

**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. 8,854,595 & 9,173,322

Title: Constricted Convection Cooling System for an Electronic Display

Inter Partes Review Nos. IPR2023-00199 and -00220



DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

Wednesday, March 21, 2024

Patent Owner's Demonstratives

1

Agenda

- Challenged Patents*
- Primary references lack recited elements*
- Overwhelming Secondary Considerations*

'595 Patent, Claim 1

1. A system for cooling an electronic display having a posterior display surface and contained within a housing, the system comprising:

- a constricted convection plate placed posterior to the posterior display surface;
- two side panels placed adjacent to the constricted convection plate and the posterior display surface, defining a constricted convection channel having an entrance and an exit; and
- a fan placed to draw air from outside of the housing through the constricted convection channel.

'322 Patent, Claim 9

*9. A system for cooling an electronic display comprising
an electronic display comprising a front display surface
and a posterior surface where no electronics are
mounted to the posterior surface of the electronic
display;
a constricted convection plate behind the posterior
surface of the display covering a majority of the
posterior display surface; and
a means for forcing air between the constricted
convection plate and the posterior surface of the
electronic display.*

The '595 and '22 Patents

US 8,854,595 B2

1
CONSTRUCTED CONVECTION COOLING SYSTEM FOR AN ELECTRONIC DISPLAY
CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a non-provisional application of U.S. provisional application No. 61/033,454 filed Mar. 26, 2008 and is hereby incorporated by reference as if fully cited herein. This application is a non-provisional application of U.S. provisional application No. 61/095,615 filed Sep. 9, 2008 and is hereby incorporated by reference as if fully cited herein. This application is a non-provisional application of U.S. provisional application No. 61/095,616 filed Sep. 9, 2008 and is hereby incorporated by reference as if fully cited herein. This application is a non-provisional application of U.S. Application No. 61/135,333 filed Nov. 17, 2008 and is hereby incorporated by reference as if fully cited herein. This application is a non-provisional application of U.S. Application No. 61/138,736 filed Dec. 18, 2008 and is hereby incorporated by reference as if fully cited herein. This application is a non-provisional application of U.S. Application No. 61/142,879 filed Feb. 16, 2009. This application is a continuation-in-part of U.S. application Ser. No. 12/234,307 filed Sep. 19, 2008, which is a non-provisional application of U.S. Application No. 61/083,064 filed Mar. 5, 2008, each of which are hereby incorporated by reference in their entirety as if fully cited herein. This application is a continuation-in-part of U.S. application Ser. No. 12/234,309 filed Sep. 19, 2008, which is a non-provisional application of U.S. Application No. 61/053,713 filed May 16, 2008 each of which are hereby incorporated by reference in their entirety as if fully cited herein. This application is a continuation-in-part of U.S. application Ser. No. 12/237,365 filed Sep. 24, 2008, which is a non-provisional application of U.S. Application No. 61/057,599 filed May 30, 2008 each of which are hereby incorporated by reference in their entirety as if fully cited herein. This application is a continuation-in-part of U.S. application Ser. No. 12/235,200 filed Sep. 22, 2008, which is a non-provisional of U.S. Application No. 61/070,126 filed Jun. 26, 2008 each of which are hereby incorporated by reference in their entirety as if fully cited herein.

TECHNICAL FIELD

Embodiments generally relate to cooling systems and in particular to cooling systems for electronic displays.

BACKGROUND OF THE ART

Conductive and convective heat transfer systems for electronic displays are known. These systems of the past generally attempt to remove heat from the electronic components in a display through as many sidewalls of the display as possible. In order to do this, the systems of the past have relied primarily on fans for moving air past the components to be cooled and out of the display. In some cases, the heated air is moved into convectively thermal communication with fins. Some of the past systems also utilize conductive heat transfer from heat producing components directly to heat conductive housings for the electronics. In these cases, the housings have a large surface area, which is in convective communication with ambient air outside the housings. Thus, heat is transferred convectively or conductively to the housing and is then transferred into the ambient air from the housing by natural convection.

2
SUMMARY OF THE EXEMPLARY EMBODIMENTS

While such heat transfer systems have enjoyed a measure of success in the past, improvements in displays require even greater cooling capabilities.

In particular, cooling devices for electronic displays of the past have generally used convective heat dissipation systems that function to cool an entire interior of the display by one or more fans and fins. For example, by itself, this is not adequate in many climates, especially when radiative heat transfer from the sun through a display window becomes a major factor. In many applications and locations 200 Watts or more of power through such a display window is common. Furthermore, the market is demanding larger screen sizes for displays. With increased electronic display screen size and corresponding display window size more heat will be generated and more heat will be transmitted into the displays.

In the past, many displays have functioned satisfactorily with ten or twelve inch screens. Now, many displays are in need of screens having sizes greater than or equal to twenty-four inches that may require improved cooling systems. For example, some outdoor applications call for seventy inch screens and above. With increased heat production with the larger screens and radiative heat transfer from the sun through the display window, heat dissipation systems of the past, which attempt to cool the entire interior of the display with fins and fans, are no longer adequate.

A large fluctuation in temperature is common in the devices of the past. Such temperature fluctuation adversely affects the electronic components in these devices. Whereas the systems of the past attempted to remove heat from the entire interior of the display, a preferred embodiment causes directed convective heat transfer from the interior of the display. By the aspects described below, the present invention has made consistent cooling possible for electronic displays having screens of sizes greater than or equal to twelve inches. For example, cooling of a seventy inch screen can be achieved, even in extremely hot climates. Greater cooling capabilities are provided by the device and method described and shown in more detail below.

An exemplary embodiment relates to a constructed convection cooling system and a method of cooling an electronic display. An exemplary embodiment includes an external housing and a constructed convection plate. The external housing preferably includes an air entrance end and an exhaust end. The air entrance end defines an entrance aperture, while the exhaust end defines an exit aperture. The constructed convection plate is preferably mounted to the posterior display surface. This posterior display surface may be the posterior surface of the backlight assembly or the posterior surface of any other thin panel display assembly (OLEDs, plasma, etc.). The constructed convection plate further defines a constructed convection cooling channel immediately behind the posterior display surface. The convection cooling channel may be adapted to receive air entering the entrance aperture and adapted to expel air through the exit aperture.

The air entering the constructed convection cooling channel may be from a refrigerated air source in communication with the entrance opening, or alternatively may be ambient air from the display surrounding. A septum in association with the external housing may be adapted to direct air into the constructed convection cooling channel. One or more fans may be used to draw the cooling air through the constructed convection cooling channel. In other embodiments, one or

BACKGROUND OF THE ART

50

Conductive and convective heat transfer systems for electronic displays are known. These systems of the past generally attempt to remove heat from the electronic components in a display through as many sidewalls of the display as possible. In order to do this, the systems of the past have relied primarily on fans for moving air past the components to be cooled and out of the display. In some cases, the heated air is moved into convectively thermal communication with fins. Some of the past systems also utilize conductive heat transfer from heat producing components directly to heat conductive housings for the electronics. In these cases, the housings have a large surface area, which is in convective communication with ambient air outside the housings. Thus, heat is transferred convectively or conductively to the housing and is then transferred into the ambient air from the housing by natural convection.

SEC et al. v. MRI
SEC Exhibit 1001.013
IPR 2023-00199

'595 Patent | Ex. 1001 , Col. 1

Takeuchi

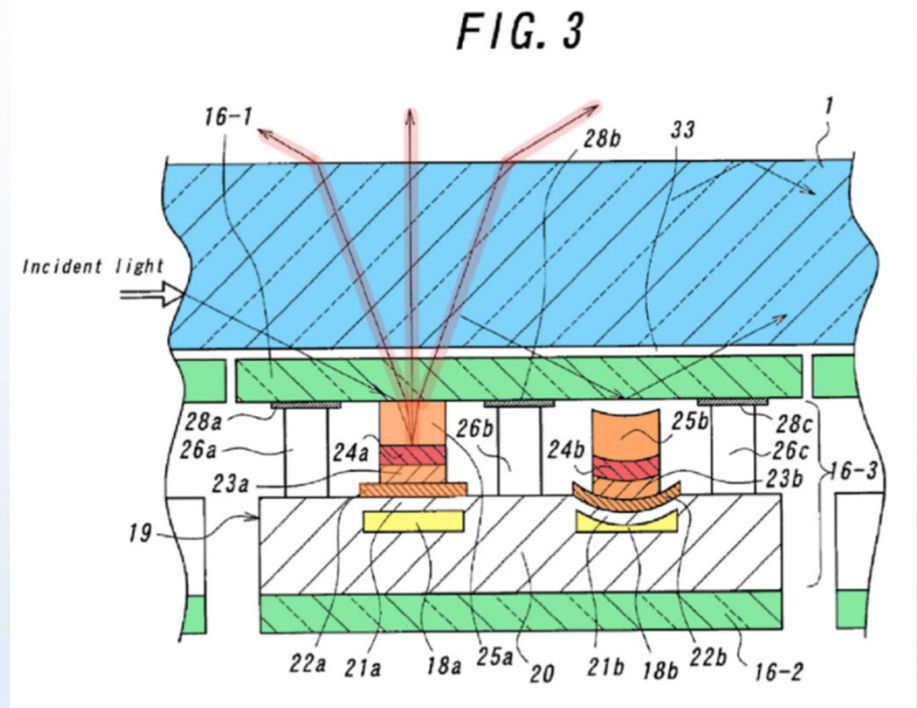
'595 Patent, Claim 1 (Ground 1)

Takeuchi **does not** teach a cooling system for an “electronic display”

- “Unique display system”
- Mechanical “actuators, the number of which corresponds to that of a number of pixels”
- “heat generation due to displacement in contact and separation directions of the actuators with respect to the light guide plate.”

Takeuchi Patent

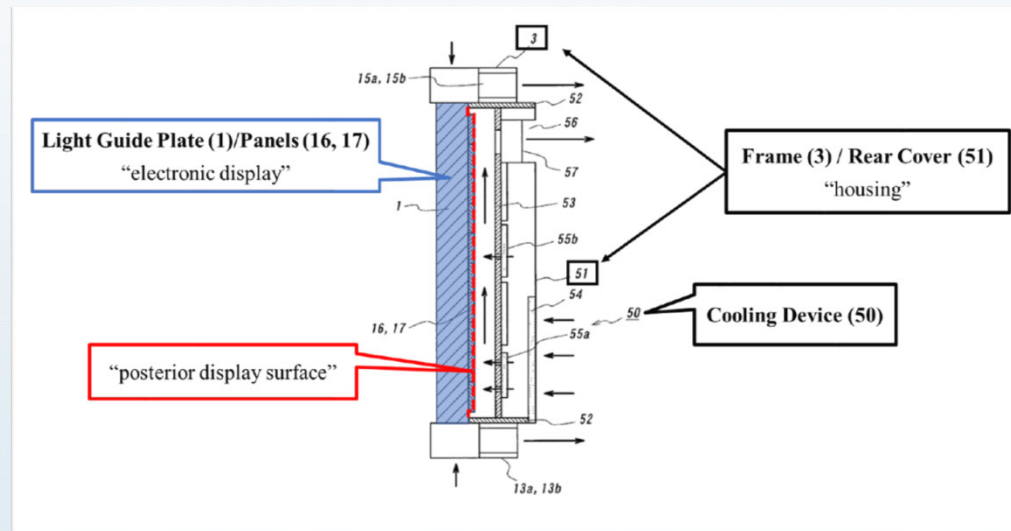
Ex. 1004 at [0004] and [0008]



Takeuchi Patent, Fig. 3

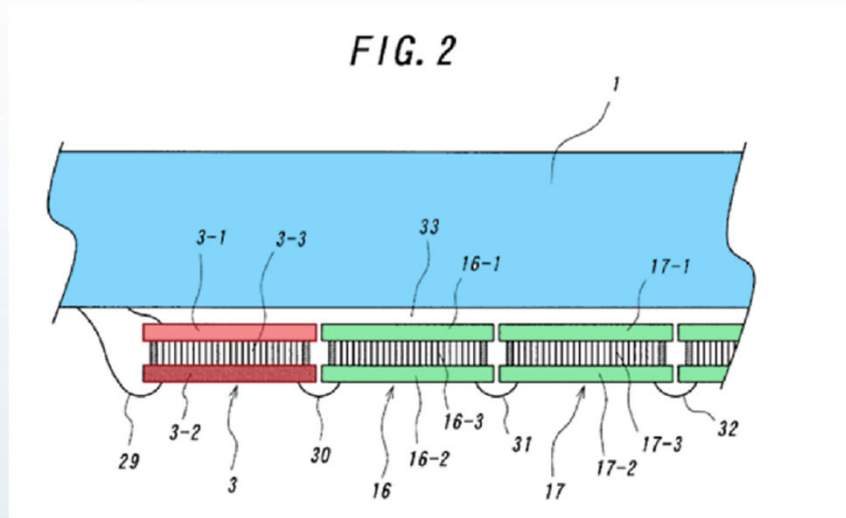
The Petition identifies Takeuchi's housing as frame 3 and rear cover 51

Takeuchi's electronic display is contained within a “housing,” particularly the combination of frame 3 and rear cover 51 shown in Figure 5. (*Id.*, ¶107.)

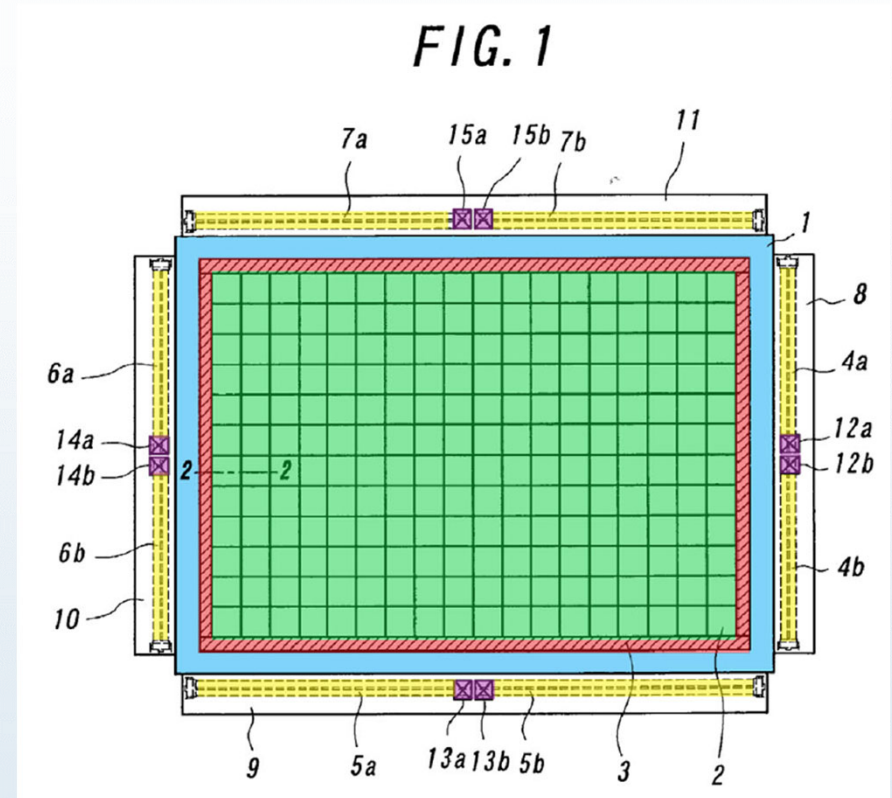


Petition at 24-25

Takeuchi's light guide plate 1 is not within frame 3 (red)



Ex. 1004 | Takeuchi Patent, Fig. 2



Ex. 1004 | Takeuchi Patent, Fig. 1

Takeuchi **does not** teach an electronic display “contained within a housing”

Testimony of Robert Smith-Gillespie

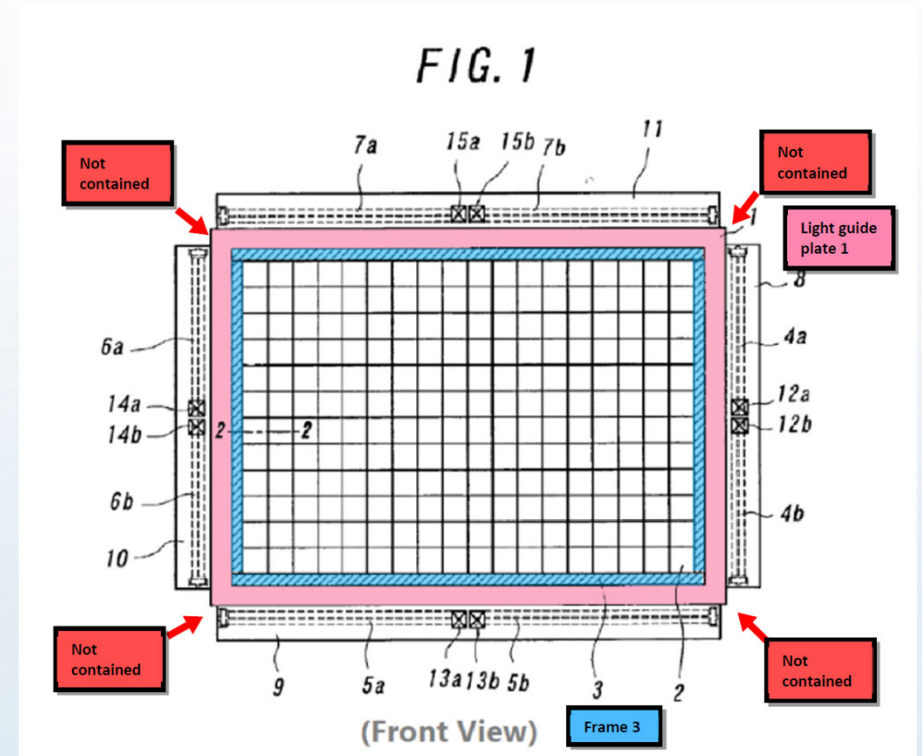
17 Q. Thank you. Turning to slide 15, what is the
18 image shown on the left-hand side of slide 15?

19 A. This is a front view of Takeuchi's electronic
20 display showing the screen area that's formed by pixel
21 elements 2 in the center of the frame. There's a frame
22 around that, obviously, of 1, and then there's some light
23 sources that are nested around the outside of the frame to
24 illuminate the light guide plate which you won't see
25 because it is transparent.

1 Q. Does the image come from the Takeuchi reference
2 itself?

3 A. Takeuchi Figure 1.

Ex. 2013, 927:19-928:3



Ex. 1004 | Takeuchi Patent, Fig. 1 (annotated by parties)

Takeuchi **does not** teach an electronic display “contained within a housing”

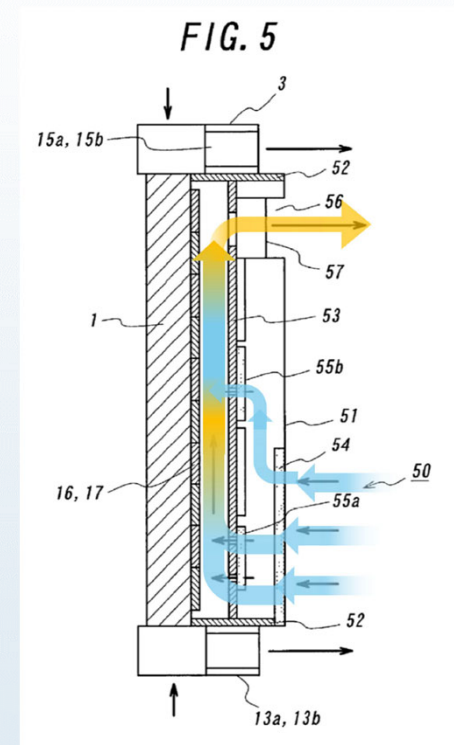
(*Id.*, FIG. 5.) While the electronic display resides in frame 3, “the back sides of the light guide plate 1 and the panels 16, 17 are completely covered by a rear cover 51” which includes inner surface portions of rear cover 51 (denoted as 52). (*Id.*, ¶¶[0023], [0040].) A “partition plate” 53 is positioned between the rear

Petition at 13

Takeuchi **does not** teach a constricted convection plate defining a constricted convection channel

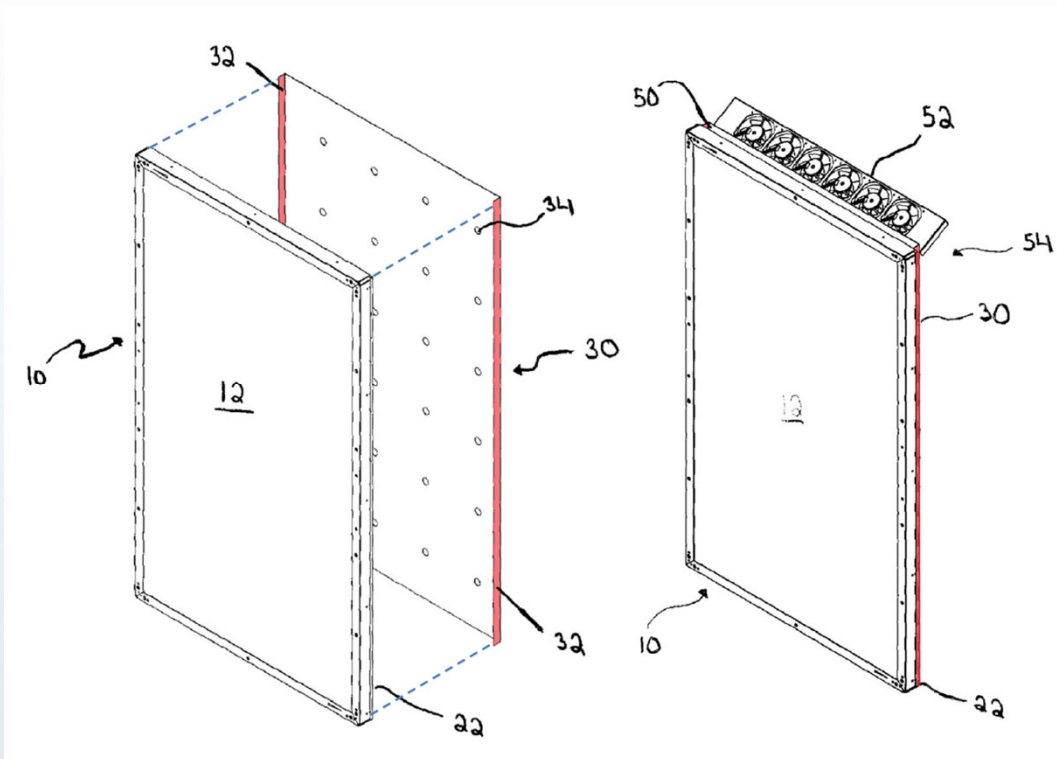
Incidentally, the ambient air introduced into the cooling chamber from the fine filter 55a in the lower portion of the partition plate 53 has a temperature that increases with cooling while flowing toward the upper portion. However, since the additional intake vent with the fine filter 55b is arranged in the middle portion of the partition plate 53 and fresh ambient air is supplied, it is possible to cool the back sides of the light guide plate 1 and the panels 16, 17 substantially uniformly.

Takeuchi Patent | Ex. 1004 , [0041]

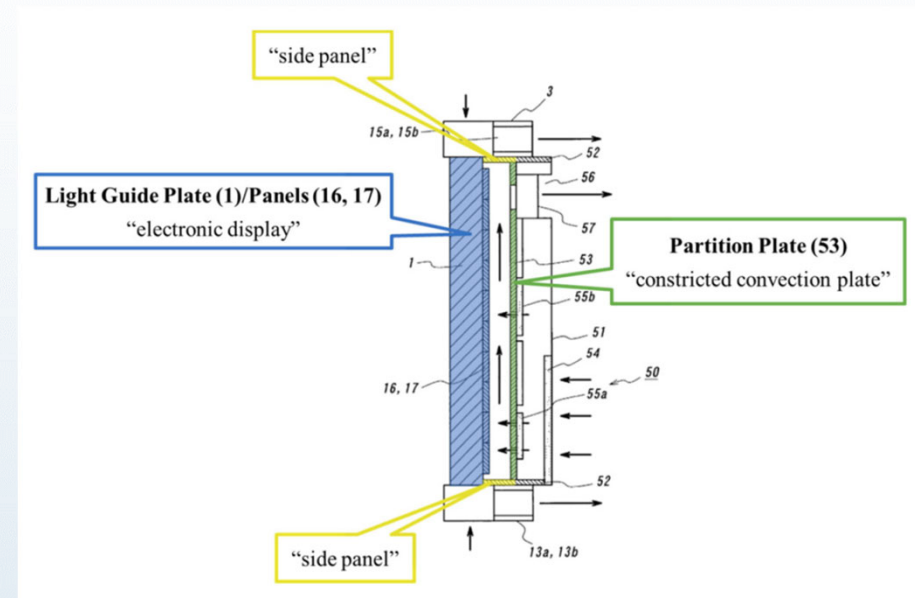


Takeuchi Patent, Fig. 5

Takeuchi **does not** teach “two side panels . . . defining a constricted convection channel”



Ex. 1001, Figs. 4 and 5A



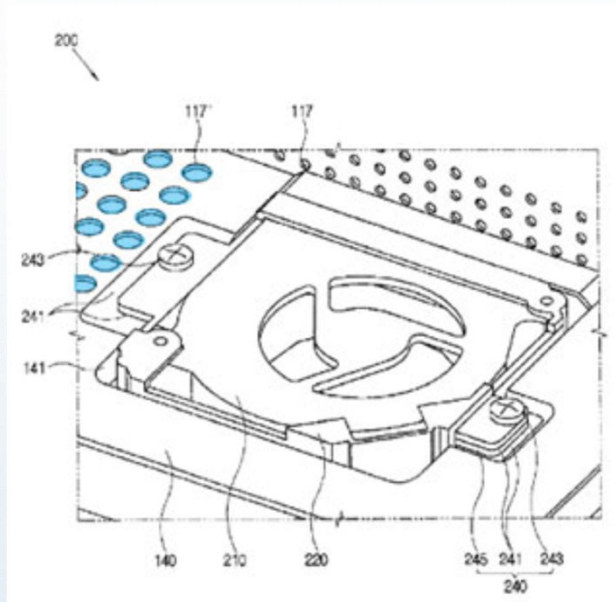
Petition at 28

Kim

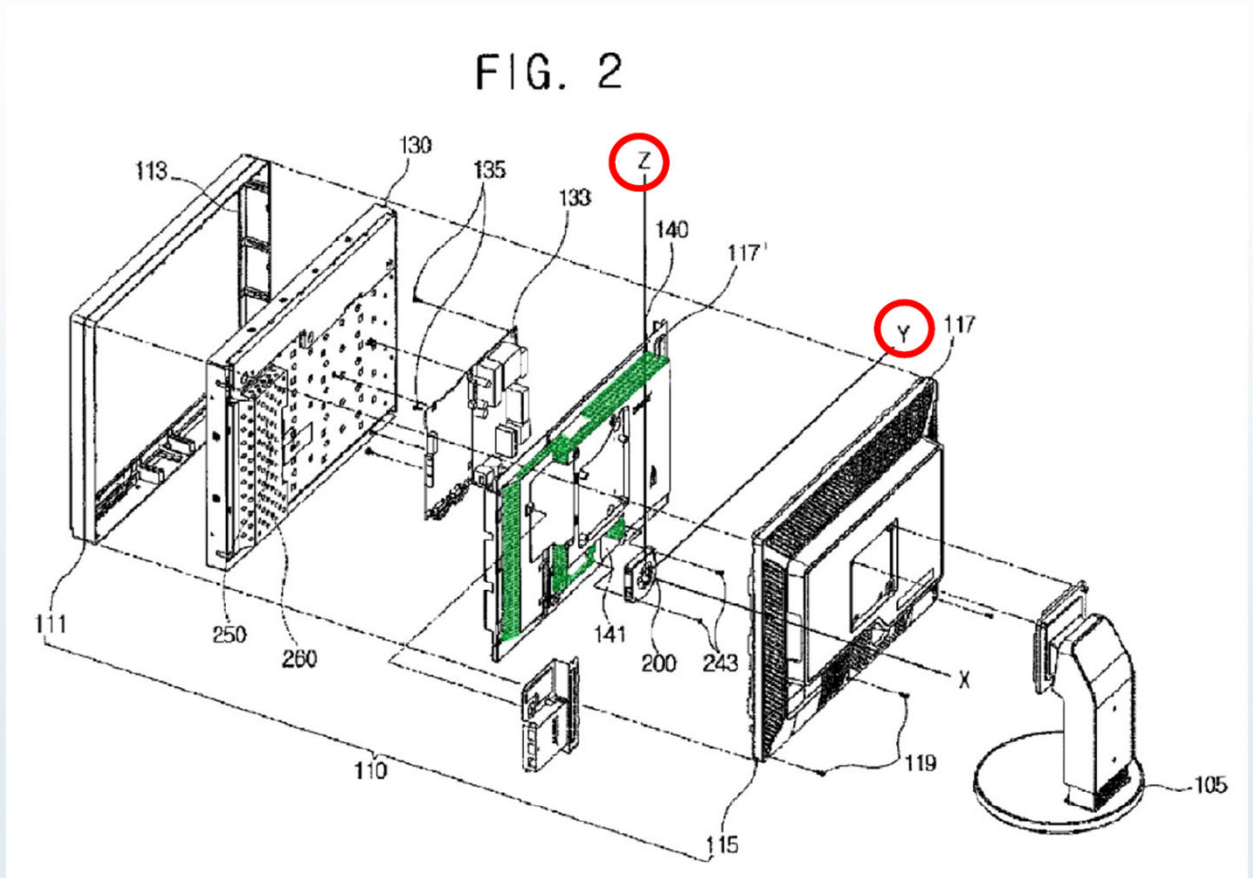
'595 Patent, Claims 1, 4, 7, 8 (Grounds 2-4)

'322 Patent, Claims 1-5, 7, 8 (Grounds 1-4)

Kim **does not** teach a constricted convection plate



Kim Patent | Ex. 1005, Fig. 4



Kim Patent | Ex. 1005, Fig. 2

Kim **does not** teach a constricted convection channel

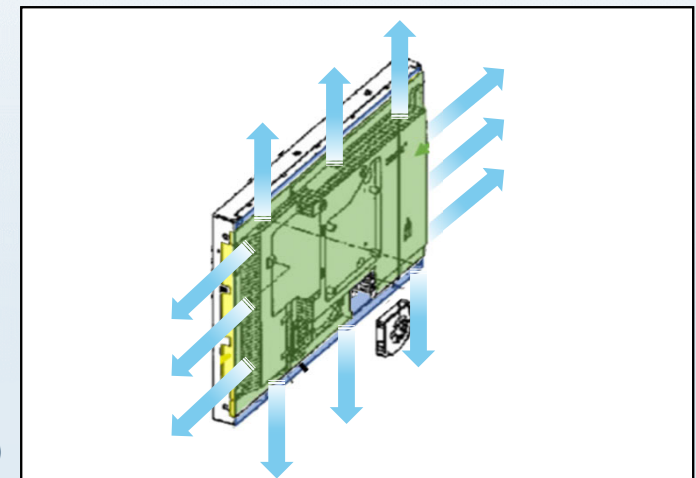
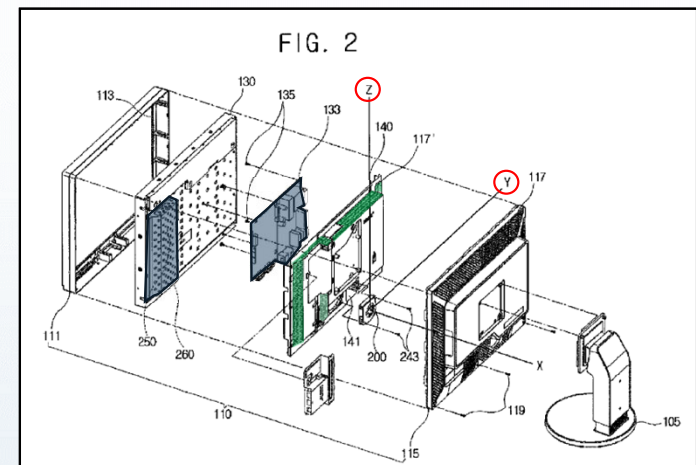
Air drawn in (in a 'X' direction shown in FIG. 2) through the air slits 117 of the rear casing 115. . . The air which flows through the heat generating parts is discharged to the outside (in a 'Y' or 'Z' direction shown in FIG. 2) through the plurality of air slits 117' of the shield cover 140 . . .

Kim Patent | Ex. 1005 at 7:53-62

Testimony of Robert Smith-Gillespie

13 Q. Okay. But there is a disclosure that the
14 airflow will flow upwards?
15 A. Correct.
16 Q. And can we agree that the air will also flow
17 left and right?
18 A. To some degree.

Ex. 2013,
1066:13-18, 14 bottom?
1067:13-15 A. I believe so, yes.



Kim Patent
Fig.2 (annotated)

Kim's Airflow Out the Left and Right Sides According to Samsung's Expert

Testimony of Robert Smith-Gillespie

2 Q. Okay. So I want to shift grounds and talk a
3 little bit about Kim. And if we could go back to our
4 demonstrative, CDX-10, slide 5. Slide 5.

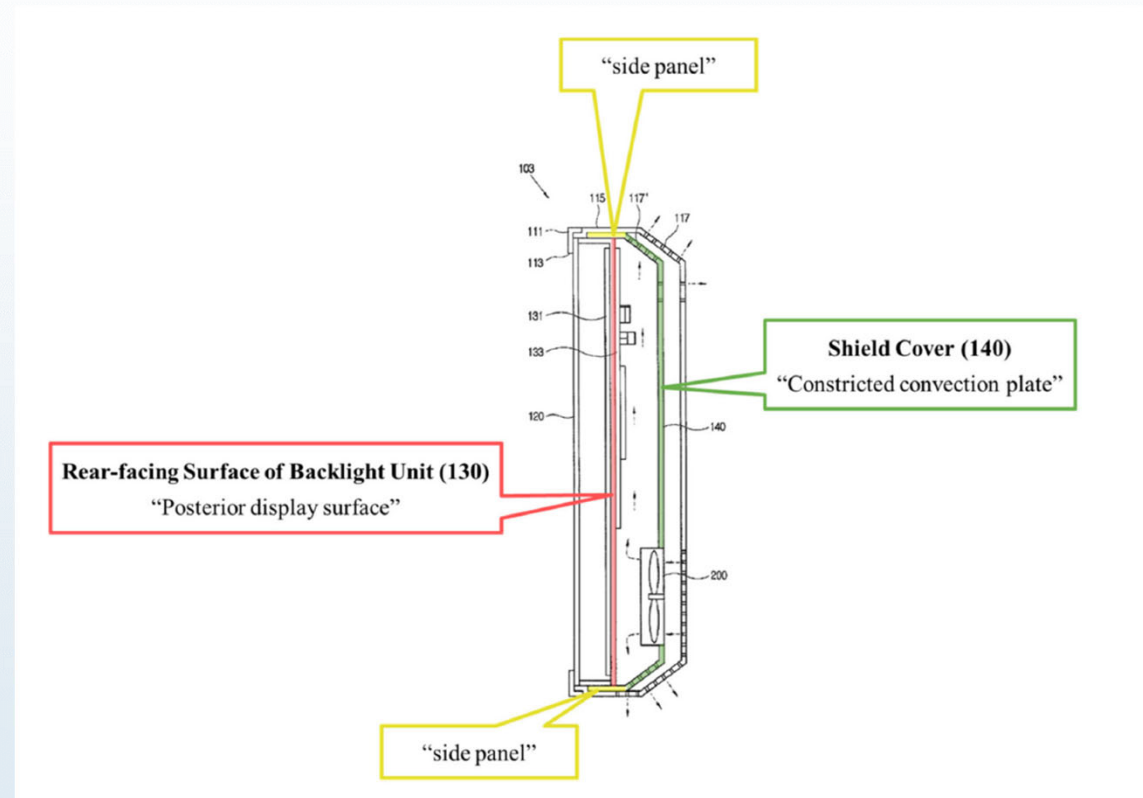
5 So this is a -- you recognize this is Kim's side
6 view, correct?

7 A. That's correct. I'm not sure that it is side
8 view. I think it might be actually a view down through the
9 display, a horizontal cross-section.

10 Q. Okay. Well, thank you for saying that,
11 horizontal cross-section. But this is -- this is from your
12 report, you recognize this as something that you annotated?

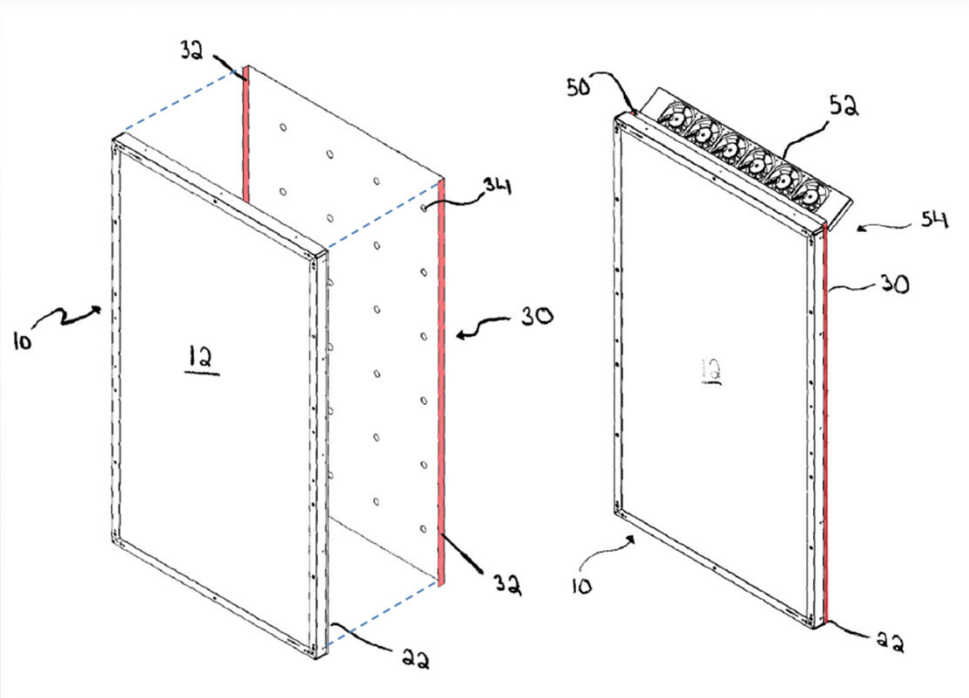
13 A. Yes.

Ex. 2013, 1056:9-13

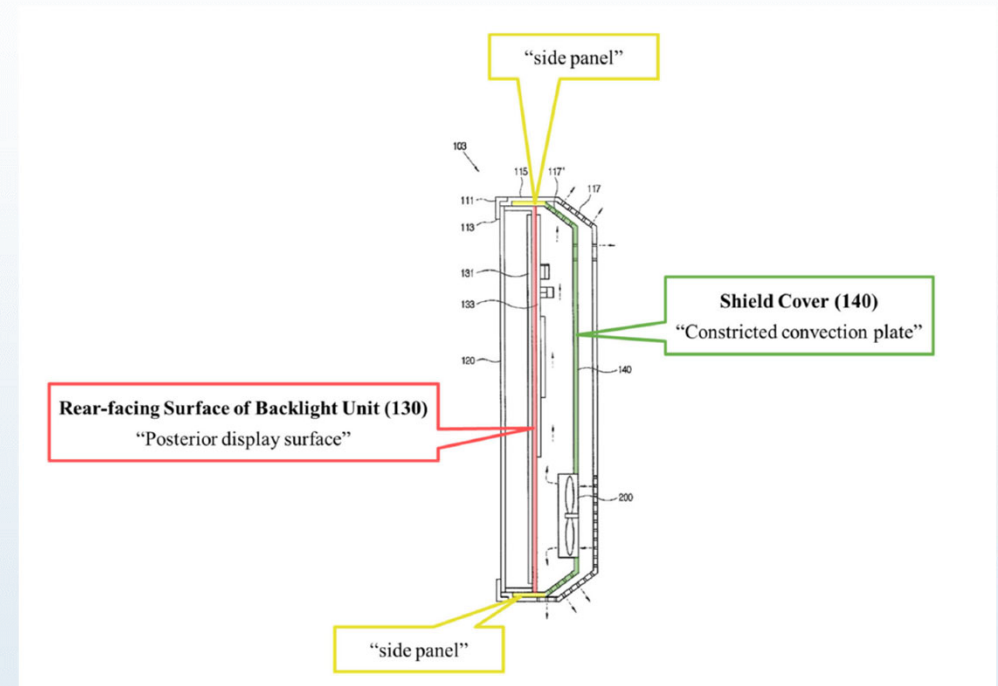


Kim Patent | Ex. 1005, Fig. 5 (annotated by Petitioner)

Kim **does not** teach two side panels . . . defining a constricted convection channel with an entrance and an exit ('595 Patent, Claim 1)



'595 Patent, Figs. 4, 5A



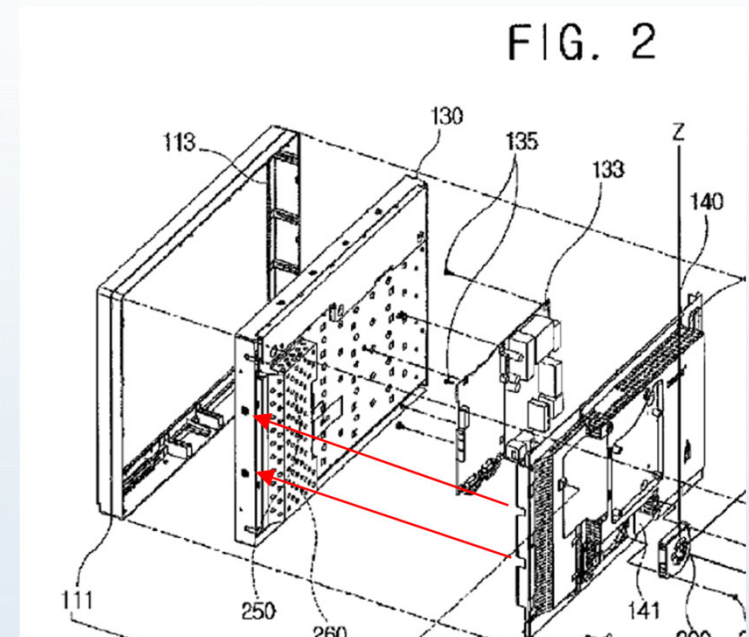
Kim Patent | Ex. 1005, Fig. 5 (annotated by Petitioner)

Kim **does not** teach two side panels . . . defining a constricted convection channel with an entrance and an exit ('595 Patent, Claim 1)

Testimony of Robert Smith-Gillespie

- 15 Q. And then there is these little circles right
16 here (indicating). Do you see that?
17 A. Yes.
18 Q. They match up with these little channels here?
19 A. I believe so, yes (indicating).
- 17 Q. And the side panels are going to -- whether it's
18 inside or outside, they are going to be mated up with this
19 side of the backlight unit, right?
20 A. Correct.

Ex. 2013, 1058:13-19, 1059:17-20



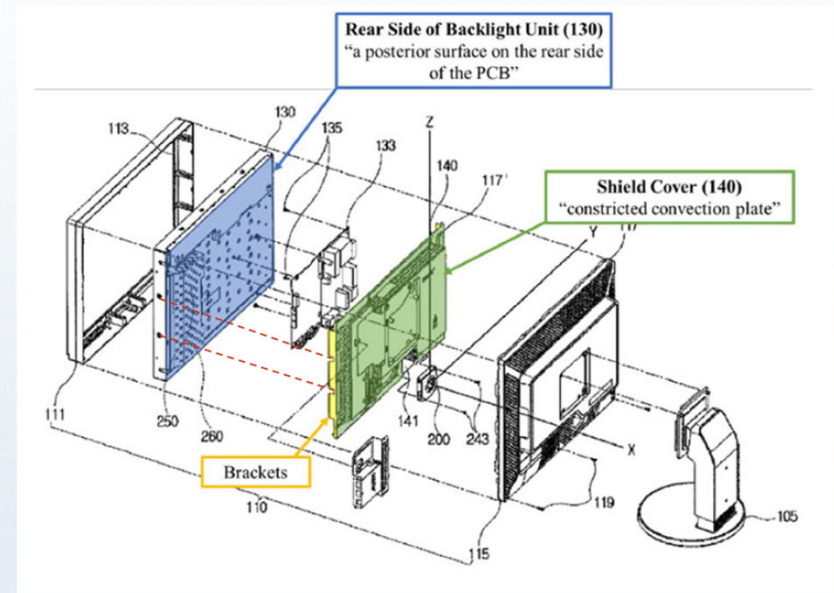
Kim Patent | Ex. 1005, Fig. 2

Kim **does not** teach at least one bracket which connects the posterior display surface with the constricted convection plate ('322 Patent, Claims 1 and 5)

Testimony of Robert Smith-Gillespie

- 15 Q. And then there is these little circles right
16 here (indicating). Do you see that?
17 A. Yes.
18 Q. They match up with these little channels here?
19 A. I believe so, yes (indicating).
20
17 Q. And the side panels are going to -- whether it's
18 inside or outside, they are going to be mated up with this
19 side of the backlight unit, right?
20 A. Correct.

Ex. 2013, 1058:13-19, 1059:17-20



Petition at 44 (red added by Patent Owner)

Kim **does not** teach at least one bracket which connects the posterior display surface with the constricted convection plate ('322 Patent, Claims 1 and 5)

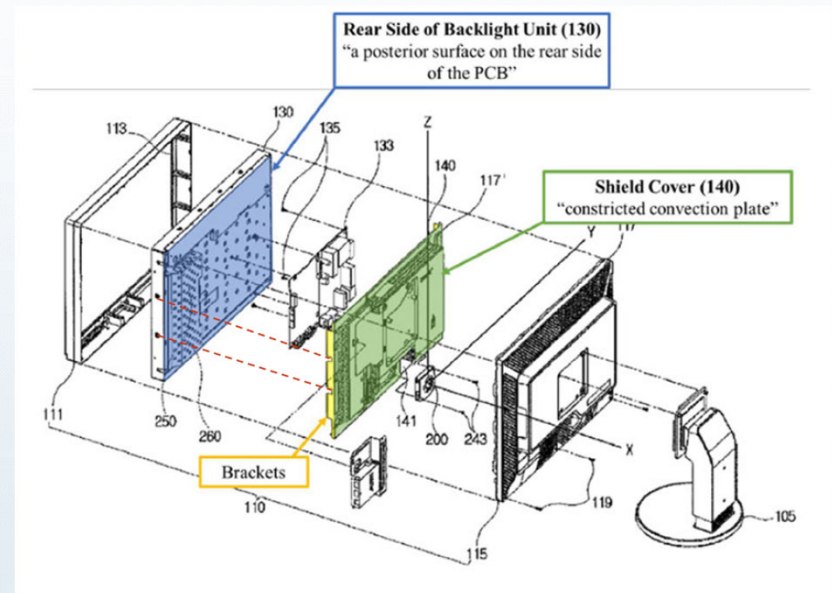
Testimony of Robert Smith-Gillespie

2 Was it conventional at the time of
3 the invention to include a set of brackets on the
4 back of a display?

5 A. I can't say that it was
6 conventional, no. I have never seen brackets
7 placed on the back of displays like this during
8 that time frame or before that time frame.

19 A. A flat panel display or an LCD
20 display in particular. Generally, mounting
21 points would be provided on flanges along the
22 edges, not along the back.

Ex. 2057, 85:6-8, 20-22

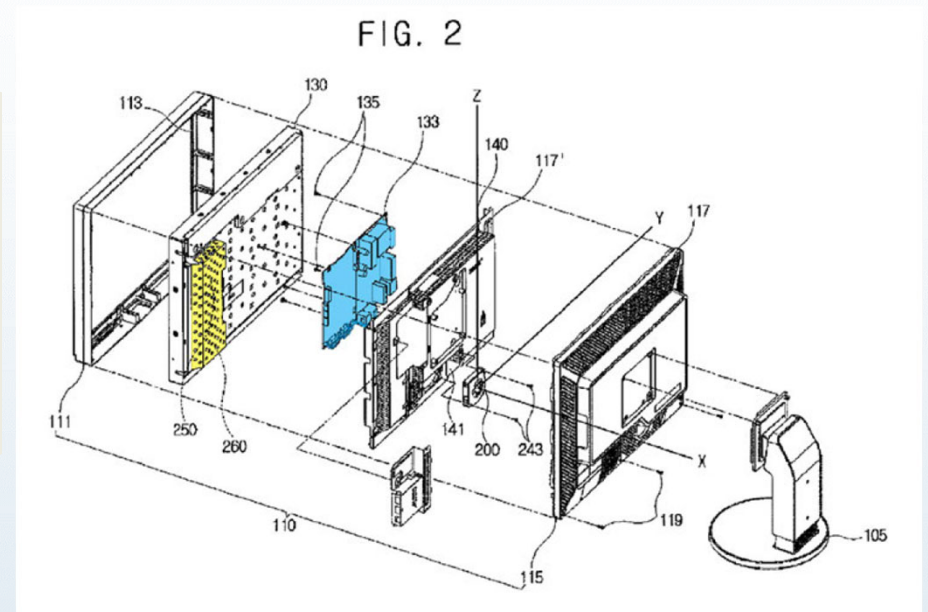


Petition at 44 (red added by Patent Owner)

Kim **does not** teach a constricted convection plate is substantially parallel to the posterior display surface ('322 Patent, Claims 3-4)

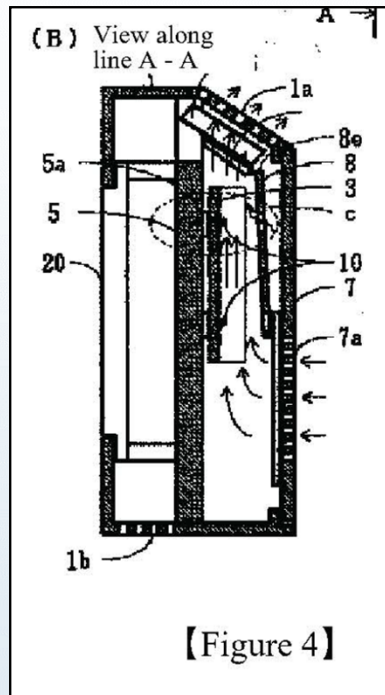


“[I]f the specification is completely silent on the issue arguments based on drawings not explicitly made to scale are unavailing.”
Nystrom v. TREX Co., 424 F.3d 1136, 1149 (Fed. Cir. 2005)

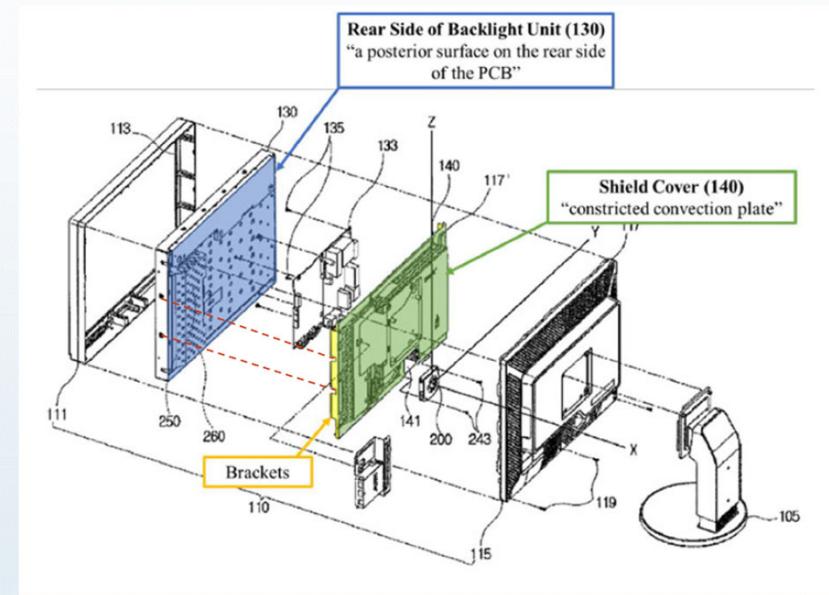
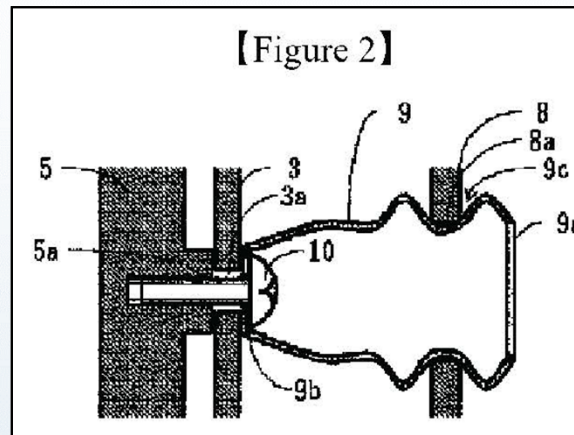


Kim Patent | Ex. 1005, Fig. 2

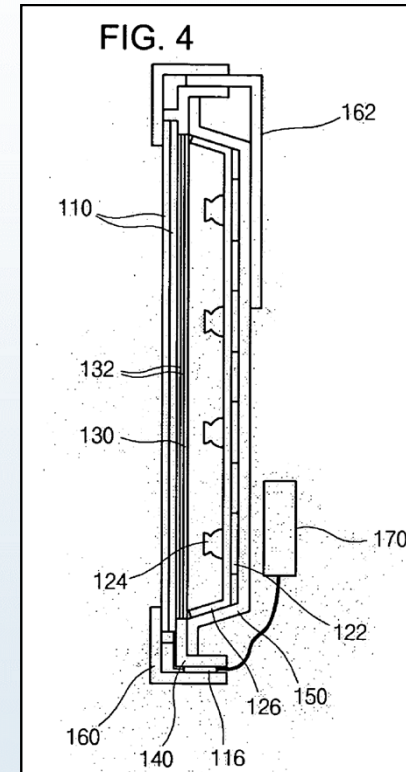
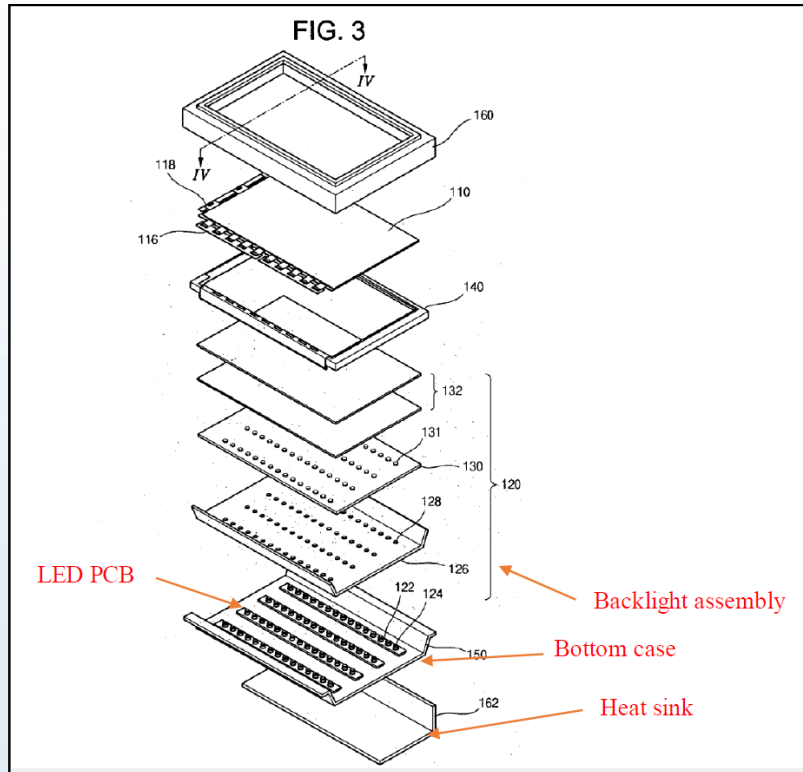
Kim and Takahashi **do not** render obvious claim 8 (access apertures)



Ex. 1008/1026 (Takahashi) Figs. 2 & 4



Hong Features



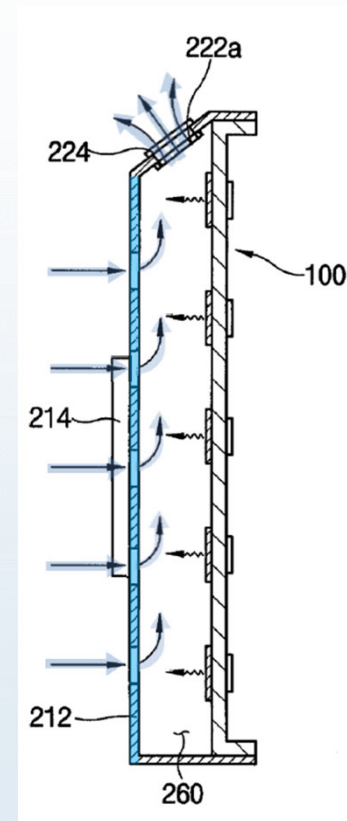
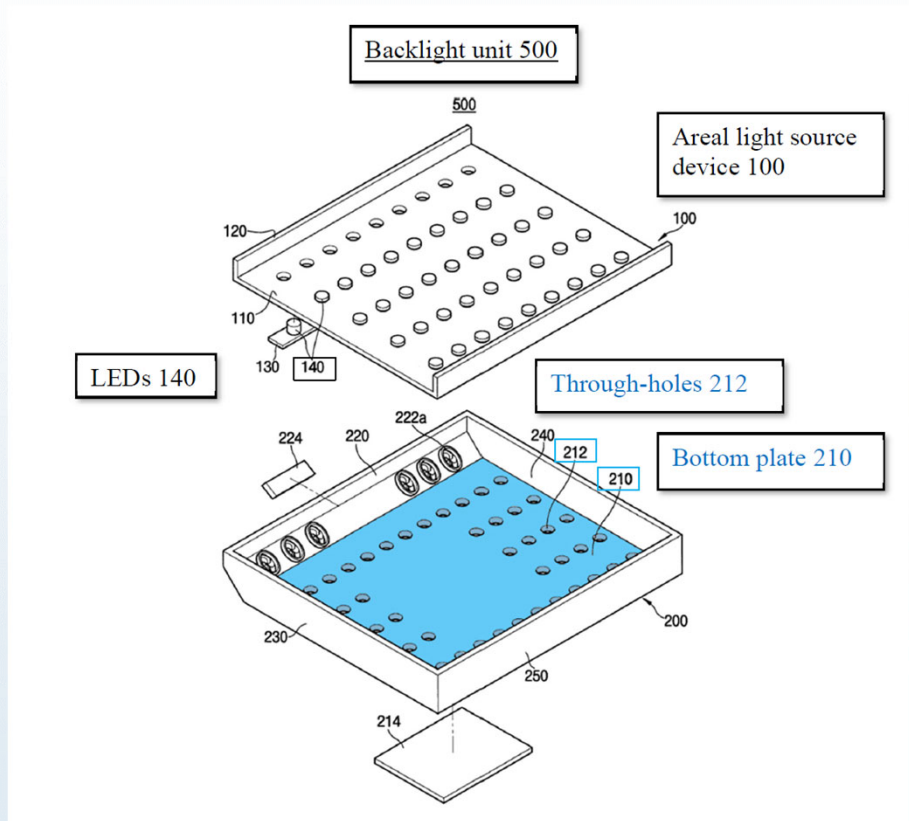
Hong Patent
Ex. 1006/1029

Na

'595 Patent, Claims 1, 4, 7, 8 (Grounds 5-6)

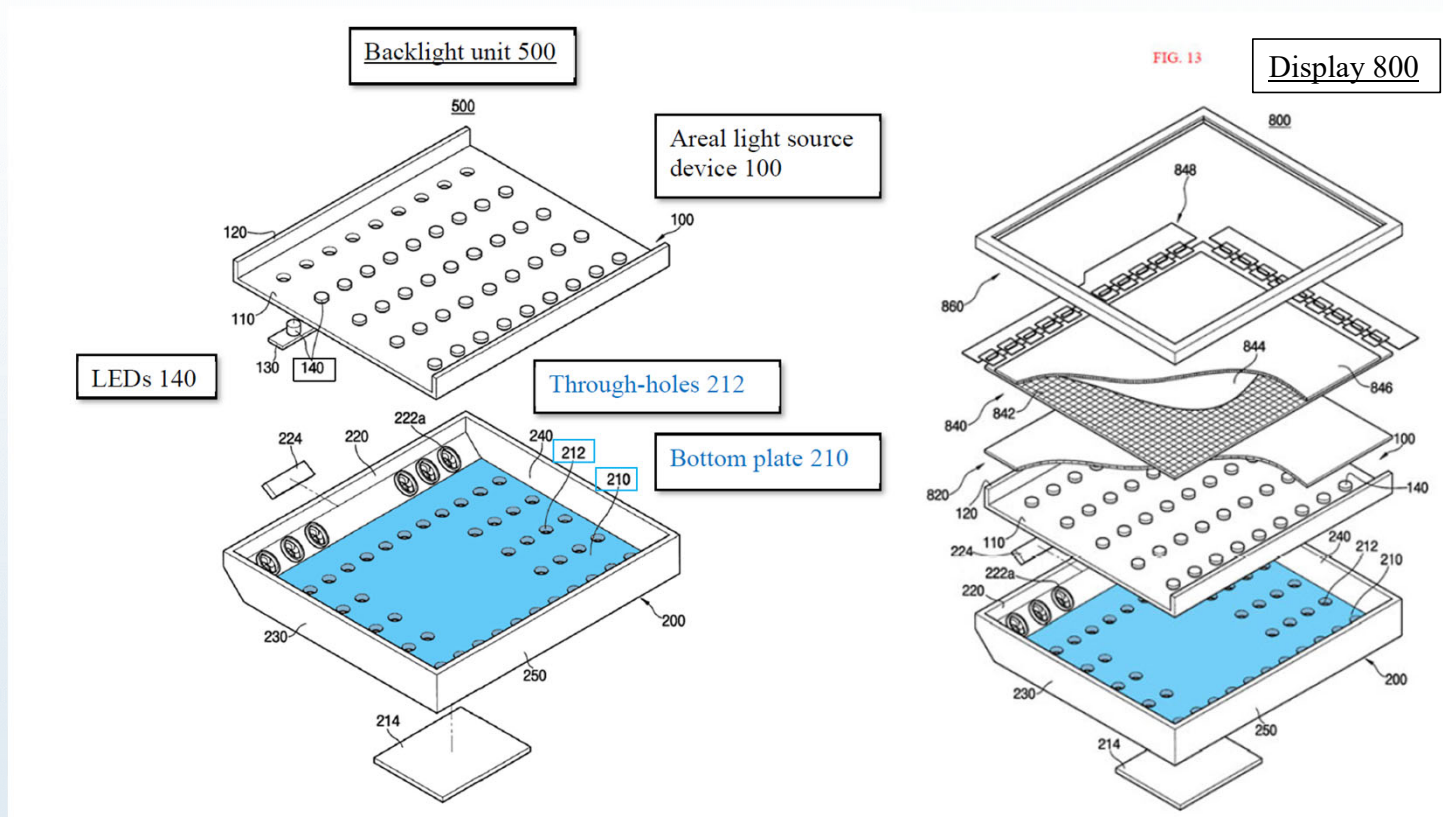
'322 Patent, Claims 4, 7-13, 16 (Grounds 5-7)

Na



Na Patent | Ex. 1010, Figs. 1, 3

Na **does not** teach a constricted convection plate placed behind the posterior surface of its electronic display



Na Patent | Ex. 1010, Figs. 1, 13

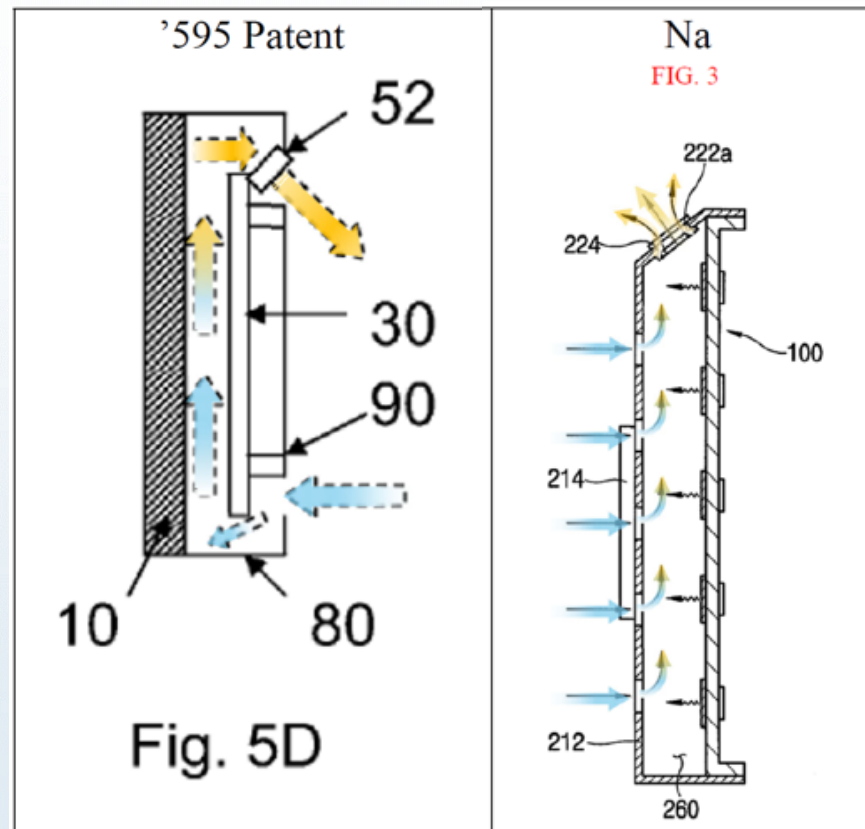
Na **does not** teach a constricted convection plate placed behind the posterior surface of its electronic display

**Testimony of Robert Smith-Gillespie
regarding Takeuchi**

23 discloses a light guide plate and panels 16 and 17. Panels
24 16 and 17 are the most posterior portion, so I have
25 highlighted those in red as the posterior display surface.

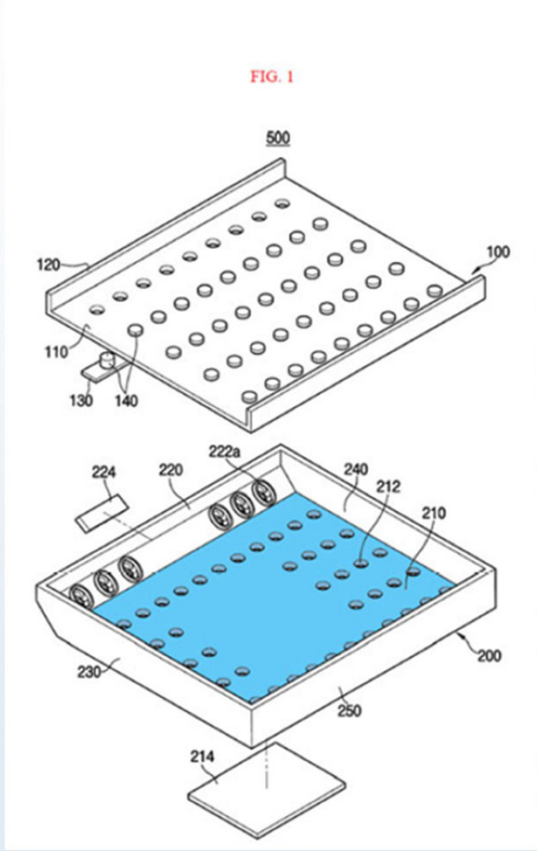
Ex. 2013, 930:23-25

Na **does not** teach a constricted convection plate defining a constricted convection channel

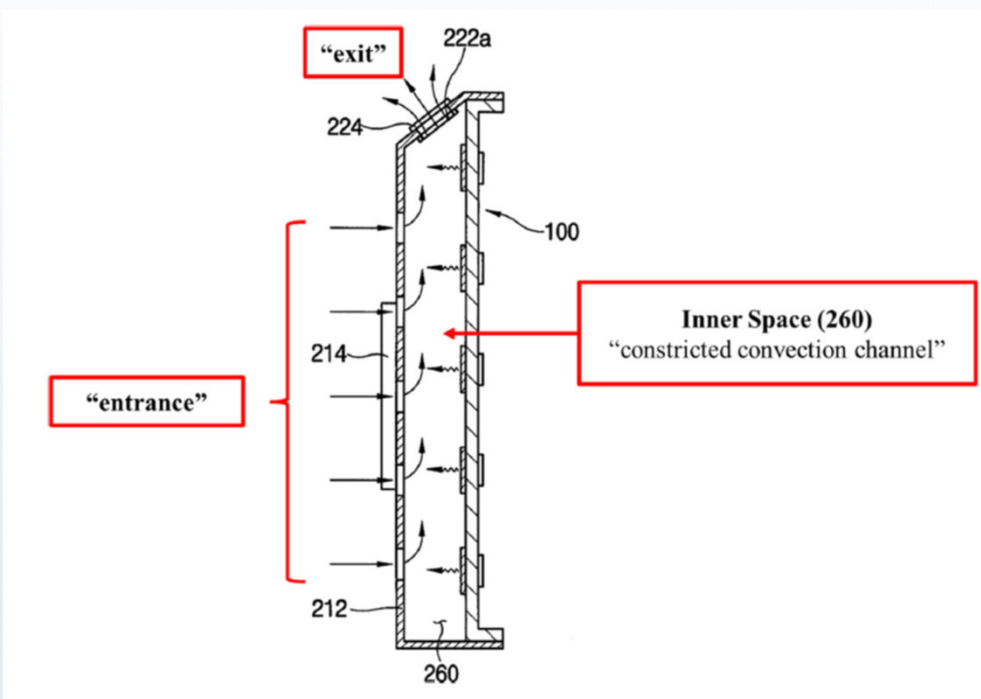


Na **does not** teach a constricted convection channel having an entrance and an exit

Petition's identification of fifty-holes as "entrance"

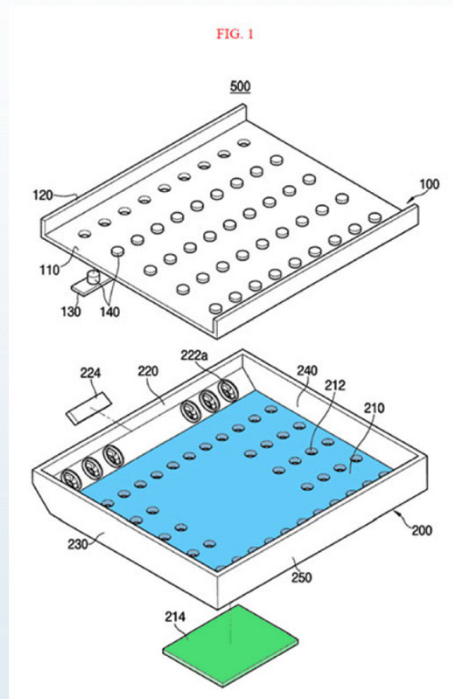


Na Patent | Ex. 1010, Fig. 1

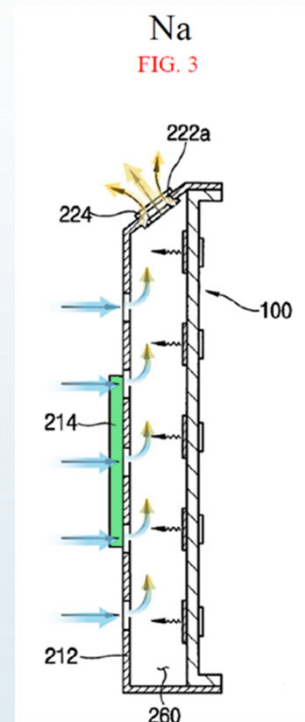


Petition at 72

Na **does not** teach “no electronics mounted to the posterior surface of the electronic display”



Na Patent | Ex. 1010, Fig. 1



Na Patent | Ex. 1010, Fig. 3

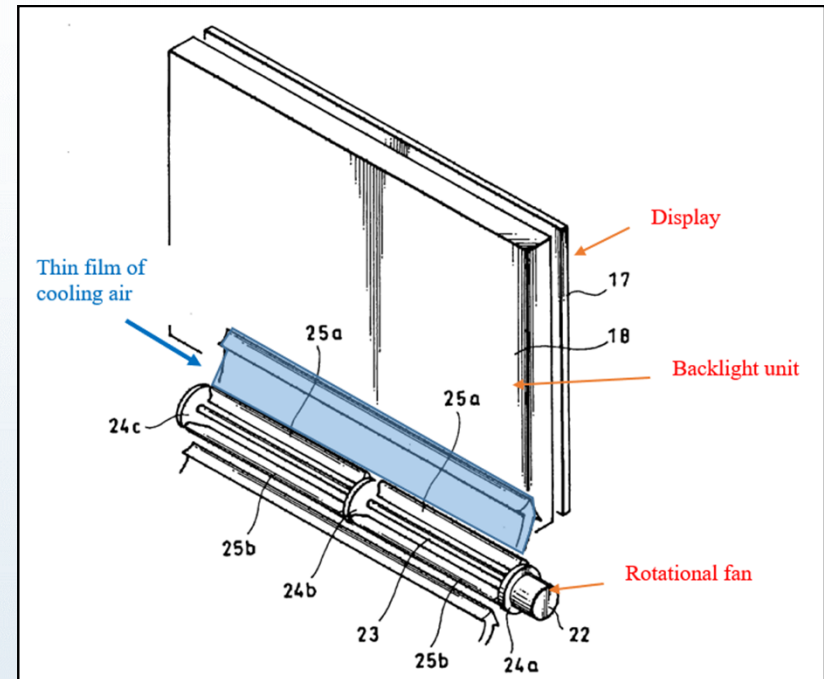
Kimura

'322 Patent, Claims 1-5, 7-9, 12-13, 16 (Grounds 8-11)

Kimura

The cooling fan can generate an air flow in one direction perpendicular to a rotational shaft 1, and includes a plurality of parallel revolution shafts 2 that revolve as a single body around the rotational shaft 1. Vanes 3 are rotatably provided on the revolution shafts 2 and by rotationally driving the vanes 3 using the rotational shaft 1 in the clockwise direction shown by the arrow in FIG. 1, lift is generated by the rotated vanes 3 at predetermined revolution angles, thereby producing an airflow in one direction.

Ex. 1004 | Kimura Patent, [0045]



Kimura Patent, Fig. 10
Ex. 1004 (annotated)

Kimura's Fan

What is claimed is:

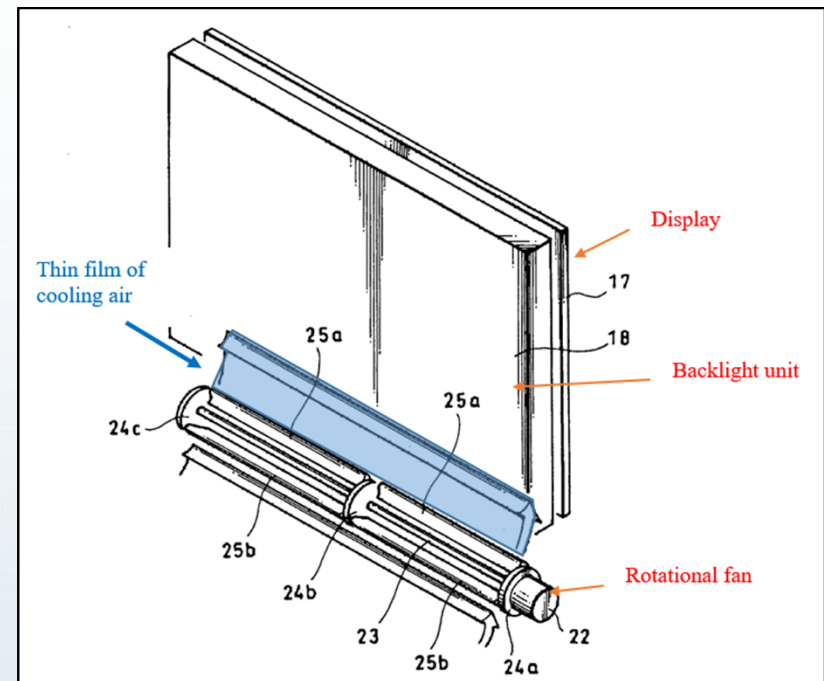
1. A cooling fan comprising:

a fan rotator composed of a rotational shaft that is rotationally driven by a driving source and at least two vanes that have parallel shafts that rotate together with the rotational shaft, are freely rotatable on the shafts, face one another, and revolve around the rotational shaft; and

vane angle control means that implements control so that
...

wherein a wind in a single direction perpendicular to the rotational shaft is generated by rotation of the fan rotator.

Ex. 1004 | Kimura Patent, claim 1



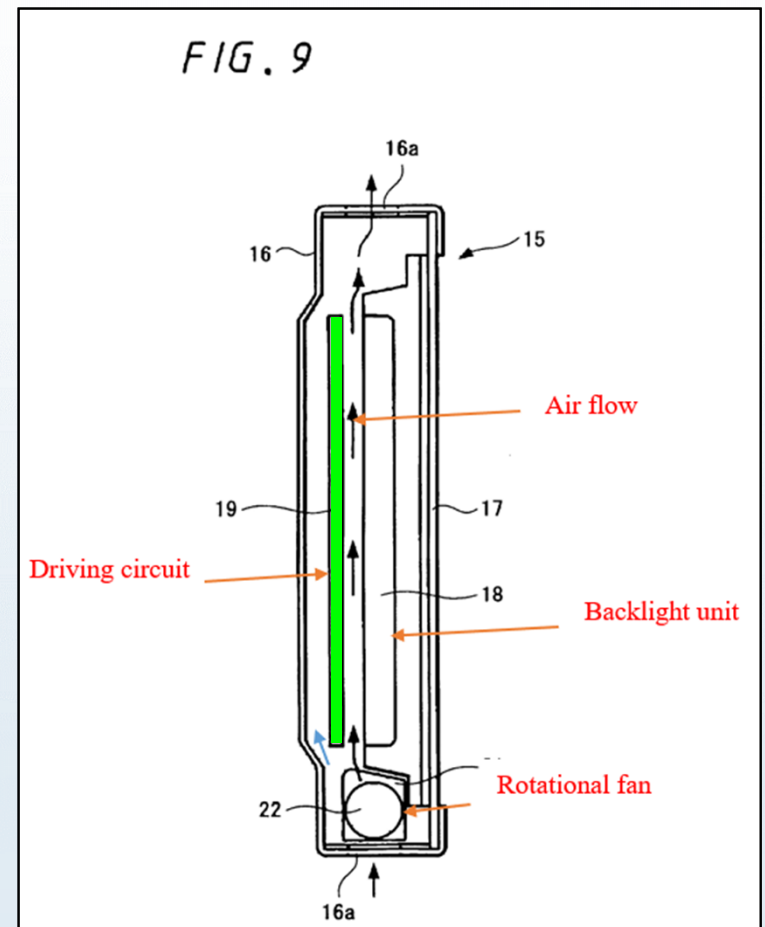
Kimura Patent, Fig. 10
Ex. 1004 (annotated)

Kimura's single sentence disclosure of driving circuit 19 **does not** teach or suggest a plate configured to form part of a constricted convection channel

A driving circuit 19 for the flat panel display is disposed behind the backlight unit 18. A cooling fan 20 according to the present invention is installed inside a gap 21 that is around 20 mm square and 700 mm long that is produced at a lower part of the panel due to the construction of the flat panel display. By circulating a wind generated by rotationally driving the cooling fan 20 in the form of a film to the rear surface of the backlight unit 18, the entire backlight unit 18 is cooled uniformly.

Ex. 1004 | Kimura Patent, [0078]

Ex. 1004 | Kimura Patent,
Fig. 9



Kimura's single sentence disclosure of driving circuit 19 **does not** teach or suggest its driving circuit 19 "cover[s] a majority of the posterior display surface"

Testimony of Robert Smith-Gillespie

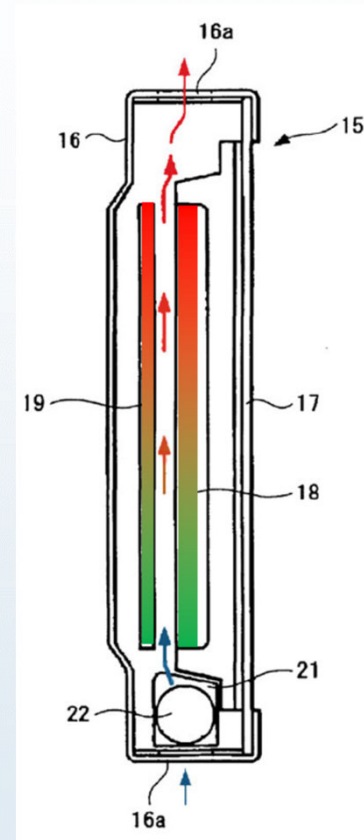
15 Q. And Kimura doesn't tell us the size of the
16 driving circuit that you rely on here, this element 19?

17 A. Not the size of the driving circuit, no.

17 Q. And you would agree that there are driving
18 circuits that are much smaller than an LCD display that
19 were known to skilled people, correct?

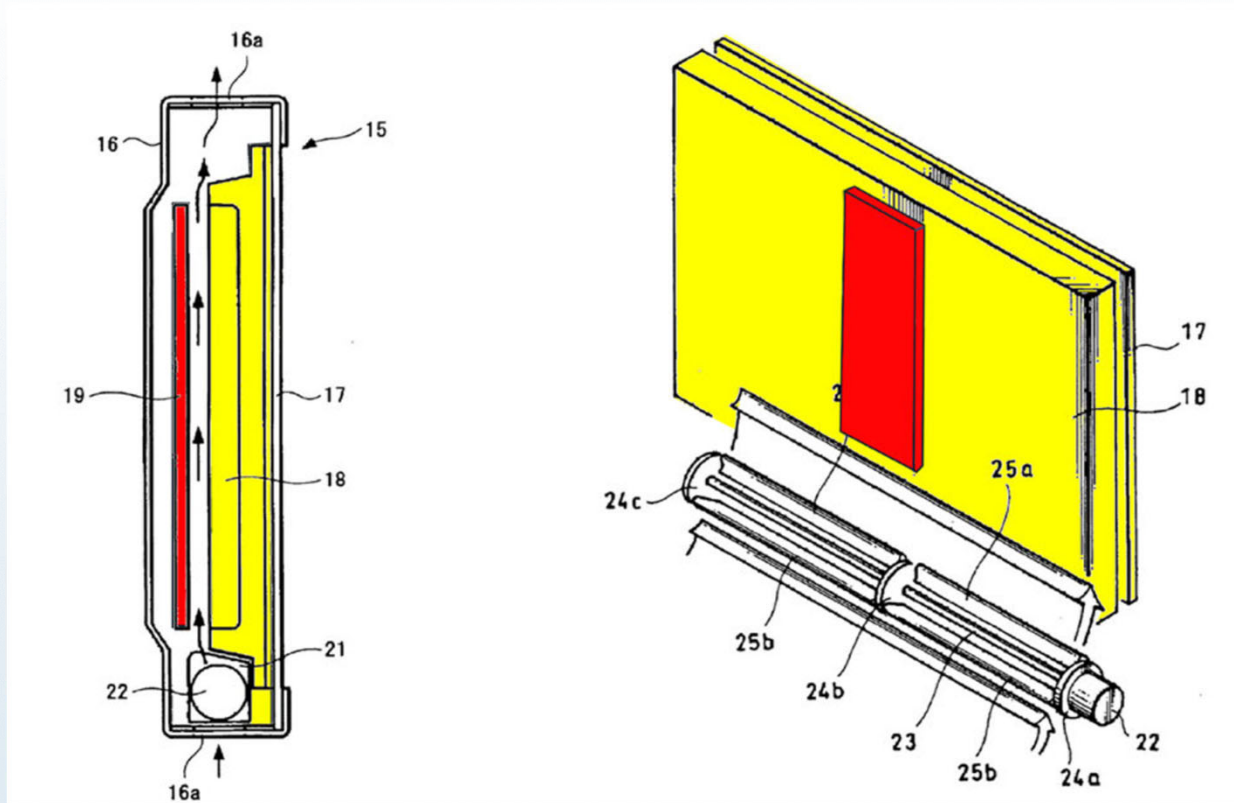
20 A. That's correct.

Ex. 2013, 1083:15-17, 1086:17-20



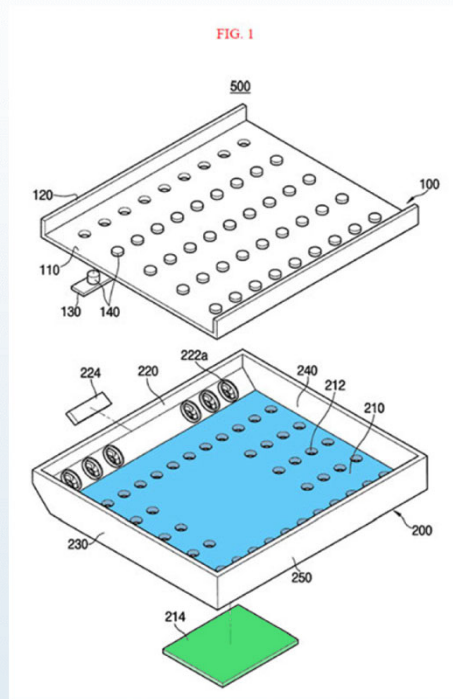
Ex. 1004 | Kimura Patent, Fig. 9
(annotated to show effect of
enlarging driving circuit)

Kimura's single sentence disclosure of driving circuit 19 **does not** teach or suggest its driving circuit 19 "cover[s] a majority of the posterior display surface"

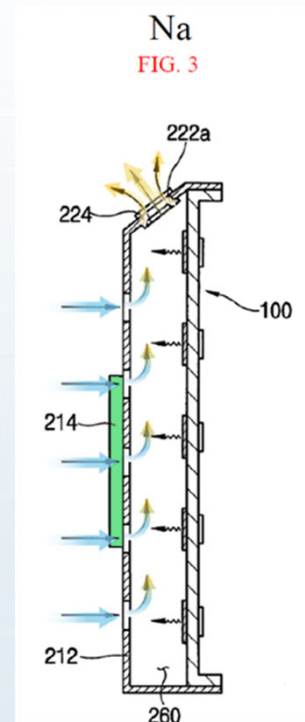


Ex. 1004 | Kimura Patent, Figs. 9, 10 (annotated with driving circuit added to Fig. 10)

Kimura's single sentence disclosure of driving circuit 19 **does not** teach or suggest its driving circuit 19 "cover[s] a majority of the posterior display surface"



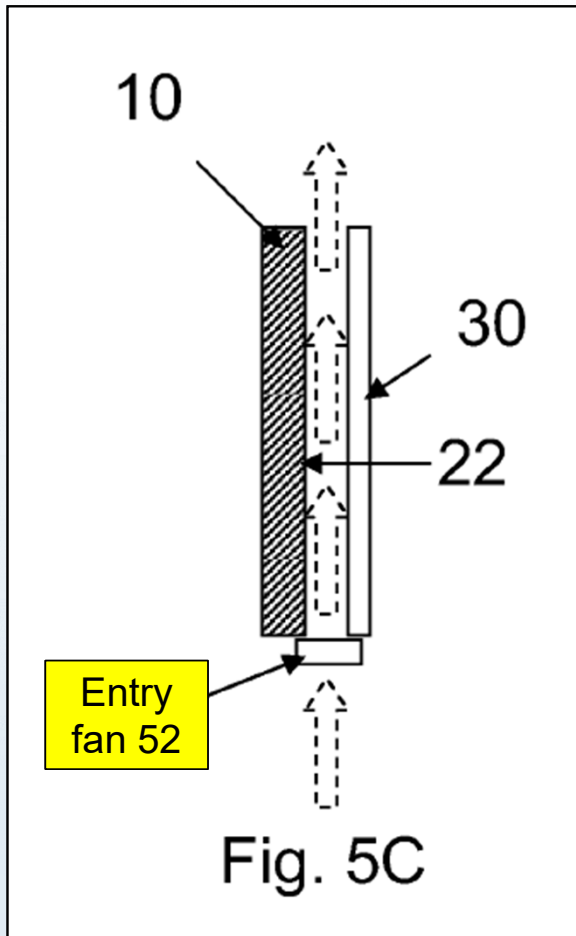
Na Patent | Ex. 1010, Fig. 1



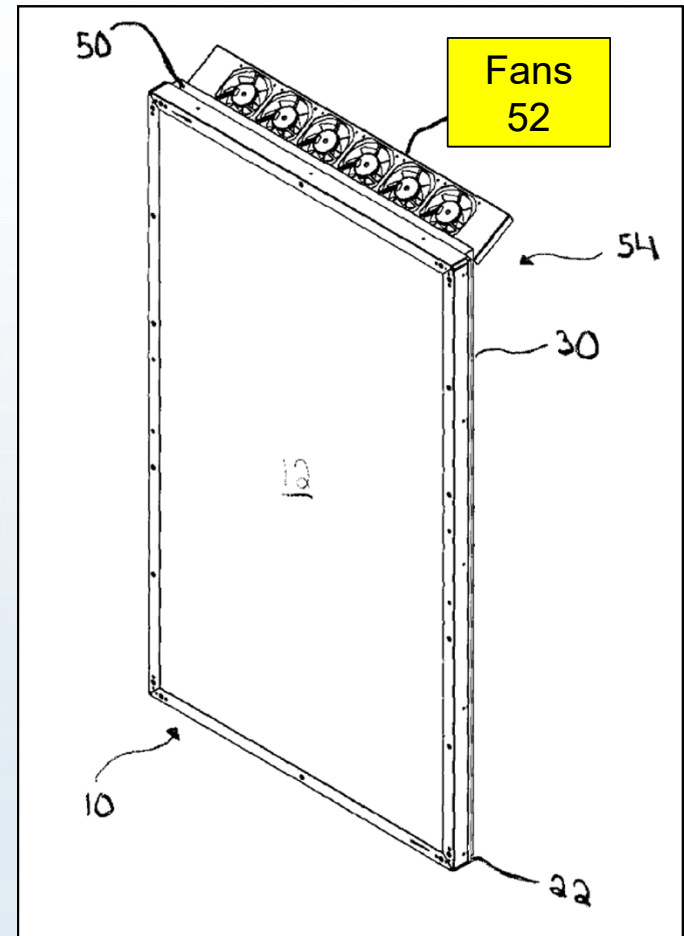
Na Patent | Ex. 1010, Fig. 3

'322 Patent discloses a “means for forcing air between the constricted convection plate and posterior display surface” from which Kimura teaches away

Ex. 1001
'322 Patent
Fig. 5C

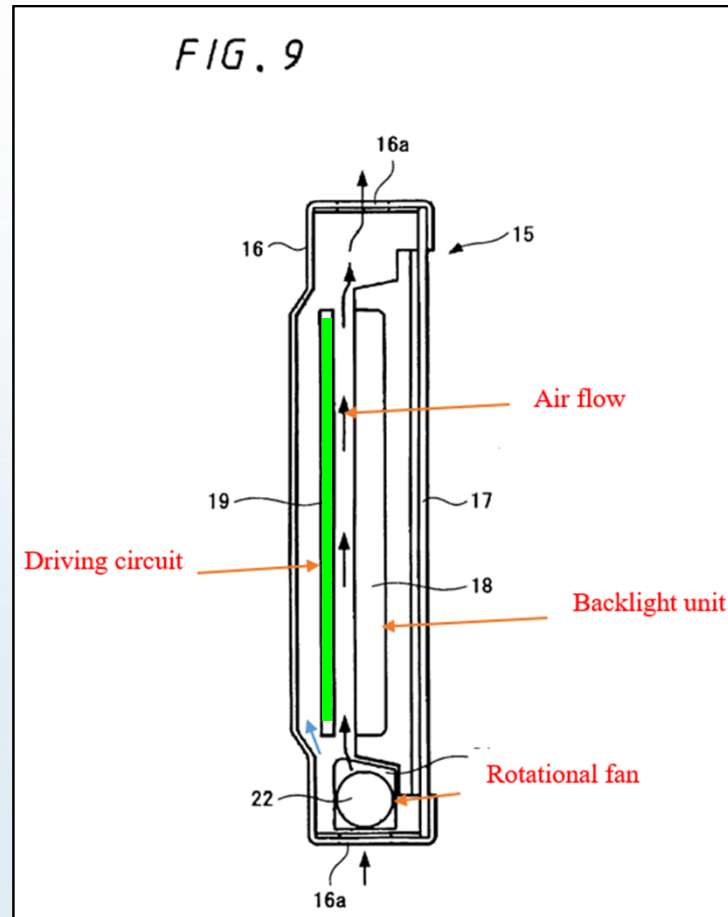
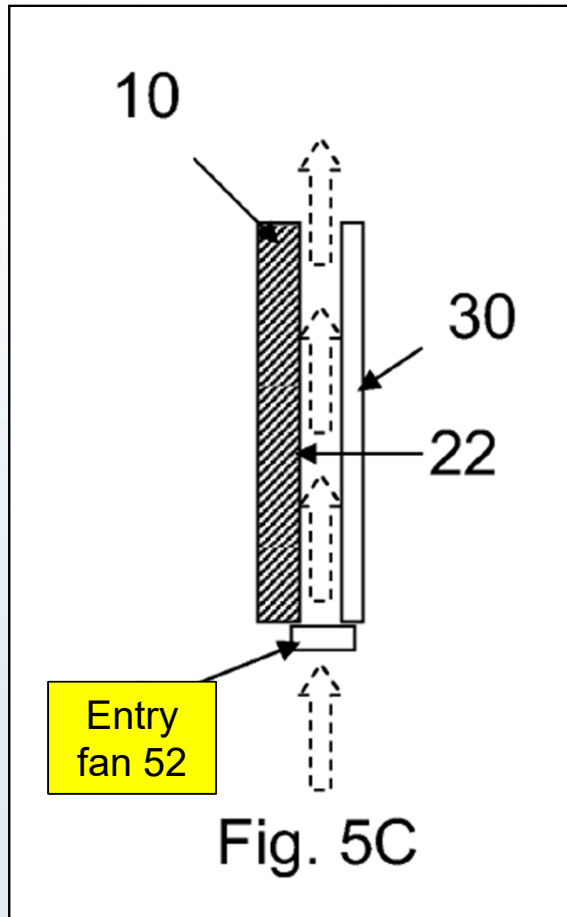


Ex. 1001
'322 Patent
Fig. 5a



Kimura **does not** teach the required “means for forcing air”

Ex. 1001
'322 Patent,
Fig. 5C | JX-2



Kimura Patent,
Fig. 9
Ex. 1004

Kimura expressly teaches that its single fan overcomes problems in the art with using multiple propeller fans like the means for forcing air described in the '322 patent

2. Description of the Related Art

Fans are conventionally used in a flat panel display apparatus such as a thin-screen television to cool the backlight that is both a light source for the display panel and also a high-temperature region.

Factors such as the apparatus design and installation conditions for the fan make it difficult to provide sufficient circular area for a propeller fan. . . . Aside from the propeller fans mentioned above, cross flow fans, sirocco fans and the like are also used. Since such fans generate airflows in all directions of the rotating surfaces, there are the problems of poor efficiency for use as cooling fans and a high noise level.

Ex. 1004 | Kimura Patent, [0004]-[0005]

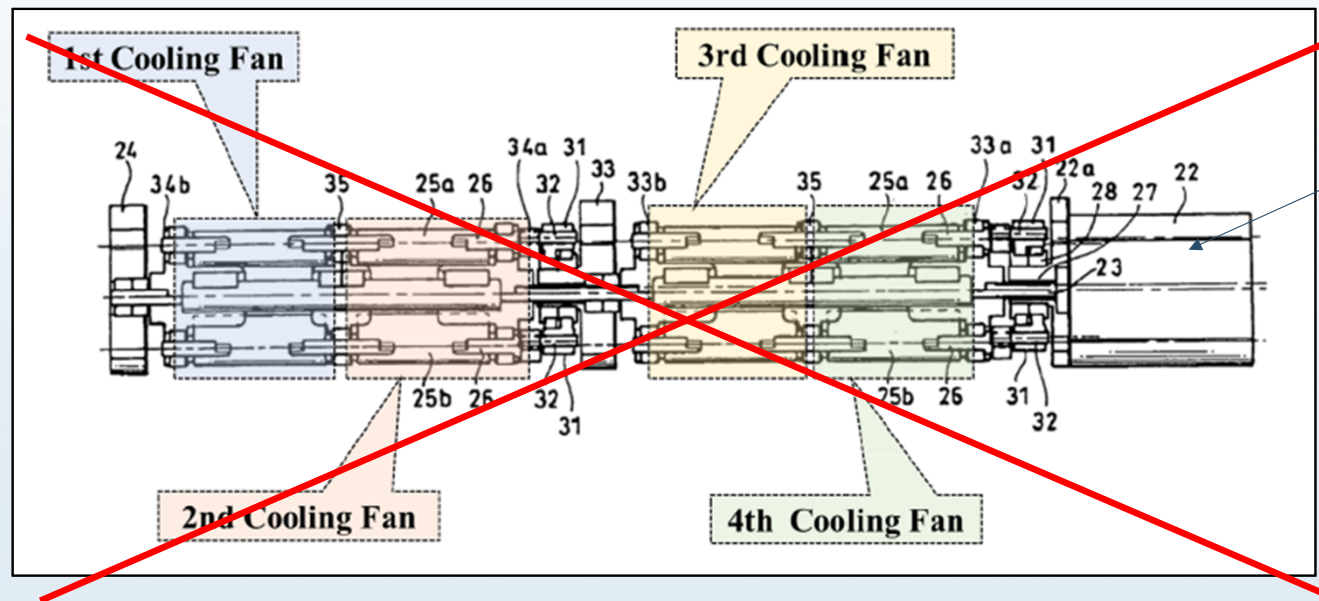
[T]he present invention relates to a cooling fan for cooling a backlight unit that is a high-temperature region in a flat panel display apparatus, the cooling fan being especially capable of uniformly cooling the backlight unit of a large flat panel display apparatus with high efficiency and operating more quietly than conventional fans.

Ex. 1004 | Kimura Patent, [0004]-[0005]

Mr. Smith-Gillespie disregards the express teachings of Kimura so he can find the “plurality of fans” required by claim 13

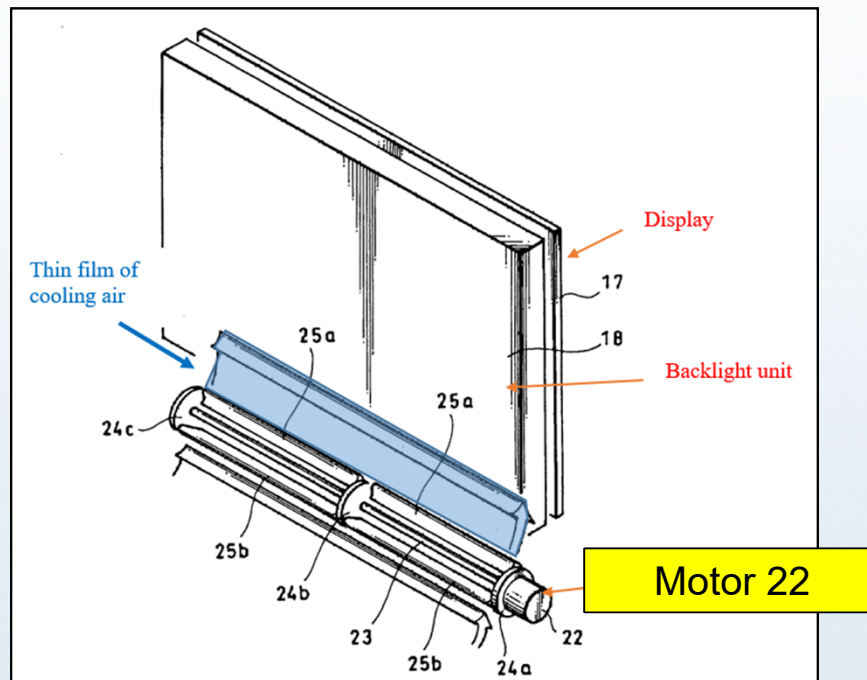
Also, in the case of the cooling fan shown in **FIG. 11**, the vanes that have been divided into two are further divided into two by the support frames **35**.

Ex. 1004 | Kimura Patent, [0078]



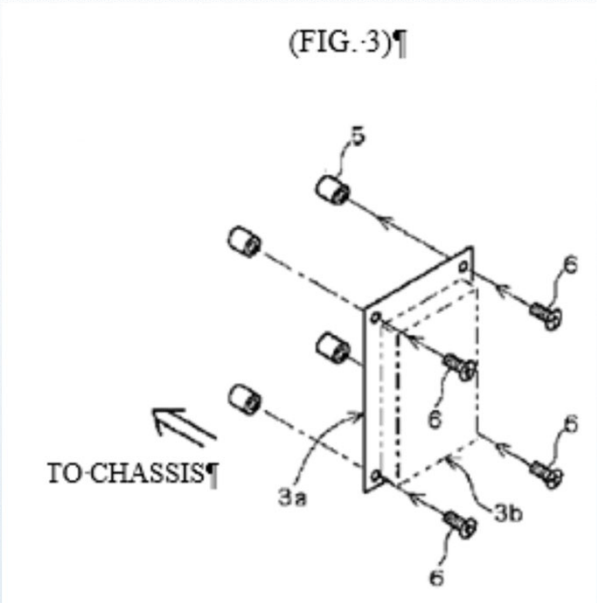
Petition at 88

Adding a second fan, which includes its own motor, would create a gap in the air flow and ruin the “film” of air flowing towards the display



Ex. 1004 | Kimura Patent, Fig. 10

Kim and Kochiyama (Ground 9)



Ex. 1004 | Kochiyama Patent, Fig. 3; Pet. at 90-91

Real-World Facts Demonstrate Nonobviousness

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

SAMSUNG



White Paper:

Taking the Message Outdoors

How New Outdoor Display Tech Is Changing How
Businesses Communicate

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 ('595 POR at 68-69; '322 POR at 63).

MANUFACTURING RESOURCES INTERNATIONAL DEMONSTRATIVE EXHIBIT—NOT EVIDENCE

Patent Owner's Demonstratives

47

Mother Nature presented an “enormous engineering challenge”



SAMSUNG

Fortin Xpressway 7:10PM

NEXT TRAIN

PLATFORM B
PURPLE LINE TRAIN ARRIVES IN

04
Minutes

SCHEDULED STOPS

Jenkins Blvd	7:22PM
Steen Ave	7:28PM
Brineway St	7:35PM
Shaw Blvd	7:40PM
Ritter Ave	7:57PM
Cherry Blvd	8:06PM
Tyrone Ave	8:12PM
Devilla Ave	8:16PM

Map showing various streets including Stanton Pkwy, Baker Ave, E. Peralta Pkwy, W. Michaelson Ave, Loren Ave, Kristensen Ave, Windsor Ave, Acosta Blvd, Acacia Ave, Latz Ave, Reeves Ave, Ortiz St, Meeka Blvd, Faulkner Blvd, Duffy Ave, Kline Hwy, Mendez St, W. Gilbert Pkwy, S. Medina Blvd, N. Medina Blvd, Rich Blvd, W. 4th St, and Miller Ave.

White Paper:
Taking the Message Outdoors
How New Outdoor Display Tech Is Changing How
Businesses Communicate

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 ('595 POR at 69; '322 POR at 63).

Samsung failed despite its expertise and enormous resources



Leader in Innovation

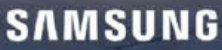
Our relentless innovation has helped transform the way the world interacts with information and with each other. Samsung is dedicated to creating scalable technology that securely and seamlessly integrates with a business' infrastructure. Our comprehensive B2B product portfolio helps people to be more 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 ('595 POR at 69; '322 POR at 63).

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	
Kim	
(10) Pub. No.: US 2006/0077636 A1	
(43) Pub. Date: Apr. 13, 2006	
(54) DISPLAY DEVICE USABLE OUTDOORS	
Publication Classification	
(51) Int. Cl.	
H05K 7/20 (2006.01)	
(52) U.S. Cl.	
361/688	
(76) Inventor: Sung-gi Kim, Suwon-si (KR)	
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	
Cho et al.	
(10) Pub. No.: US 2006/0132699 A1	
(43) Pub. Date: Jun. 22, 2006	
(54) COOLING APPARATUS AND LIQUID CRYSTAL DISPLAY DEVICE HAVING THE SAME	
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)	
Publication Classification	
(51) Int. Cl.	
G02F 1/1333 (2006.01)	
(52) U.S. Cl.	
349/161	
(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.	
Correspondence Address:	
CANTOR COLBURN, LLP	
55 GRIFFIN ROAD SOUTH	
BLOOMFIELD, CT 06002	
(21) Appl. No.: 11/313,151	
(22) Filed: Dec. 20, 2005	

(12) United States Patent	
Kim et al.	
(10) Patent No.: US 7,800,706 B2	
(45) Date of Patent: Sep. 21, 2010	
(54) COOLING FAN UNIT AND DISPLAY APPARATUS HAVING THE SAME	
FOREIGN PATENT DOCUMENTS	
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)	
CN 1780548 A 5/2006	
JP 9-270975 A 10/1997	
JP 2004-029388 A 1/2004	
KR 2003-071073 A 9/2003	
KR 2006-026748 A 3/2006	
(*) 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	
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	
Oh et al.	
(10) Patent No.: US 7,948,575 B2	
(45) Date of Patent: May 24, 2011	
(54) LIQUID CRYSTAL DISPLAY DEVICE HAVING PARTICULAR POLARIZING FILTER IN HOUSING	
FOREIGN PATENT DOCUMENTS	
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)	
JP 2006-039344 2/2006	
JP 2007-065137 3/2007	
JP 2007065137 A * 3/2007	
KR 2003-57218 7/2003	
(*) 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	
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 ('595 POR at 70; '322 POR at 64).

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 ('595 POR at 70; '322 POR at 64).

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.

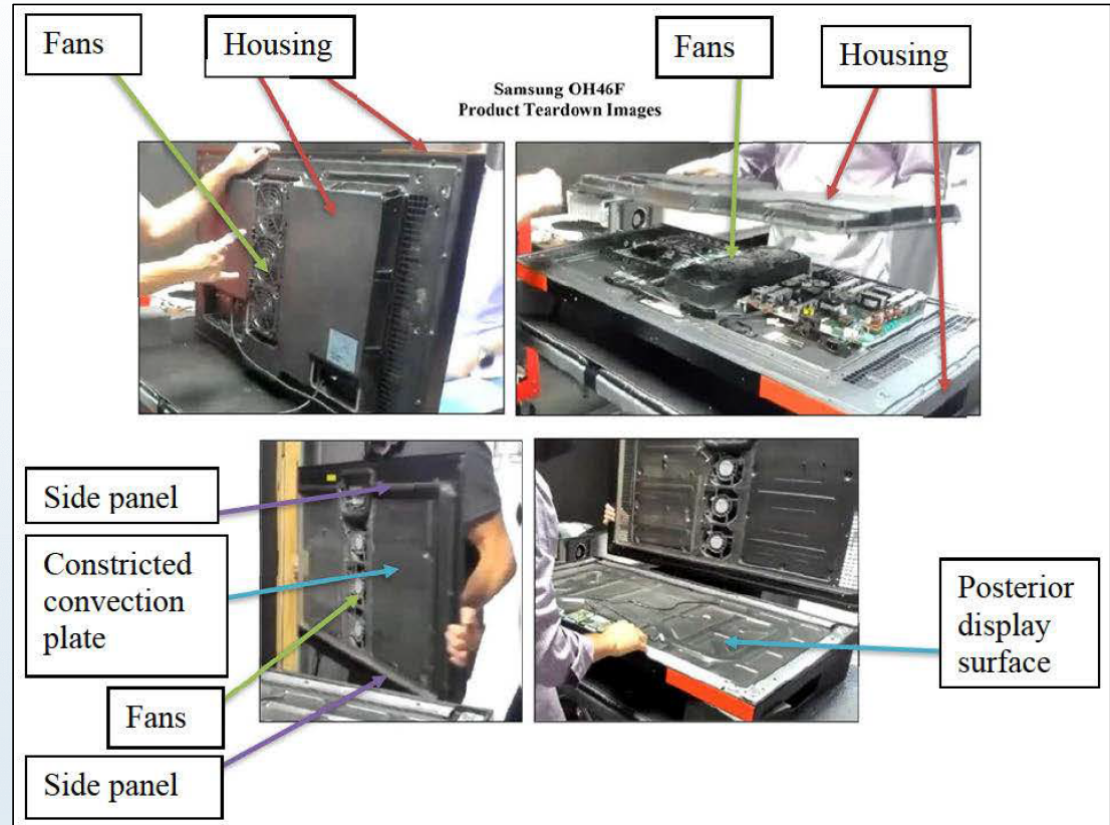
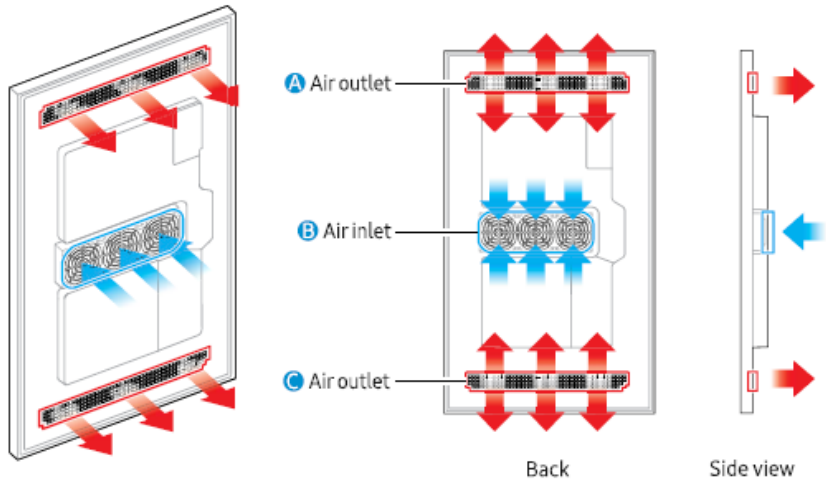
1 Q. When was that OHF product introduced
2 to the market?
3 A. Maybe 2017. I don't know that
4 exactly.

Undisputed that Samsung's products practice the patents

SAMSUNG

Outdoor Installation Guide

OH46F/OH55A/OH55F



Commercial Success & Willingness of Others to License MRI Patents

- Undisputed that Samsung achieved commercial success (Ex. 2040-2041)

Samsung's infringing 46-inch and 55-inch OHF products (and subsequent OHA and OHB products) achieved the commercial success its earlier efforts could not. From 2015-2017, the years the predecessor OHD display was on the market, those OHD products generated [REDACTED] in U.S. sales in 2015; [REDACTED] in U.S. sales in 2016, [REDACTED] in U.S. sales in 2017; and [REDACTED] in [REDACTED] in 2018. Ex. 2040.

By contrast, sales of Samsung's commercial embodiments of the '595 patent resulted in immediate commercial success thus further demonstrating the nexus between claim 1 and the commercial success of Samsung's OHF products practicing it. In contrast to the OHD products' [REDACTED] in U.S. sales over several years, the 55-inch OHF product achieved over [REDACTED] in U.S. sales in a single year. Ex. 2040. Federal Circuit precedent holds sales of this magnitude alone

- 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 its new OHF products which infringe the challenged claims, and are able to function outside and in full sunlight because of their cooling system. *See* Ex. 2038, at 13-22 (comparing the Samsung OH series thermal management system having a constricted “[REDACTED]” [REDACTED] with conventional systems).

EX. 2042, EX. 2043
UNDER SEAL

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)).