; '142 POR at 54).

2005-2008: Samsung Tried to Develop Effective Cooling Systems



Sung Ki Kim
*Samsung engineer for
outdoor LCD displays*

7 Q. Okay. So the record was clear, you
8 began working on outdoor LCD displays in 2005 at a
9 time that research for the outdoor display product
10 was being conducted; is that correct?

11 A. Yes, that's correct.

12 Q. And was there an actual outdoor
13 display product on the market at that time?

14 A. To my recollection, no, there wasn't
15 any.

16 Q. What was Samsung's first outdoor
17 product?

18 A. I don't recall that particular model
19 name or number, but I believe around 2010 through
20 2012, that time frame is when the first outdoor
21 product was launched.

2005-2008: Samsung Tried to Develop Effective Cooling Systems

(19) **United States**
 (12) **Patent Application Publication** (10) **Pub. No.: US 2006/0077636 A1**
Kim (43) **Pub. Date: Apr. 13, 2006**

(54) **DISPLAY DEVICE USABLE OUTDOORS** **Publication Classification**

(76) Inventor: **Sung-gil Kim, Suwon-si (KR)**

(51) **Int. Cl.**
H05K 7/20 (2006.01)
 (52) **U.S. Cl.** **361/688**

Correspondence Address:
STANZIONE & KIM, LLP
919 18TH STREET, N.W.
SUITE 440
WASHINGTON, DC 20006 (US)

(21) Appl. No.: **11/226,244**
 (22) **Filed: Sep. 15, 2005**

(30) **Foreign Application Priority Data**
 Oct. 12, 2004 (KR) 2004-81435

(57) **ABSTRACT**
 A display device usable outdoors includes a display part to form a picture thereon, a housing to accommodate the display part and having an opening through which the display part is mounted, a protecting member installed in the opening part of the housing to protect the display part, a heat exchanger mounted within the housing to cool down an inside of the housing, and a non-reflecting coating part disposed on the protecting member to prevent a drop in brightness of the display part due to solar light. Accordingly, the display device usable outdoors prevents a drop in the brightness and a rise in temperature of the display part.

(19) **United States**
 (12) **Patent Application Publication** (10) **Pub. No.: US 2006/0132699 A1**
Cho et al. (43) **Pub. Date: Jun. 22, 2006**

(54) **COOLING APPARATUS AND LIQUID CRYSTAL DISPLAY DEVICE HAVING THE SAME** (30) **Foreign Application Priority Data**
 Dec. 20, 2004 (KR) 2004-0108831

(76) Inventors: **Joo-won Cho, Seoul (KR); Chun-ho Song, Seoul (KR); Seock-hwan Kang, Suwon-si (KR); Gi-cherl Kim, Yongin-si (KR); Se-ki Park, Suwon-si (KR); Sang-gil Lee, Seoul (KR); Jong-seo Lee, Hwaseong-si (KR); Sang-yu Lee, Yongin-si (KR); Ju-young Yoon, Suwon-si (KR)**

(51) **Int. Cl.**
G02F 1/1333 (2006.01)
 (52) **U.S. Cl.** **349/161**

Correspondence Address:
CANTOR COLBURN, LLP
55 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

(21) Appl. No.: **11/313,151**
 (22) **Filed: Dec. 20, 2005**

(57) **ABSTRACT**
 A cooling apparatus comprises a casing, a heat sink and a cooling fan. The casing comprises a first opening and a second opening to provide an air path. The heat sink is received in the casing. The heat sink includes a recession part. The cooling fan is disposed in the recession part.

(12) **United States Patent** (10) **Patent No.: US 7,800,706 B2**
Kim et al. (45) **Date of Patent: Sep. 21, 2010**

(54) **COOLING FAN UNIT AND DISPLAY APPARATUS HAVING THE SAME** 6,522,543 B2 * 2/2003 Kurihara et al. 361/704
 7,259,964 B2 * 8/2007 Yamamura et al. 361/697
 2003/0128503 A1 * 7/2003 Takahashi 361/681
 2006/0070280 A1 4/2006 Yamamura et al.
 2006/0104023 A1 5/2006 Lee et al.

(75) Inventors: **Sun-jin Kim, Suwon-si (KR); Seung-hoon Oh, Yongin-si (KR)**

(73) Assignee: **Samsung Electronics Co., Ltd., Suwon-si (KR)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 337 days.

(21) Appl. No.: **11/778,138**
 (22) **Filed: Jul. 16, 2007**

FOREIGN PATENT DOCUMENTS
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 JP 9-270975 A 10/1997
 JP 2004-029388 A 1/2004
 KR 2003-071073 A 9/2003
 KR 2006-026748 A 3/2006

OTHER PUBLICATIONS
 Office Action dated Jun. 11, 2010 issued by State Intellectual Property Office of PR China in Chinese Patent Application No. 200710146279.4.

(12) **United States Patent** (10) **Patent No.: US 7,948,575 B2**
Oh et al. (45) **Date of Patent: May 24, 2011**

(54) **LIQUID CRYSTAL DISPLAY DEVICE HAVING PARTICULAR POLARIZING FILTER IN HOUSING** 5,027,111 A 6/1991 Davis et al.
 6,133,980 A * 10/2000 Faris 349/176

(75) Inventors: **Pil-yong Oh, Suwon-si (KR); Il-yong Jung, Yongin-si (KR)**

(73) Assignee: **Samsung Electronics Co., Ltd., Suwon-si (KR)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 381 days.

(21) Appl. No.: **12/197,755**
 (22) **Filed: Aug. 25, 2008**

FOREIGN PATENT DOCUMENTS
 JP 2006-039344 2/2006
 JP 2007-065137 3/2007
 JP 2007065137 A * 3/2007
 KR 2003-57218 7/2003

OTHER PUBLICATIONS
 European Search Report issued Aug. 12, 2009 in EP Application No. 09151616.1.
 * cited by examiner
 Primary Examiner — Mike Qi

Exs. 2033-2037 ('740 POR at 57; '142 POR at 54-55).

2010-2012: Samsung's first outdoor product used air-conditioning



Sung Ki Kim
*Samsung engineer for
outdoor LCD displays*

16 Q. What was Samsung's first outdoor
17 product?

18 A. I don't recall that particular model
19 name or number, but I believe around 2010 through
20 2012, that time frame is when the first outdoor
21 product was launched.

9 Q. What type of thermal management system
10 did that first product launched in 2010 to 2012 time
11 frame have?

12 A. Compress cooling system. That was --
13 (English) compression expansion.

14 That was a compression expansion
15 cooling system that was used for the display as well
16 as electronic components.

17 Q. And what do you mean by "compression
18 expansion cooling system"?

19 A. That's a technology where the theory
20 is the same as the general air-conditioning.

21 Q. So it was a refrigeration-type system?

22 A. Yes, that's correct.

Ex. 2029, 46:16-47:22 ('740 POR at 57; '142 POR at 55).

2013-2015: Samsung's OHD product came next

19 Was Samsung's OHD product the next
20 product launched after the one that used the
21 refrigeration system?

22 THE WITNESS: It is true that OHD is
1 the next product. However, from 2013 to

14 Q. When was the OHD product introduced to
15 the market?

16 A. I don't know the exact date, but my
17 understanding is that it was prior to 2016.

18 Q. It was prior to the date that you
19 rejoined the VD division, visual display division?

20 A. Yes, that's correct.

1 Q. You mentioned [REDACTED] for the OHD
2 product. Can you explain what happened to that
3 product?

4 A. Yes, I will do so.

5 [REDACTED]
[REDACTED]
[REDACTED] [REDACTED]
[REDACTED] [REDACTED]
[REDACTED] That was the problem.

After a decade of failures, Samsung introduced the OHF products



Sung Ki Kim
*Samsung engineer for
outdoor LCD displays*

16 What was -- what product was the OHD
17 product replaced by?
18 A. As far as that particular product is
19 concerned, it was OHD and continued to be OHD. It's
20 just that in the midst of that, [REDACTED]
21 [REDACTED]. And my understanding of the product that
22 follow OHD was the OHF.

1 Q. When was that OHF product introduced
2 to the market?
3 A. Maybe 2017. I don't know that
4 exactly.

Undisputed that Samsung's products practice the patents

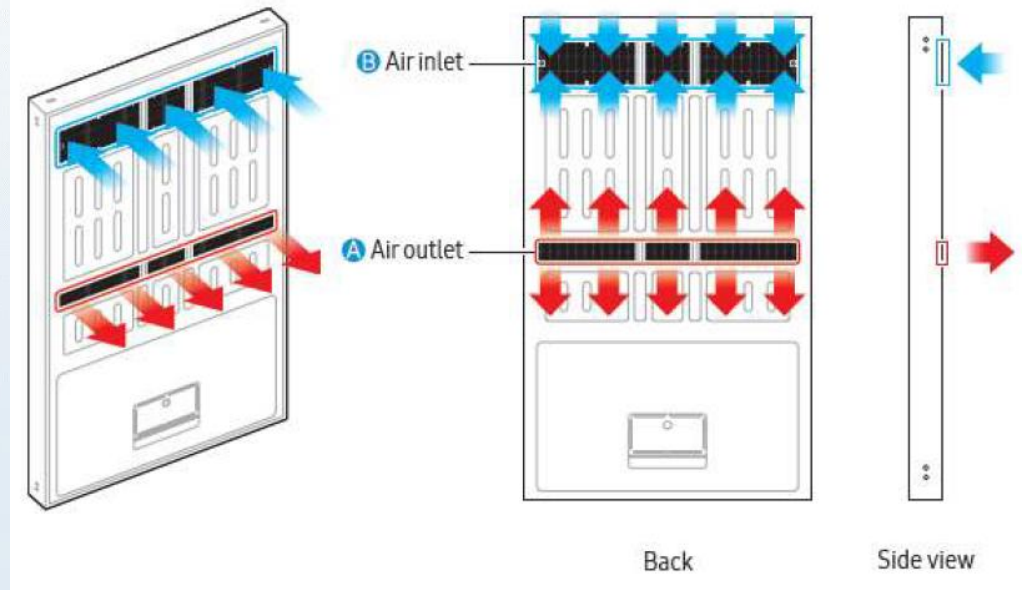


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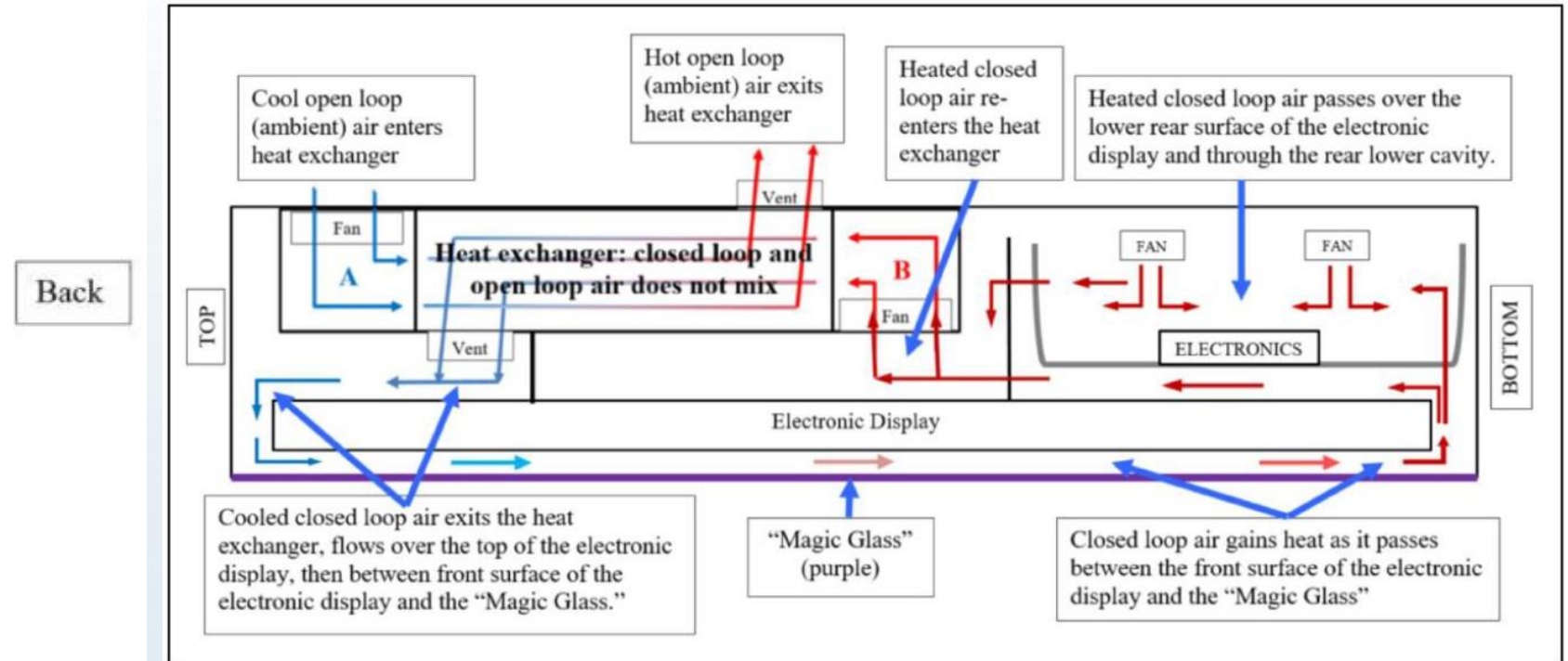
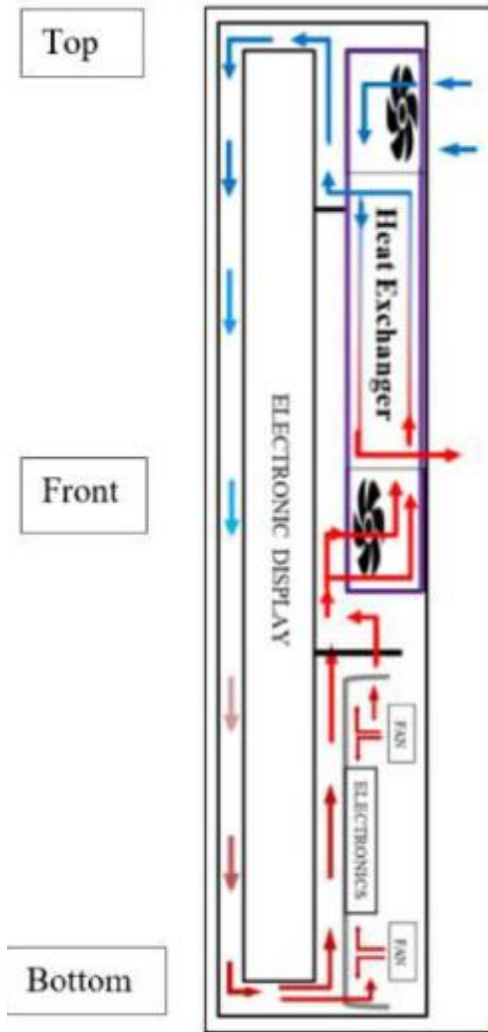
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OH75A/OH75F/OH85F



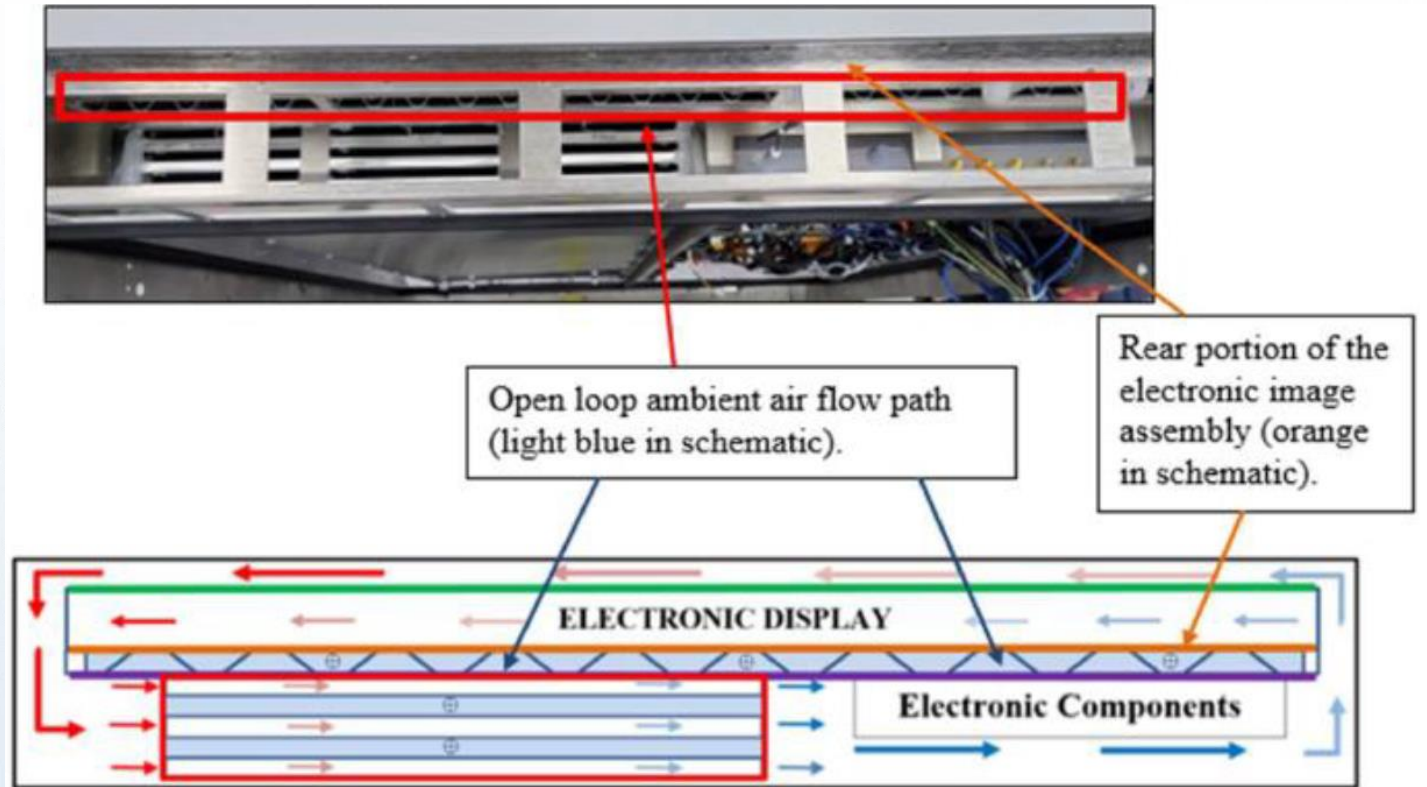
Ex. 2039; Ex. 2053, 52:16-53:4 ('740 POR at 58-59, 62; '142 POR at 55-57, 60).

Undisputed that Samsung's products practice the patents



Ex. 2024, ¶¶ 186-87; Ex. 2039 ('740 POR at 58-59, 62; '142 POR at 55-57, 60).

Undisputed that MRI's products practice the patents



Commercial Success & Willingness of Others to License MRI Patents

- Undisputed that Samsung and MRI have achieved commercial success (Ex. 2040-2041 (Samsung); Exs. 2044-2046 (MRI))

E. Commercial Success

Samsung does not dispute that Samsung and MRI's products practice the challenged claims and are commercially successful.⁵ POR, 59-61. Samsung instead argues that MRI is not entitled to a presumption of nexus because the products are not coextensive with the claims. Reply, 21-22. First, almost all of the "features" and "highlights" that Samsung identifies (at 22) are, in fact, features or benefits of MRI's invention discussed in the '740 Patent, including the cover glass with solar reduction layer which Samsung terms "Magic Glass" (Ex. 1001, 5:60-6:9), "slim design" (*id.*, 5:8-11), water and dust resistant "IP56" certification (*id.*, 5:25-45), and "excellent visibility" (*id.*, 5:22-25, 9:27-28). And providing "Extreme Outdoor Durability" by protecting against overheating is a key feature of the invention.

- LG and others have willingly licensed MRI's patents (Exs. 2049-2050; Ex. 2051; Ex. 2052)

Copying is indicative of non-obviousness

Revealingly, during its development of these copycat OHF products, Samsung performed extraordinarily detailed teardowns and analyses of [REDACTED] products. “[C]opying the claimed invention ... is indicative of non-obviousness.” *Windsurfing Int’l Inc. v. AMF, Inc.*, 782 F.2d 995, 1000 (Fed. Cir. 1986). A team of Samsung engineers obtained and tore down two of [REDACTED] products: a large format product and a mid-sized product. Exs. 2042, 2043; *see* Ex. 2030 (Sungsu Lee transcript), at 184:15-191:8; Ex. 2031 (Wunkil Lee transcript), 77:13-81:16 (discussing how Samsung disassembled [REDACTED] products and studied them in early [REDACTED]; Ex. 2029, 139:7-16; Ex. 2042 (analyzing, specifically, the [REDACTED] and [REDACTED] of the Samsung and [REDACTED] outdoor displays). Thereafter, Samsung released these new versions of its outdoor displays, the OHF series. The OHF series infringes the challenged claims, and are able to function outside and in full sunlight because of their cooling system. Indeed, but for their effective cooling system, these products would not be capable of outdoor use.

EX. 2042, EX. 2043
UNDER SEAL

'740 POR at 60-61; *see* '142 POR at 58-59.

Samsung Praised MRI's "Pioneering" Technology

From: Romulus Sala Stoian [r.sstoian@samsung.com]
Sent: 4/24/2020 10:20:27 PM
To: Bill Dunn [BDunn@mri-inc.net]
Subject: Mutual NDA
Attachments: SDSA Template - NDA - Mutual - v20190809 1033 FINAL.DOC

Bill,

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

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

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

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

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

The real-world development of outdoor displays proves that what Samsung now contends was obvious, was not obvious at the time.



“[W]e have found that ‘[o]bjective considerations such as failure by others to solve the problem and copying may often be the most probative and cogent evidence of nonobviousness’.”

Volvo Penta of the Americas, LLC v. Brunswick Corp., 81 F.4th 1202, 1212 (Fed. Cir. 2013) (quoting *Advanced Display Sys. v. Kent State Univ.*, 212 F.3d 1272, 1285 (Fed. Cir. 2000)).