

Declaration of Robert Smith-Gillespie in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 11,013,142

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD,
Petitioner,

v.

MANUFACTURING RESOURCES INTERNATIONAL, INC.,
Patent Owner

IPR2023-00221

U.S. Patent No. 11,013,142

Issue Date: May 18, 2021

Title: ELECTRONIC DISPLAY WITH COOLING

**DECLARATION OF ROBERT SMITH-GILLESPIE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO.
11,013,142**

SEC et al. v. MRI
SEC Exhibit 1002.0001
IPR2023-00221

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Declaration of Robert Smith-Gillespie in Support of
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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. 11,013,142 (“’142 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 ’142 patent issued on May 18, 2021 from U.S. Application No. 16/933,932, 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 ’142 patent is March 3, 2008, the filing date of Provisional Application No. 61/033,064, to which the ’142 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.

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I have been asked to provide my opinion concerning the question of whether the devices described in claims 1-15 of the '142 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 '142 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 '142 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.

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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

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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).

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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

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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.

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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 '142 Patent (Ex. 1001) and its prosecution history (Ex. 1022).

19. I have cited the following documents in my analysis below:

Exhibit No.	Description
Ex. 1001	U.S. Patent No. 11,013,142 (“the ’142 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	U.S. Patent No. 6,392,727 to Larson et al. (“Larson”)
Ex. 1006	United Kingdom Patent Application No. GB 2402205A by Yare (“Yare”)
Ex. 1007	U.S. Patent No. 6,825,828 (“Burke”)
Ex. 1008	E. Fred Schubert & Jong Kyu Kim, <i>Solid-State Light Sources Getting Smart</i> , 308 <i>Science</i> 1274 (2005) (“Schubert”)
Ex. 1009	Military Handbook: Reliability Prediction of Electronic Equipment, DEPARTMENT OF DEFENSE, MIL-HDBK-217F (1991) (“MIL-HDBK-217F”)
Ex. 1010	Allan Webber, <i>Calculating Useful Lifetimes of Embedded Processors</i> , TEXAS INSTRUMENTS INCORPORATED, SPRABX4 (Nov. 2014) (“Webber”)
Ex. 1011	LIAN-TUU YEH & RICHARD C. CHU, THERMAL MANAGEMENT OF MICROELECTRONIC EQUIPMENT: HEAT TRANSFER THEORY, ANALYSIS METHODS, AND DESIGN PRACTICES (Dereje Agonafer ed., 2002) (“Yeh & Chu”)

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Exhibit No.	Description
Ex. 1012	ALLAN W. SCOTT, COOLING OF ELECTRONIC EQUIPMENT (John Wiley & Sons, 1974) (“Scott”)
Ex. 1013	DAVE S. STEINBERG, COOLING TECHNIQUES FOR ELECTRONIC EQUIPMENT (John Wiley & Sons, 1980) (“Steinberg”)
Ex. 1014	U.S. Patent No. 5,748,269 to Harris et al. (“Harris”)
Ex. 1015	U.S. Patent No. 6,504,713 to Pandolfi et al. (“Pandolfi”)
Ex. 1016	U.S. Patent No. 4,327,803 to Mullejeans et al. (“Mullejeans”)
Ex. 1017	U.S. Patent No. 5,002,118 to Olmstead et al. (“Olmstead”)
Ex. 1018	U.S. Patent No. 6,244,333 to Bergh et al. (“Bergh”)
Ex. 1019	U.S. Patent No. 4,896,218 to Vick (“Vick”)
Ex. 1020	U.S. Patent No. 6,020,945 to Sawai et al. (“Sawai”)
Ex. 1021	U.S. Patent No. 3,858,965 to Sumita (“Sumita”)
Ex. 1022	File History for U.S. Patent Application No. 16/933,932
Ex. 1023	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. 1024	U.S. Patent No. 8,854,572 to Dunn (the “’572 patent”)
Ex. 1025	U.S. Patent No. 9,629,287 to Dunn (the “’287 patent”)
Ex. 1026	U.S. Patent No. 9,173,325 to Dunn (the “’325 patent”)

20. In the citations, emphasis is added unless noted otherwise.

II. LEGAL PRINCIPLES

21. I am not an attorney. For purposes of this declaration, I have been informed by counsel for Samsung Electronics Co., LTD, about certain aspects of the law that are relevant to my analysis and opinions, as set forth below.

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A. Prior Art

22. I understand that the prior art to the '142 patent includes patents and printed publications in the relevant art that predate the '142 patent's priority date. I have been informed by Counsel to assume generally the actual filing date of the earliest filed patent application to which the '142 patent claims priority. That patent application is U.S. Provisional Patent Application No. 61/033,064, which was filed on March 3, 2008. Therefore, for purposes of my analysis I have considered March 3, 2008 as the relevant date for determining what is "prior art." In other words, I have considered as "prior art" anything publicly available prior to March 3, 2008. I further understand that, for purposes of this proceeding in the United States Patent Trial and Appeal Board, only patents and documents that have the legal status of a "printed publication" may be relied on as prior art.

23. I have also been informed and understand that when a patent application is a continuation-in-part of another patent application, as is the case here, not all claims may be entitled to the same priority date, and that the priority of a particular claim is the actual filing date of the earliest filed priority patent application that fully discloses the subject matter of that claim. Regardless, in my analysis below, I assume that the priority date for all claims is March 3, 2008 because all prior art relied upon in this declaration pre-date that earliest claimed

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priority.

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 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

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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*”

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standard 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

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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

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order 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 '142 patent should be undertaken from the perspective of a POSITA 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 educational level of active workers in the field; and (4) the educational level of the

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inventor.

39. Applying these factors, as to the '142 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 POSITA would have had 5–7 years of experience in the field working with electronic displays and have a similar understanding of product design issues and failure modes associated with electronic displays. To the extent necessary, a POSITA 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 ’142 PATENT**

41. The ’142 patent discloses systems and methods for cooling an electronic image assembly including placing a transparent panel forward of the display assembly and providing an airflow pathway through the gap form therebetween. The ’142 patent additionally discloses the use of at least one polarizer located at the transparent panel to reduce solar energy entering said airflow pathway.

42. Key features of the system for cooling the electronic image assembly (EIA) claimed in the ’142 include (from claim 1):

- i. A housing for the EIA with a transparent cover panel placed forward of the EIA’s display surface
- ii. A closed loop airflow pathway wherein air is made to pass “around” the EIA with a portion of the air passes between the cover panel and the EIA display surface
- iii. An open loop ambient air pathway behind the EIA
- iv. An air circulation device to push air around the closed loop

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v. A polarizer (linear) on the inner surface of the cover panel (facing the EIA).

43. Other features of the system include:

- i. At least one anti-reflective (AR) film on the cover panel
- ii. A heat exchanger unit placed rearward of the EIA which exchanges heat between the close loop and open loop airflow paths.

44. I understand that a POSITA is presumed to know and be familiar with all of the relevant art in the field at the time of the relevant invention.

45. The technology at issue in the challenged claims of the '142 patent relates to the cooling of electronic image displays, including liquid crystal displays (LCD displays). Such displays and their cooling systems have been known and used well-before March 2008.

46. 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.

47. A typical LCD display is comprised of three main components: an LCD panel, an electronic driver circuit, and a backlight. The LCD display panel comprises a thin layer of liquid crystal ("LC") material constrained between two

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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 LCD panel to provide a color image on the display.

48. 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.*, Ex. 1007, 1:15-30; *Solid-State Light Sources Getting Smart*, E. Fred Schubert & Jong Kyu Kim, *Science* **308**, 1274-78 (2005) (Ex. 1008).) 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.

49. 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-

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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 military equipment electronics.

50. 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

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 1994, MIL-HDBK-217F (1991) (Ex. 1009) 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.

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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.

51. Sensitive electronics in display systems include power supply components, microcontrollers, microprocessors, and other semiconductor 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 '142 patent filing. Thus, some cooling mechanism must be used to ensure the continued reliability of electronics, and ultimately, to prevent failure. (*See* Ex. 1011, 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.”).)

52. 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. 1012, p.1 (“All electronic equipment needs cooling.”); Ex. 1013, 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

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convection. (Ex. 1020, p.2.)

53. 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 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 '142 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.

54. 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

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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. 1014, 5:18–23.)

55. 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. 1009), 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)

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(Ex. 1009, § 6.3.)

56. 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 filing of the '142 patent wherein thermal considerations and countermeasures were taken by the inventors.

57. *Convective cooling of electronic displays.* Both conductive and convective cooling of electronic displays were well-known at the time of the '142 patent filing. (Ex. 1001, 1:66-2:7 (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 '142 patent application. For example, Harris, disclosed a convective cooling system for removing heat from “an environmentally-sealed enclosure having a removable cover, and housing a liquid crystal display screen.” (Ex. 1014, Abstract).

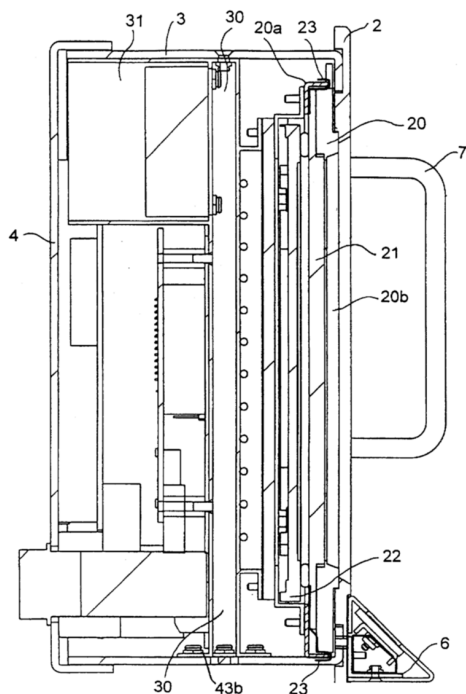


FIG.2

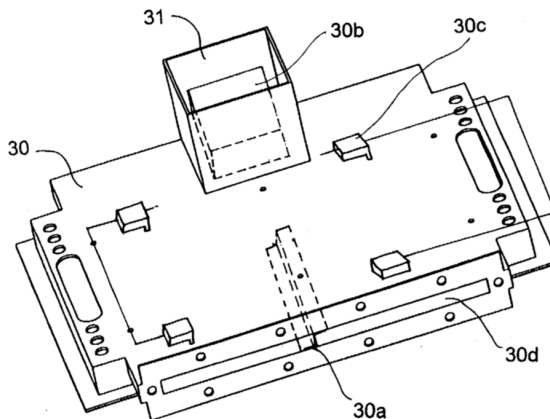


FIG.3

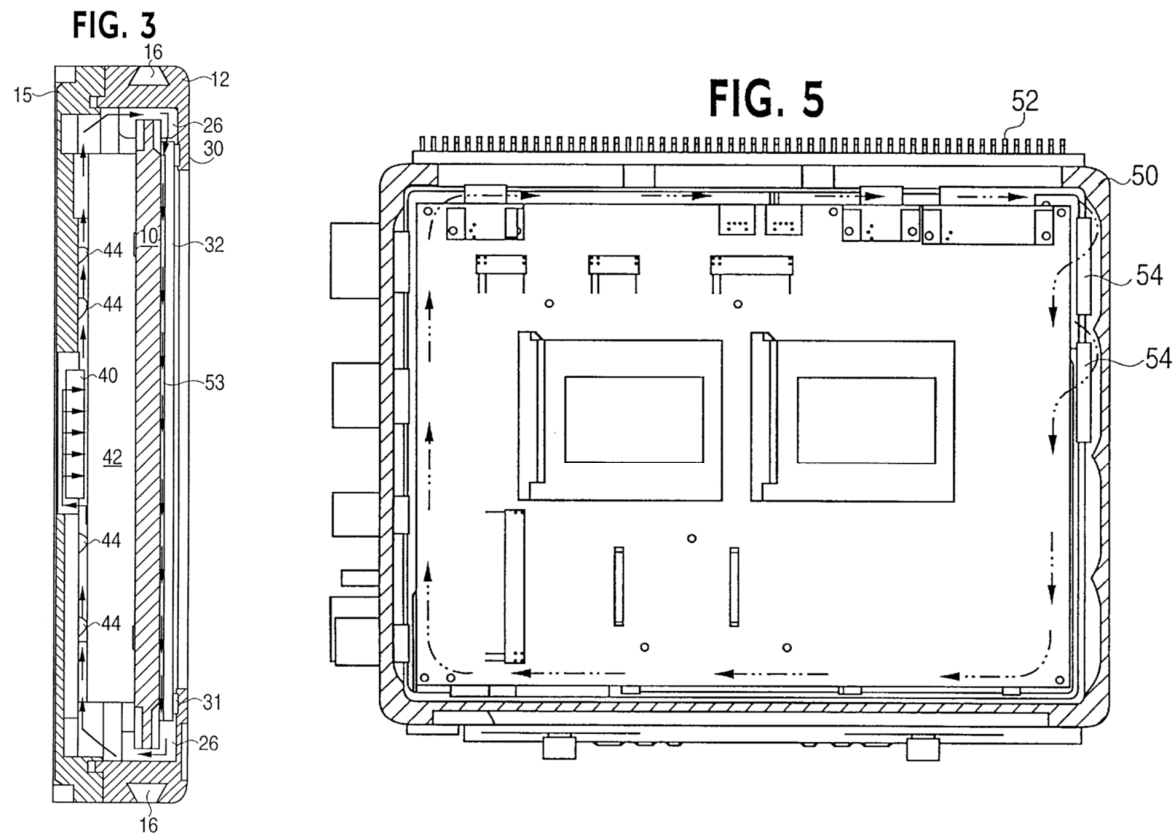
(Ex. 1014, FIGS. 2 and 3, 5:18-30 (plenum **30** and fan **30b**, air intake passage **30d**, and exhaust port **31** provide cooling by convection).)

58. 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)

59. *Closed loop cooling of electronic displays.* While Harris suggests the

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use of an open loop cooling system, closed loop cooling of electronic displays was also well-known. For example, Pandolfi discloses sealed, closed loop, forced air cooling system for cooling a display module. (Ex. 1015, 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 “The 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.)

60. 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).

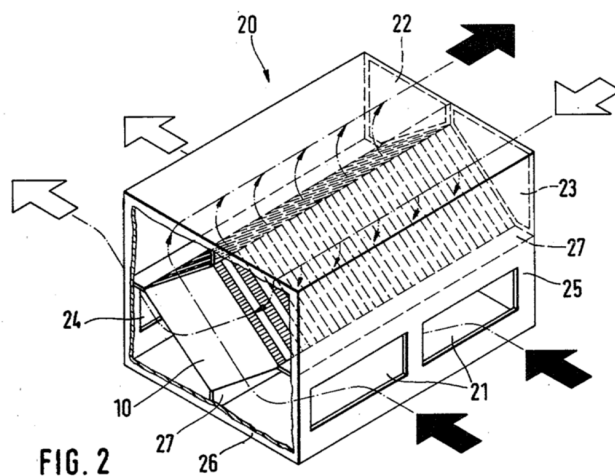
61. *Air-to-air heat exchanger technologies and their application to electronic displays.* Air-to-air heat exchangers were well known both for their use

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in heat recovery systems in process industries and heating and cooling systems.

Muellejeans, issued in 1982 (Ex. 1016 (disclosing a cross-flow heat exchanger)),
Olmstead, issued in 1991 (Ex. 1017 (also disclosing a cross-flow heat exchanger)),
and Bergh, issued in 2001 (Ex. 1018 (disclosing a folded plate heat exchanger)),
provide examples of a few types of air-to-air heat exchangers.

62. 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.



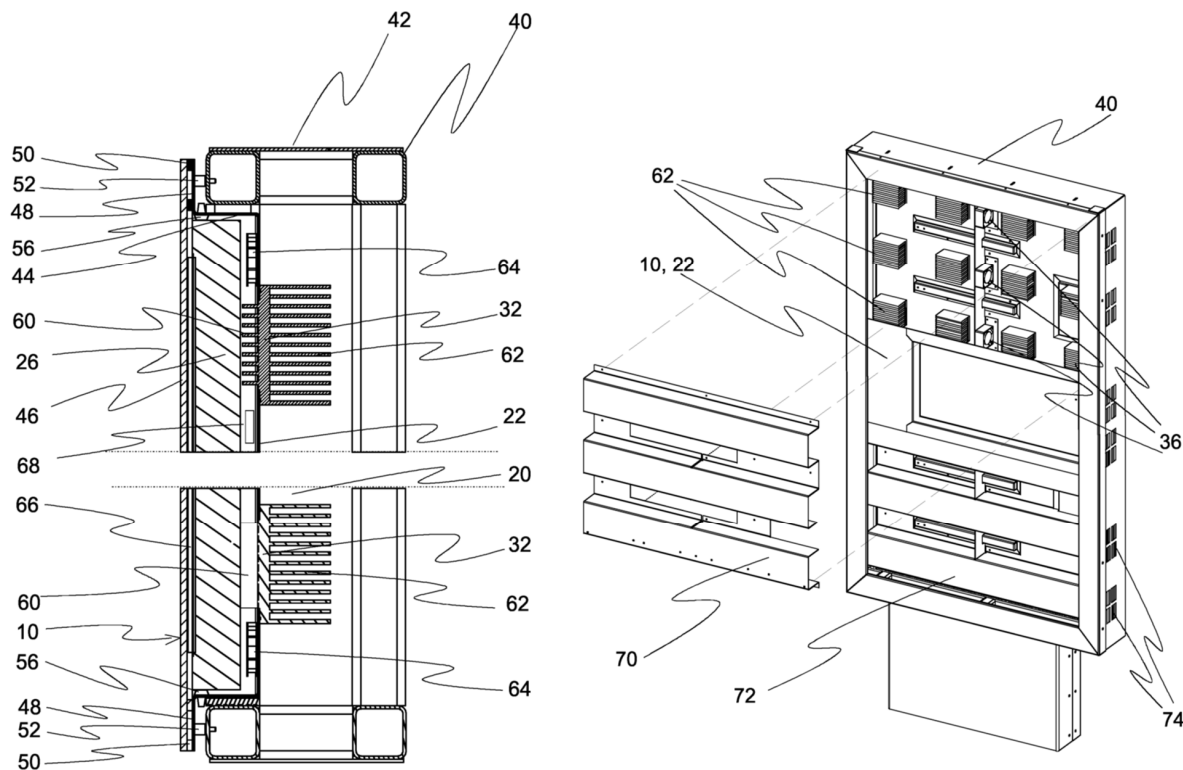
(Ex. 1016, FIG. 2)

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63. Karpannen (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)



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

64. Karpanen 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.

65. *The use of optical filters for solar energy reduction in electronic displays.* Optical filters have long been used to enhance the readability of electronic displays used in bright ambient environments. The primary issue initially addressed was that of contrast reduction of CRT displays exposed directly

to sunlight or other very high illuminance sources (e.g. cloud banks, reflections off buildings, sand or snow, operating theater lights, etc.). A CRT emits light by emitting photons from a phosphor surface excitation by an electron beam. The phosphors used in CRT are typically comprised of white powders fused to the inner surface of the cathode ray tube. When high levels of illuminance fall on the phosphor screen, the phosphors reflect a white, diffuse light over the entire surface. This reflected light combines with the image forming light emitted by the phosphors there by “washing-out”³ the displayed image.

66. Several types of optical filters have been employed including bandpass filters whose pass bands align with the emission spectra of the displayed image, shadow masks and micro-louver filters are a few examples applied to the emissive-type displays. Since front surface reflections are a strong contributor to

³ Display wash-out is a phenomenon wherein the image contrast is greatly reduced meaning the ratio of the image area to the background area approaches 1:1. This can easily happen with certain types of displays in high ambient illumination environments. CRTs, FEDs, and PDPs are all sensitive to display wash-out. LCD are also susceptible to wash-out but not as badly as phosphor-based emissive displays.

the wash-out issue, numerous approaches have been explored to reduce the reflections from surfaces. These approaches are generally referred to as anti-reflective coatings or film and are discussed in the next section.

67. The use of polarized filters was found effective for reducing wash-out on CRTs in the 1980's. Vick (Ex. 1019), discloses “[a] contrast enhancement filter for use on display devices which utilizes a multiple bandpass optical interference filter with the passbands matched to any predetermined desired frequencies of the display device and a circular polarizer disposed outwardly from said interference filter and an anti-reflective coating deposited thereon.” (Ex. 1019, Abstract.) Vick suggests that the disclosed filter can be applied to CRT, TFEL, and LCD display devices. (*Id.*, 1:24-28.) The circular polarizer, which comprises a laminated stack of a linear polarizer and a $\frac{1}{4}$ wave retarder film, was “well-known in the art” (*Id.*, 3:34-36.) at time of filing the patent application (1987).

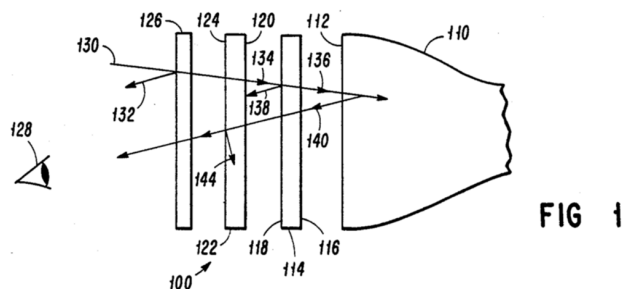
68. Vick describes the operational principals of the disclosed filter as follows:

In operation, a typical viewer **128** will look through the anti-reflective coating **126**, the polarizer **122**, and the interference filter **114** to the faceplate **112** of the CRT **110**. A typical incident ambient light ray **130** is shown incident upon the anti-reflective coating **126** where a very small percentage of light **132** is reflected back toward the viewer

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128. The remainder of the incident light **130**, which is not reflected, then passes through coating **126** and encounters the polarizer **122** thereby passing only polarized light **134** towards the interference filter **114**, which passes light **136** in several narrow passbands while reflecting light **138**, with a phase shift, back toward polarizer **122**. The light **138** with its phase shift will not pass through polarizer **122**.

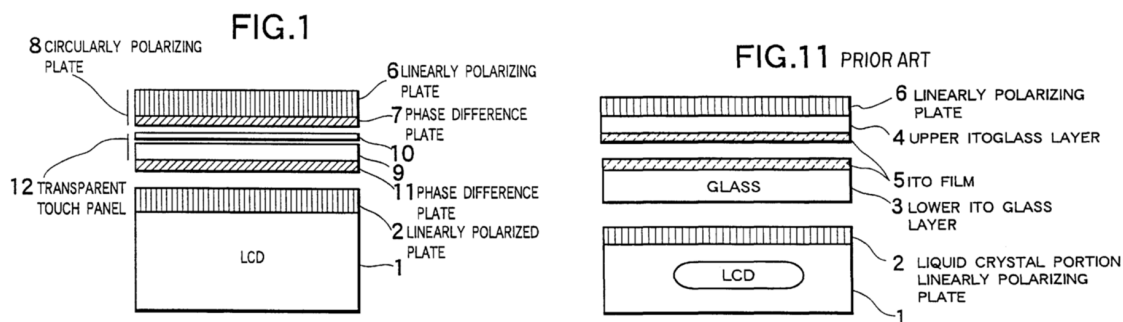
(*Id.*, 3:38-52.)



(*Id.*, FIG. 1.)

69. A later patent, issued in February 2000, (“Sawai”) (Ex. 1020) utilizes a similar polarizing filter applied to a transparent touch panel for use with an LCD display. While a preferred embodiment of the display apparatus includes a linear polarizer and a “phase difference plate” (i.e. retarder), Sawai discloses in the discussion of prior art, an LCD display panel which includes a linear polarizer integrated to the transparent touch panel.

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(Ex. 1020, FIGs. 1 and 11.)

70. Finally, Larson (Ex. 1005) discloses a linearly polarized filter for use with a “display ... [that] comprises a polarized display that has reduced reflectances in the output of the display to maintain high contrast output, high illumination levels, and less expensive production.” (Ex. 1005, 1:62-66.) The filter part of this display places the polarizer on the inner side of the cover glass facing the image surface of the display. The glass substrate and polarizer may include anti-reflection layers. Larson points out that:

The auxiliary polarizer **20** is an absorbing polarizer, preferably of a similar type as the front polarizer, and is preferably aligned in the same direction as the front polarizer **8**. Alignment of the polarizers **8**, **20** in the same direction minimizes the attenuation of light coming from the backlight **18**. This allows maximum transmission of the light with little to no attenuation of the light. Reflected light, however, initially passes through the cover glass and is polarized by the auxiliary polarizer **20**. By removing one of the polarizations before it reaches the gap **9**, the reflections from each of the interfaces between

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the auxiliary polarizer **20** and front polarizer **8** are reduced by around 50%.

(*Id.*, 3:18-30.)

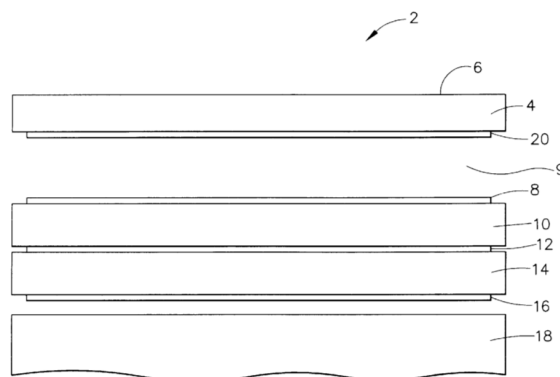


FIG. 2

(*Id.*, FIG. 2.)

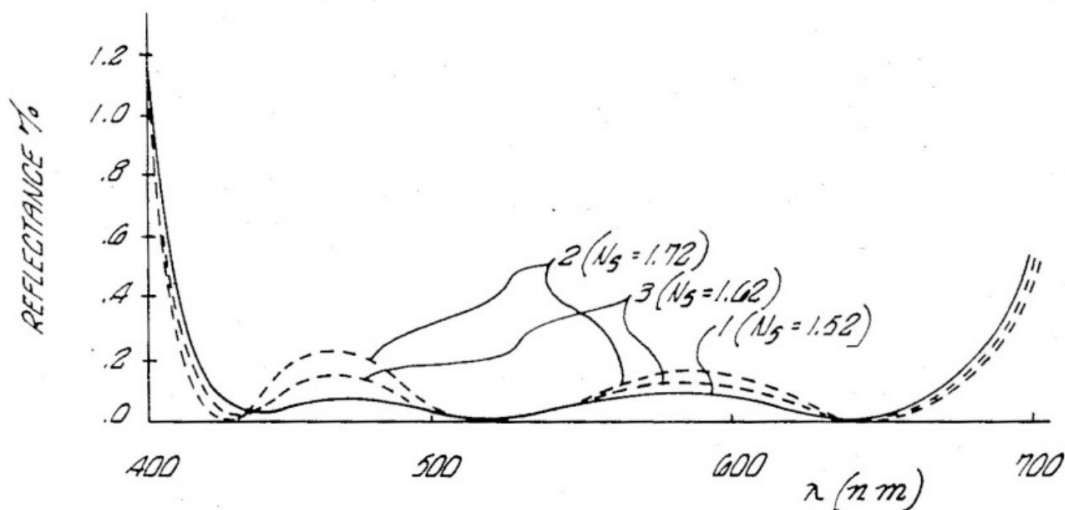
71. Note that polarizers naturally absorb at least some light. Larson's proposed absorbing polarizer would absorb at least some sunlight when used in an outdoor environment.

72. *The use of anti-reflection coatings in general and as applied to electronic displays.* Anti-reflective coatings have long been applied to optical elements in compound lenses for microscopes, cameras and other types of lenses to reduce ghost images that arise from the so-called Fresnel reflectance at air-glass interfaces. These reflections occur due a mismatch between the index of refraction of glass (~1.45 - 1.5) to that of air (1.00) and are roughly 4.0% per surface. By applying a stack of very thin (1/4 wavelength) layers of transparent dielectric

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materials to the glass, the reflectances can be caused to interfere with one another canceling themselves out. Practical coatings with $<0.1\%$ per surface are possible with this method.

73. Sumita discloses one such system of multi-layer anti-reflection coatings which may be applied to glass or film via vapor deposition or sputtering processes.



(Ex. 1021, FIG. 3.)

V. THE '142 PATENT

A. Overview of the '142 Patent

74. The '142 patent is titled "Electronic display with cooling." It issued from U.S. Application Ser. No. 16/933,932, which was filed on July 20, 2020.

(Ex. 1001, face page.)

75. The '142 patent, which is included as Exhibit 1001 with this

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Declaration, describes cooling systems for electronic displays. (*Id.*, 1:60-62.) The '142 patent describes the cooling systems having two separate gas (e.g., air) flow paths for cooling an electronic display. (*Id.*, 2:41-42.) A first path may be 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 return[s] to [a] front surface of the image assembly.” (*Id.*, 2:44-47.) A second path may be 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.*, 2:47-51.)

76. Furthermore, the heat exchanger can be used to “transfer heat from the circulating gas”, e.g., from the closed loop path, “to the ambient gas”, e.g., to the open loop path. (*Id.*, 2:51-52, 2:44-51.) 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.*, 3:20-49, 2:41-51, FIG. 1.) The fan assemblies are also used as inlets, exhausts and exits for the closed loop and open loop paths. (*Id.*, 3:25-29, 5:15-22.)

77. The electronic display **200** includes side covers **252**, a rear cover **250** and a front display surface **221**. (*Id.*, 5:50-52, 5:60-62, FIG. 2A.) The front

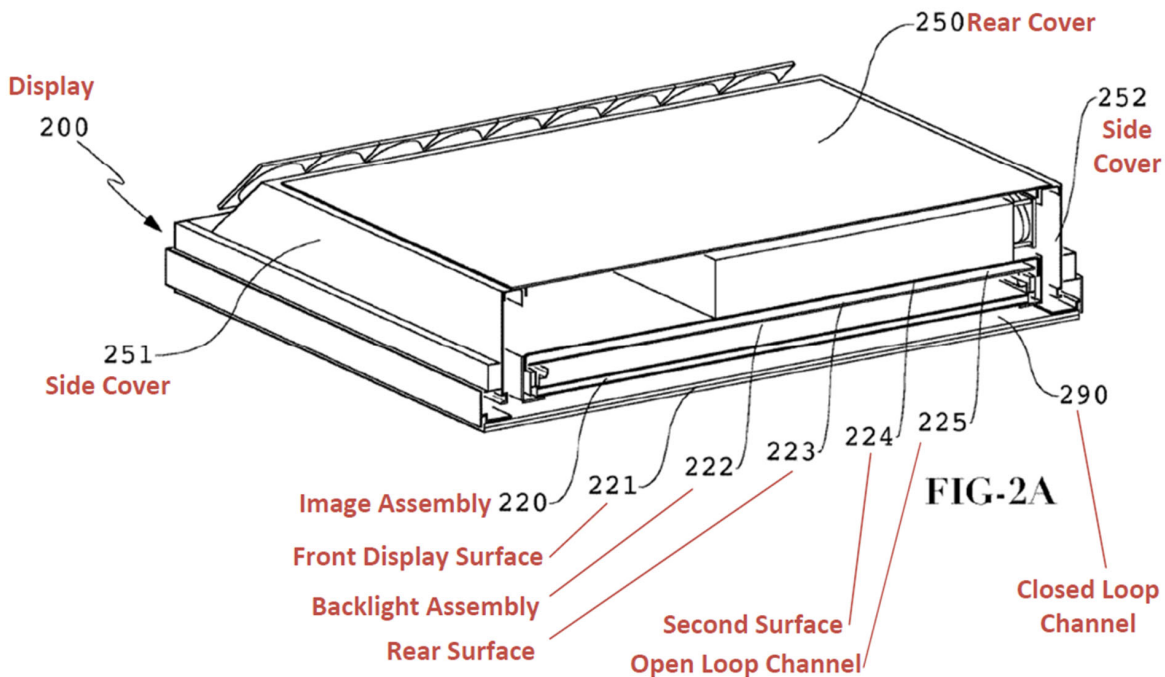
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display surface **221** is also referred to as a transparent panel, transparent cover panel and a cover panel. (*Id.*, Abstract, claim 6, claim 1.) The front display surface **221** “is placed in front of the image assembly **220**, defining a [closed 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 reflections, and protecting the internal display components.” (*Id.*, 5:60-66, 6:7-8, 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.* 6:1-5.) The ’142 patent also described 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.* 6:5-9.)

78. 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

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other flat/thin panel displays.” (*Id.*, 5:54-60.) The image assembly **220** can be “an LCD stack with a backlight assembly **222**.” (*Id.*, 6:13-16.) 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.*, 6:17-20.) 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.*, 6:20-23.) The rear surface **223** of the backlight assembly **222** can “contain a thermally conductive material, such as a metal,” where “[a]luminum may be an exemplary material for the rear surface **223**.” (*Id.*, 6:23-26.) 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.*, 6:28-33.) Figure 2A of the ’142 patent is shown below.

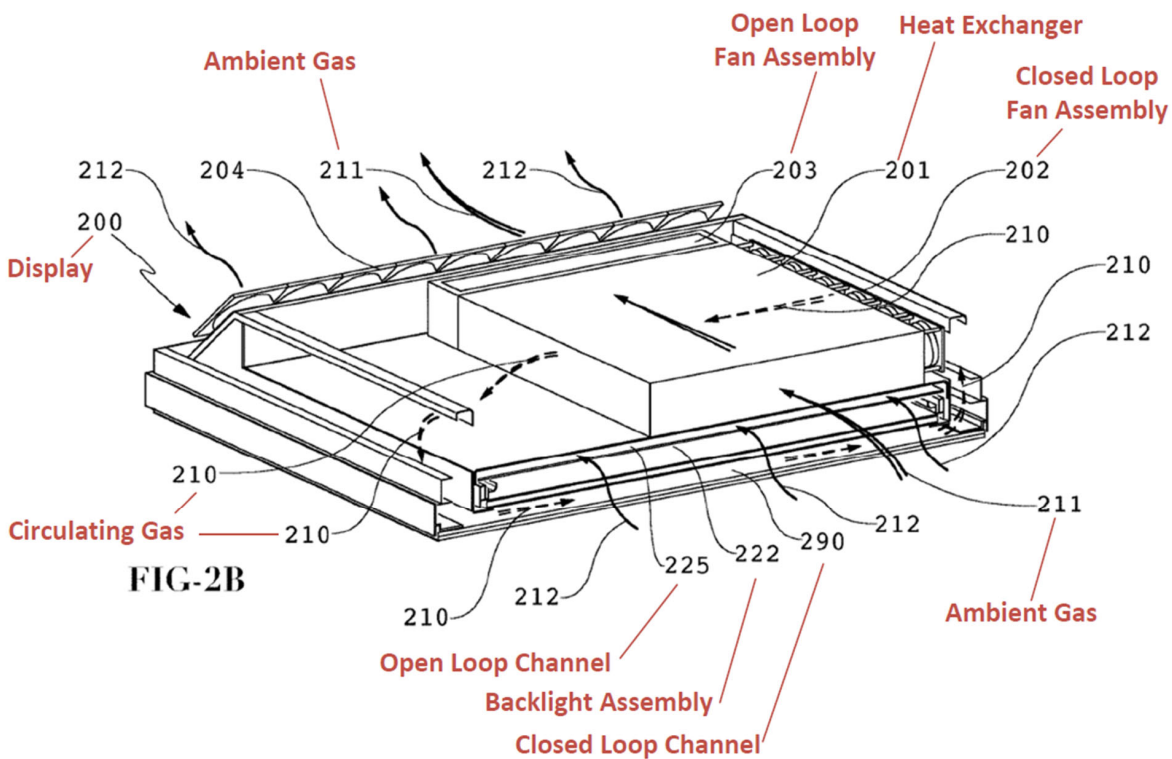


(*Id.*, FIG. 2A (annotated).)

79. Furthermore, the electronic display includes “[a] closed loop fan assembly **202** [which] may be used to propel the circulating gas **210** around the 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.*, 6:37-40.) The ’142 patent mentions that more than one open loop fan assembly can be used. (*Id.*, 6:40-51.) The ’142 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.*, 6:52-62.) Figure 2B of the ’142 patent is shown

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below.

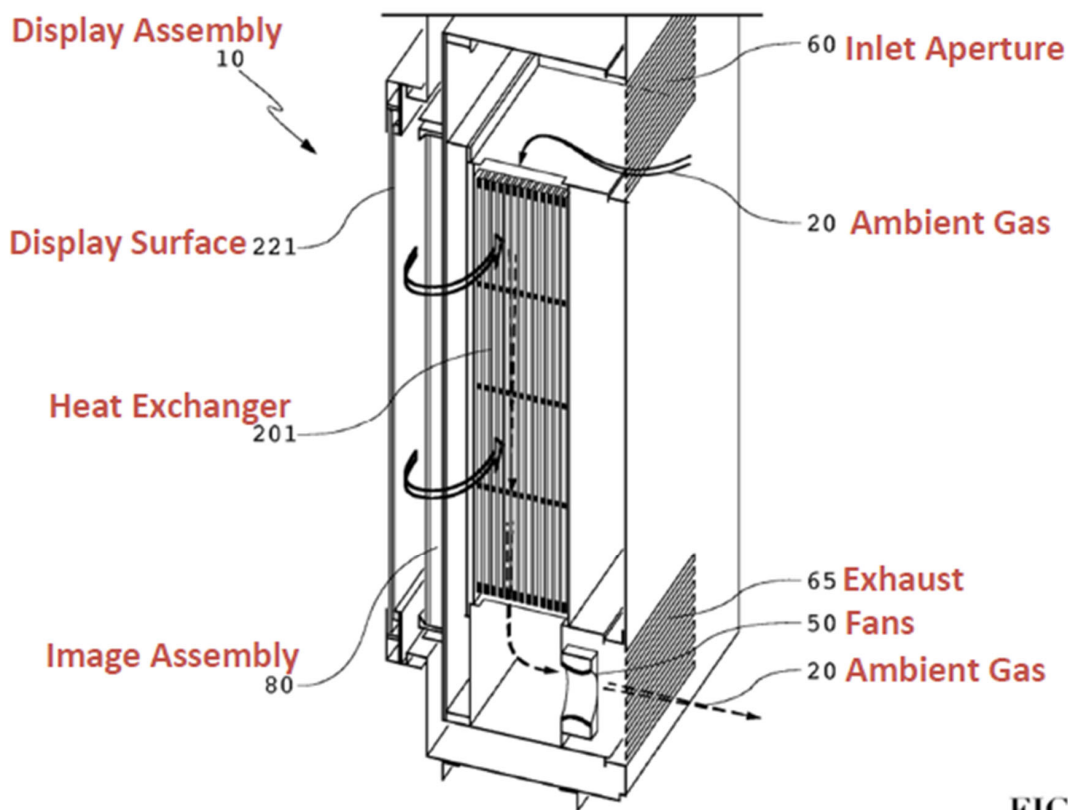


(*Id.*, FIG. 2B (annotated).)

80. The '142 patent also describes removing heat from the display assembly 10 by directing circulating gas through a channel between the front display surface 221 and the image assembly 80. (Ex. 1001, 6:63-68, 7:1-40, FIG. 3.) For example, the '142 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.*, 7:3-5, FIG. 3.) The ambient gas is only flowed

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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.*, 3:10-12, 6:63-65, FIG. 3.) The '142 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.*, 7:5-10, FIG. 3.) Additionally, the '142 patent describes that the ambient gas **20** can be pre-conditioned, e.g., cooled, before it is directed into the heat exchanger **201**. (*Id.*, 7:21-23, 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.*, 7:23-25, 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.*, 7:32-35, FIG. 3.) Figure 3 of the '142 patent is shown below.

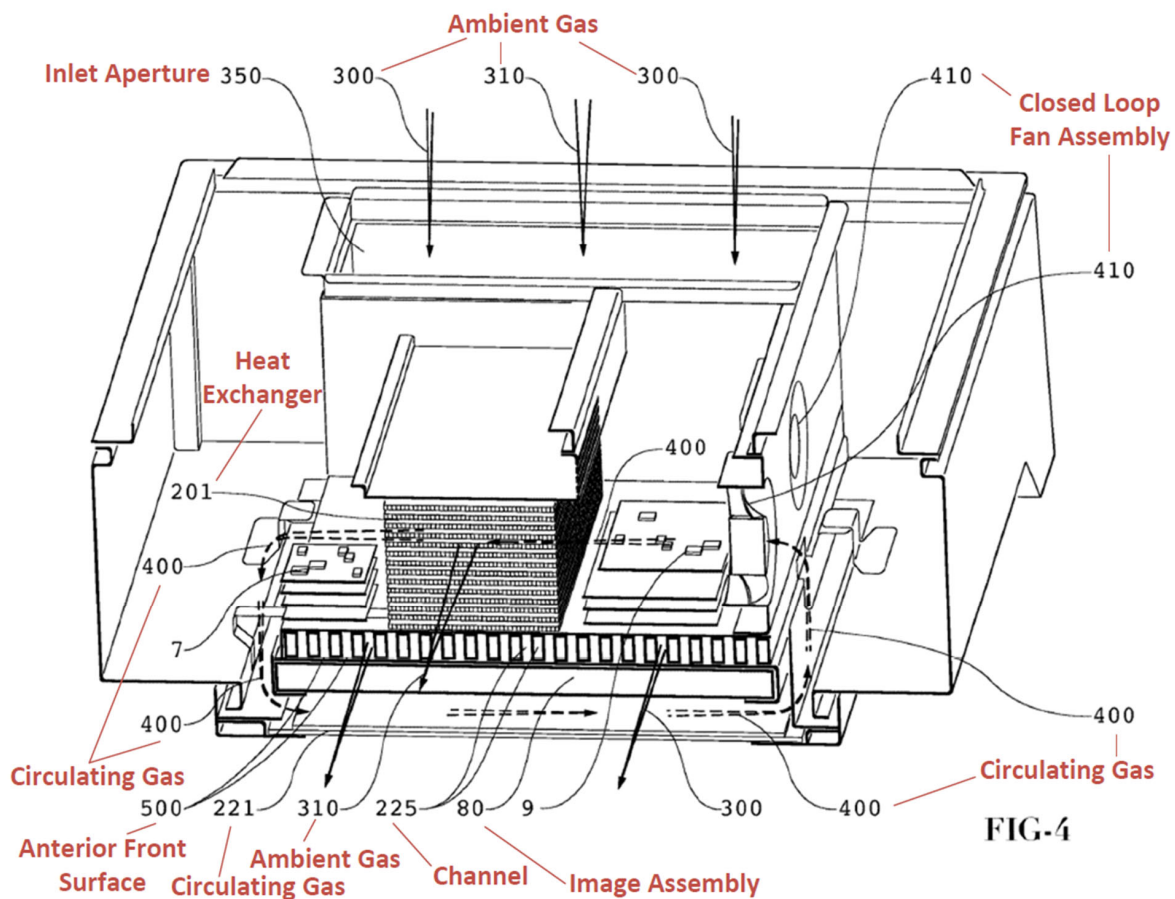


(*Id.*, FIG. 3 (annotated).)

81. Additionally, the '142 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.*, 7:41-47, FIG. 4.) The '142 patent also describes receiving the circulating gas **400** and the ambient gas **310** in a substantially perpendicular direction to transfer heat

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between the two gases. (*Id.*, 7:46-50, 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.*, 7:51-54, FIG. 4.) Thus, the ambient gas **300** is used “to absorb heat from the image assembly **80**”. (*Id.*, 7:61-63, FIG. 4.) Figure 4 of the ’142 patent is shown below.



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

82. To further cool the image assembly **80**, the ’142 patent describes

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removing distributed heat to a plurality of ribs and to thermally-conductive surfaces using the ambient gas **300**. (*Id.*, 7:51-60, 8:3-23, 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.*, 7:51-60, 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.*, 8:3-6, 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.*, 7:51-60, 8:3-10, FIG. 4.)

B. Prosecution History

83. 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.”

84. During prosecution, the Examiner rejected claims 1-20 as being obvious in light of the prior art in several office actions dated September 30, 2020, and December 12, 2021. (*See* Ex. 1022, pp.320-34 (09/30/2022 Non-Final Rejection), pp.124-33 (12/12/2021 Final Rejection).) The Examiner primarily relied on (a) U.S. Patent No. 5,869,919 (“Sato”); (b) U.S. Patent No. 6,211,934

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(“Habing”); (c) U.S. Patent Publication No. 2002/0033919 (“Sanelle”); (d) U.S. Patent Publication No. 2005/0134526 (“Willem”); and (e) U.S. Patent No. 5,991,153 (“Heady”). (*See id.*, pp.320-34 and pp.124-33.) In a December 12, 2021 final rejection, claims 5-7 were indicated as reciting allowable subject matter, and claims 11-20 were found allowable. (*Id.*, pp.128-30.) In response, the Patent Owner amended claim 1 to recite the subject matter of claim 5 and the intervening claims. (*Id.*, pp.111-22.)

C. The Challenged Claims

85. This Declaration addresses claims 1-15 of the ’142 patent. Claims 1, 6 and 12 are the independent claims.

86. Independent Claim 1 recites:

1[pre]	A cooling system for an electronic image assembly, the cooling system comprising:
1[a]	a housing for the electronic image assembly;
1[b]	a cover panel forming a forward portion of the housing, wherein the cover panel is located forward of, and at least some distance from, the electronic image assembly and is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;

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1[c]	a closed loop airflow pathway passing through the housing, wherein said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and wherein at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel;
1[d]	an open loop airflow pathway for ambient air passing through said housing and behind said electronic image assembly;
1[e]	at least one air circulation device positioned to force the circulating gas through the closed loop airflow pathway when activated; and
1[f]	at least one polarizer located at an inward facing surface of said cover panel and configured to prevent at least some sunlight striking said cover panel from traveling beyond said at least one polarizer.

87. Independent Claim 6 recites:

6[pre]	A cooling system for an electronic image assembly, the cooling system comprising:
6[a]	a housing for the electronic image assembly;
6[b]	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;

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6[c]	an open loop airflow pathway passing through the housing behind the electronic image assembly;
6[d]	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;
6[e]	an inlet located at a first portion of said housing for ingesting ambient air into said open loop airflow pathway;
6[f]	an exhaust located at a second portion of said housing for exhausting said ambient air from said open loop airflow pathway;
6[g]	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;
6[h]	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;
6[i]	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

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6[j]	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.
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88. Independent Claim 12 recites:

12[pre]	A method for cooling an electronic image assembly, said method comprising the steps of:
12[a]	placing said the electronic image assembly within a housing;
12[b]	forcing circulating air through a closed loop airflow pathway within said housing, wherein at least a portion of said closed loop airflow pathway extends between an electronic image assembly and a cover panel forming a front portion of said housing and spaced apart from said electronic image assembly, wherein said cover panel is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;

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12[c]	forcing ambient air through a second airflow pathway within said housing, wherein said second airflow pathway extends behind said electronic image assembly; and
12[d]	providing one or more solar energy reduction layers at an inward facing surface of said cover panel, wherein each of said one or more solar energy reduction layers is configured to reduce an amount of solar energy transferred to said circulating air in at least said portion of said closed loop airflow pathway.

89. 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

90. Independent claims 1, 6, and 12 of the '142 patent recite a “closed loop” pathway for “circulating gas/air.” (*See* Ex. 1001, 9:64-10:3, 10:7-9, 10:56-58, and 11:30-12:6.) 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. 1023, 1.) The '142 patent is related to the '572, '287, and '325 patents because the '142 patent and the '572, '287, and '325 patents have a common ancestor, namely, U.S. Patent Application No. 12/620,330

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(the “’330 application”) which issued as U.S. Patent No. 8,274,622. (*See* Ex. 1001, face page (disclosing that the ’142 patent is a continuation-in-part (through other patents) of the ’330 application); Ex. 1024, face page (disclosing that the respective patent is a continuation of the ’330 application); Ex. 1025 (same); Ex. 1026, 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 ’142 patent.

91. Moreover, like the ’142 patent, the subject matter in the ’572 patent, the ’287 patent and the ’325 patent relates to cooling of electronic displays using a cooling system having closed loop pathways. Specifically, the ’142 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, 2:41-44.)

92. Likewise, the ’572 and ’287 patents both describe the use of **closed loops**. (Ex. 1024, 3:33-42 and 3:53-55 (describing “an isolated gas cooling chamber **20**” that “comprises a **closed loop**” for cooling an LCD display), FIGs. 1 and 2; Ex. 1025, 3:51-54 and 4:4-7 (same), FIGs. 1 and 2.) The ’325 patent also describes the use of a closed loop for cooling a display. (Ex. 1026, 3:50-53, 4:56-

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59, and 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.)

93. 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 ’142 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, 2:44-47; 6:13-15 and 6:37-38 (describing “circulating gas **210** around the closed loop,” and around the “image assembly **220**”), FIGS. 2A and 2B.)

94. 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. 1024, 3:33-35, 3:39-42, and 3:53-55, FIGS. 1 and 2; Ex. 1025, 3:51-54, 3:57-60, and 4:4-7, FIGS. 1 and 2.)

95. The structures of the closed loops of the ’142 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

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the image assembly, and also passes through a heat exchanger. In particular, the '142 patent states: “the fan assemblies **102** and **103** for the **closed loop** may be 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, 3:22-31, FIG. 1.) The '142 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.*, 3:32-35, FIG. 1.)

96. 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. 1026, 4:56-62, FIGs. 2A and 2C.)

97. Thus, like the '142 patent, the '572, '287, and '325 patent describe cooling of electronic displays using closed loops, where the closed loop surrounds the image assembly. 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 '142 patent.

98. The Court construed “closed loop” as “gas pathway within a display

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housing containing gas that is essentially isolated from external air.” (Ex. 1023, p.1.) In my opinion, this is a proper construction of the term “closed loop” recited in the claims of the ’142 patent as well, in light of the specification and prosecution history of the ’142 patent.

99. The ’142 refers to the gas/air, circulating through a closed loop as the “circulating gas/air” and also as the “isolated gas.” For example, independent claims 1, 6, and 12 each recite “circulating gas/air” passing through a “closed loop.” (*Id.*, 9:64-10:3, 10:7-9, 10:56-58, and 11:30-12:6.) The specification of the ’142 patent states that “[t]he **circulating gas** which is being forced by the **closed loop** fan assemblies is primarily circulating around the display.” (*Id.*, 3:50-52.) The ’142 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.

(Ex. 1001, 3:30-39, FIG. 1.)

100. Thus, the circulating gas/air recited in the claims of the ’142 patent is

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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. 1023, p.1) is applicable to the claims at issue.

101. Moreover, during prosecution of the ’142 patent, the Applicant distinguished the claimed invention from a prior art reference, U.S. Patent No. 5,869,919 (Ex. 1027) (“Sato”), by arguing that Sato did not disclose a “closed loop” because in Sato, ambient air entered and exited the display unit. (Ex. 1022, pp.320-34 (Office Action dated 9/30/2020), pp.238-61 (Response filed on 12/18/2020, pp.254-255).) Specifically, in an Office action issued on September 30, 2020, the Examiner stated that except for the polarizer limitation, Sato disclosed all of the other limitations of the originally filed claim 1, which recited “an airflow pathway.” (Ex. 1022, pp.323-24 (Office Action dated 9/30/2020 at 3-4), pp.5990-95; *see id.*, pp. 5958-6000 (listing originally filed claims at 5990-95).) In response, Applicant amended claim 1 to recite “a closed loop” and argued that Sato did not teach a closed loop, stating that “Sato, on the other hand, teaches that the arrow line **416** represent[s] **ambient air which enters and exits the unit.**” (Ex. 1022, pp. 239 and pp.254-55 (Response filed on 12/18/2020, p.2 (listing amended claim 1), and pp.17-18 (remarks)).)

102. Thus, Applicant distinguished its “closed loop” from Sato’s system by

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arguing that the ambient air did not enter/exit the closed loop, i.e., the gas/air in the closed loop was isolated from ambient air. 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. 1023, p.1), is applicable to the claims at issue and should be adopted by the Board.

103. 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

104. I have reviewed and analyzed the prior art references and materials listed in Section I.C above. In my opinion, the claims of the ’142 patent are rendered unpatentable based on the following prior art:

Ground	References	Claim(s)
1	Karppanen [Ex. 1004] in view of Larson [Ex. 1005]	1-15
2	Yare [Ex/ 1006] in view of Larson	1-15

105. 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 ’142 patent. I reserve the

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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]

106. International Patent Application No. PCT/FI2006/050145 with Publication No. WO2007116116A1 (“Karppanen”) (Ex. 1004), entitled “Electronic 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 ’142 patent under pre-AIA 35 U.S.C. §§ 102(a) and 102(e) because it designated the United States, and was published in English before and was filed before the earliest claimed priority date of March 3, 2008 for the ’142 patent.

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

108. 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*

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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).)

109. 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 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.)

110. 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.)

111. 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

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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**).

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 upper part of Fig. 2 by way of example. 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 **5** display casing.

(*Id.*, 8:14–16, 9:1-5, FIGs. 2 and 4.)

112. Together, elements **32**, **60** (inner cooling fins), and **62** (outer cooling fins) form a heat exchanger unit which transfers heat from the inner space to the outer space with the assistance of cooling fan **64** (inner space) and cooling fan **36** (outer space). (*See id.*, 8:14–16, 9:1-5, 10:32–11:11) FIGs. 2 and 4.)

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

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and 4 depict the heat conducting and cooling pathways inside an exemplary
embodiment of the Karppanen display unit:

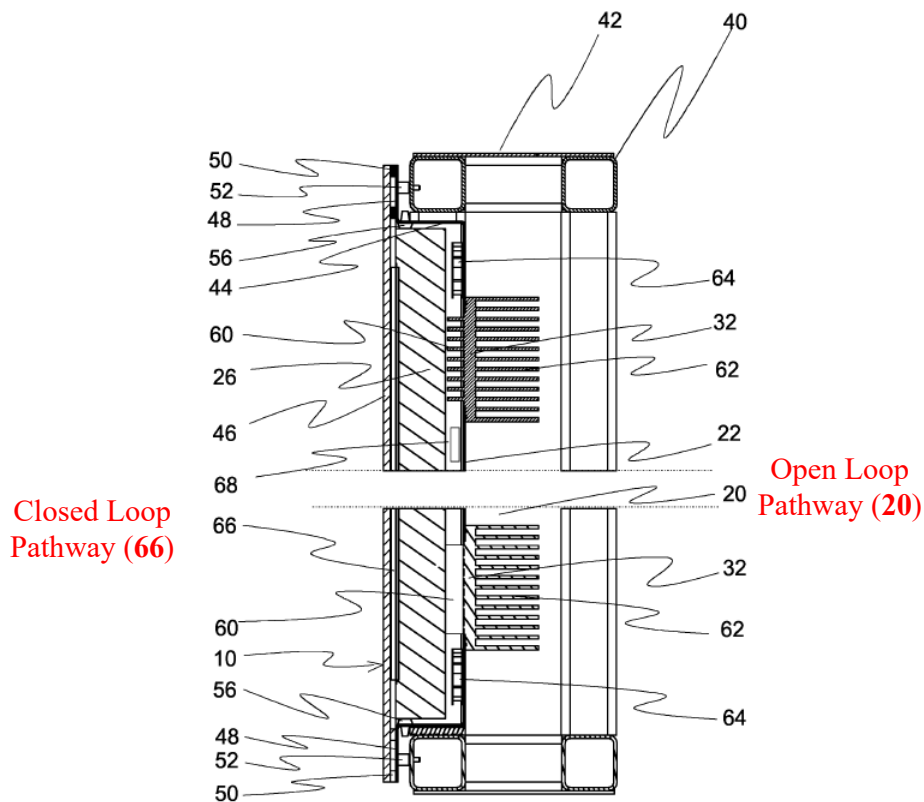


Fig. 2

(*Id.*, FIG. 2.)

2. Larson [Ex. 1005]

114. U.S. Patent No. 6,392,727 (“Larson”) (Ex. 1005), entitled “Reduced Reflectance Polarized Display,” issued on May 21, 2002 from Application No. 09/224,591, filed on December 31, 1998. I am informed that Larson qualifies as prior art to the ’142 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b) because

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it was published more than one year before the earliest claimed priority date of March 3, 2008 for the '142 patent.

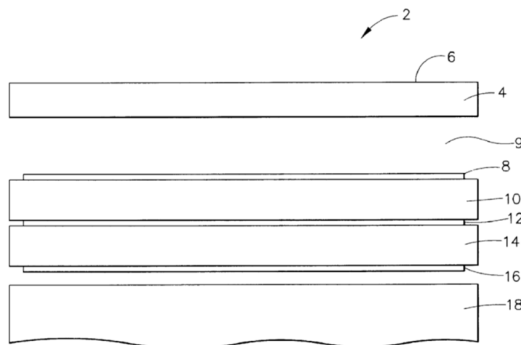
115. Larson describes a “polarized display” including a polarizer disposed adjacent to a cover glass in front of the display. (Ex. 1005, Abstract.) The polarizer is used to transmit light emitted by the display, and absorb reflected light, e.g., ambient light that may affect the display quality. (*Id.*) The polarized display is intended to reduced reflectance in the display output, maintain high contrast, high illumination levels, and be less expensive to produce. (*Id.*, 1:62-67.)

116. Furthermore, Larson discloses that “[i]n display applications, it is difficult to maintain high contrast output at high ambient illumination levels. However, polarized light displays and active matrix liquid crystal display (AMLCD) flat panels work well in maintaining the contrast in their displays because [the ambient] light passes through several absorbing layers before reflecting or scattering back out from the light producing mechanism.” (*Id.*, 1:11-17.)

117. Referring to its FIG. 1, Larson discloses a conventional polarized display **2** having a cover glass **4**, and various components of an LCD display, including a front polarizer **8** and a back polarizer **16**. (*Id.*, 1:22-27, FIG. 1.) Larson discloses that the front polarizer **8** may absorb at least a portion of the

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ambient light, e.g., the sunlight striking the cover glass **4**. (*See id.*, 3:19-30.)



(*Id.*, FIG. 1.)

118. Larson further discloses an auxiliary polarizer:

Referring now to FIG. 2, a display **2** according to various aspects of the present invention comprises: a **cover glass 4**; a **front gap 9**; a front polarizer **8**; a first substrate **10**; a liquid crystal layer **12**; a second substrate **14**; a rear polarizer **16**; an **auxiliary polarizer 20**; and a backlight **18**. Each of the components of the **display 2** is suitably a **conventional LCD** component.

(*Id.*, 2:33-39, FIG. 2.)

119. Larson additionally points out that the “auxiliary polarizer **20** is an absorbing polarizer,” (*id.*, 3:19-20), and later that “[b]y removing one of the polarizations before it reaches the gap **9**, the reflections from each of the interfaces between the auxiliary polarizer **20** and front polarizer **8** are reduced by around 50%.” (*Id.*, 3:27-30.) A POSITA would have understood that this reduction in reflection is attributable to the absorption properties of the polarizers. Absorbing

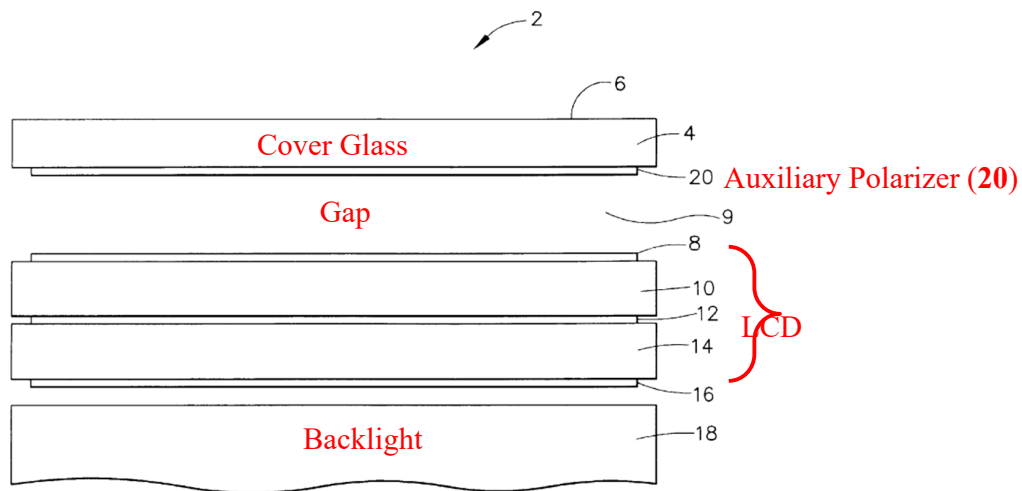
polarizers naturally absorb at least some light shining on them.

120. Larson further states:

In the present embodiment, the display includes the **auxiliary polarizer 20** between the front gap **9** and the cover glass **4**. The front gap **9** separates the auxiliary polarizer **20** from the front polarizer **8**. The **auxiliary polarizer 20** may be bonded to the cover glass **4** or otherwise retained in display **2**, and may be coated with an antireflective coating on one or both surfaces.

(*Id.*, 3:13-19, FIG. 2.)

121. Figure 2 of Larson is show below:



(*Id.*, FIG. 2.)

3. Yare [Ex. 1006]

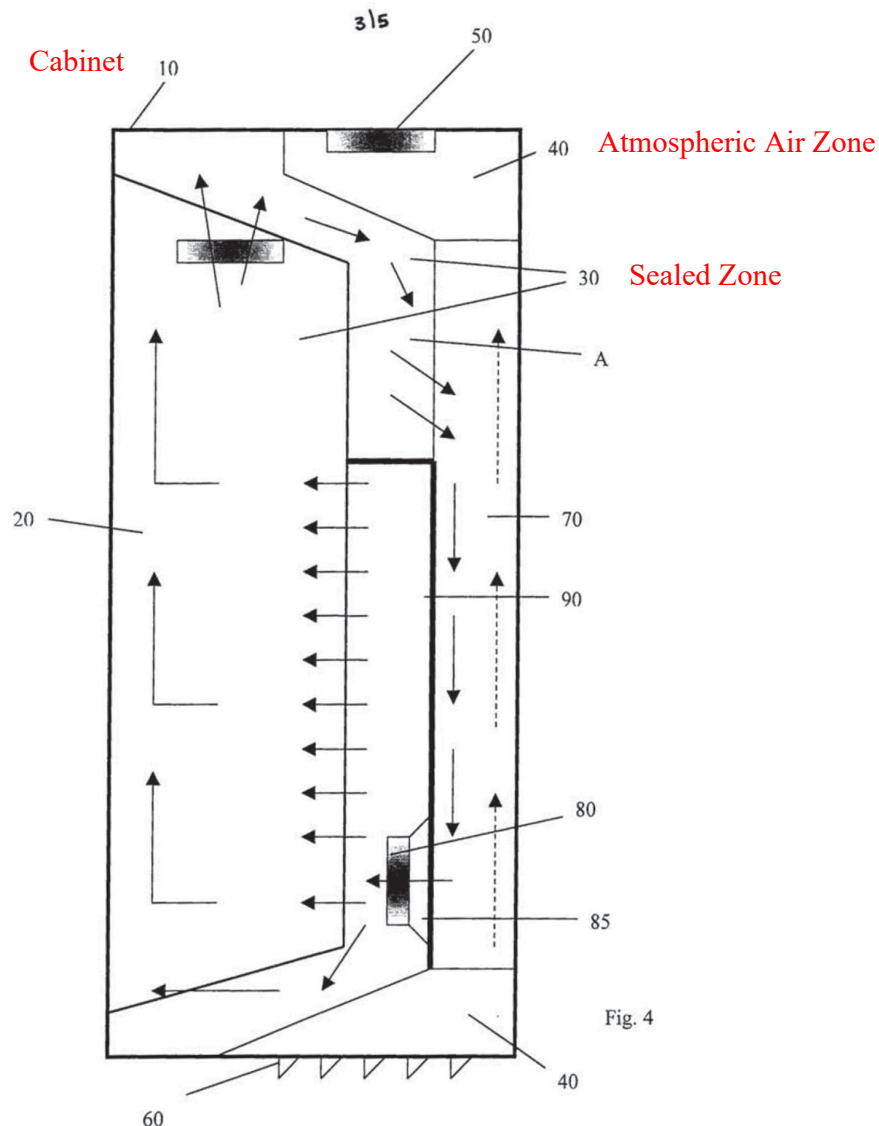
122. United Kingdom Patent Application No. GB 2402205A by Yare

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(“Yare”) (Ex. 1006), entitled “A Display System Cabinet and Display System Including Heat Removal Means,” published on December 1, 2004. I am informed that Yare qualifies as prior art to the ’142 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b) because it was published more than one year before the earliest claimed priority date of March 3, 2008 for the ’142 patent.

123. 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. 1006, 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.)

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(*Id.*, FIG. 4.)

124. 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, Figure 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.)

125. Furthermore, 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: The Combination of Karppanen and Larson Renders Claims 1-15 Obvious

1. Motivation to Combine Karppanen and Larson

126. As explained below, Karppanen teaches a cooling technique employing two cooling paths, for cooling an electronic display (e.g., an LCD display) encased within a housing. Larson teaches a technique, the use of polarizers and antireflection coating(s) for minimizing reflections that may occur in a structure such as the one that Karppanen discloses, i.e., where an airgap is

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provided between the front of the LCD and the front panel of the system, to cool the front of the display. As discussed above in § VI.A.2, the polarizer and the antireflection coating can also block some part of incident sunlight, mitigating heating of the display. Therefore, a POSITA would have been motivated to include Larson's polarizer in Karppanen's display.

127. For example, Karppanen and Larson both describe systems and devices in closely related fields, namely, electronic displays, such as LCD displays. In particular, Karppanen discloses “an electronic information board” having “a flat display element (26), such as a TFT LCD display.” (Ex. 1004, Abstract, 8:5-9, FIG. 1.) Like Karppanen, Larson also discloses an LCD display. (Ex. 1005, 1:22-27 (discloses a conventional LCD display), FIG. 1, 2:33-39 (discloses a conventional LCD display in combination with a polarizer), FIG. 2.) Larson states: “[t]he Subject matter of the present invention is particularly suited for use in connection with displays, such as LCDs.” (*Id.*, 2:25-26.)

128. Karppanen states that its electronic information board is suitable for outdoor use. (Ex. 1004, 3:10-14 (stating that an “objective of the invention is to provide an electronic information board, which tolerates well external variations of temperature and is thereby **suitable for installation outdoors**”), 5:33-34 (stating that an “advantage of the invention is that it is suitable for **use both outdoors** and

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indoors”), 8:1-2 (disclosing that a “front plate” of the electronic information board “is preferably made of shock-resistant glass,” and that “it is also possible to use other materials”).)

129. A POSITA would have understood that when used outdoors during daytime, Karppanen’s display system would be exposed to ambient light or sunlight. Larson describes that “it is difficult to maintain high contrast output at high ambient illumination levels,” and discloses further that “polarized light displays” can maintain high contrast. (Ex. 1005, 1:11-17, 1:22-32 (disclosing “a **conventional** polarized display”), FIG. 1.) Therefore, a POSITA would have recognized that the use of polarization in Karppanen’s system can beneficially improve the contrast of the display, when used outdoors during daytime.

130. In Karppanen’s electronic information board, a display casing includes a transparent front plate **46**, and a display element **26**, such as an LCD display, located behind the transparent front plate **46**. (Ex. 1004, 7:31-34, 8:4-9, FIG. 2.) The front plate **46** is separated from the display **26** by a gap or ducting **66** through which air is circulated. (*Id.*, 9:5-8, FIG. 2.)

131. Larson discloses a similar display structure, identifies a problem with that structure, and provides a solution. Specifically, the conventional polarized display that Larson discloses includes a “cover glass **4**” and a “front polarizer **8**”

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on a “substrate **10**” over “a liquid crystal layer **12**.” (Ex. 1005, 1:22-27, FIG. 1.)

Larson states that “[t]he cover glass **4** is separated from the front polarizer **8** by a gap **9**, typically filled with air.” (*Id.*, 1:27-28, FIG. 1.)

132. Larson identifies a problem with such structures, stating that “[r]eflectances associated with the boundaries between the cover glass **4**, the gap **9**, and the front polarizer **8** are especially pronounced.” (*Id.*, 1:30-32.) A POSITA would have recognized that the problem of reflectance at the boundaries would exist in Karppanen’s system as well, due to the ducting **66**, i.e., the air gap between the front plate **46** and the display element **26**.

133. As one solution to this problem, Larson states that “the rear surface of the cover glass **4** may include an antireflection coating, film, sheet, or any other form of antireflection material,” and that such a material can “reduce reflections at the boundary between the cover glass **4** and . . . the front gap **9**.” (*Id.*, 2:50-56.) As another solution, Larson discloses an embodiment in which “the display includes [an] auxiliary polarizer **20** between the front gap **9** and the cover glass **4**.” (*Id.* 3:13-15, FIG. 2; *see id.*, 2:33-39.) Larson also states the “auxiliary polarizer **20** is an absorbing polarizer,” that “is preferably aligned in the same direction as the front polarizer **8**” so as to “minimizes the attenuation of light coming from the backlight **18**.” (*Id.*, 3:19-24.)

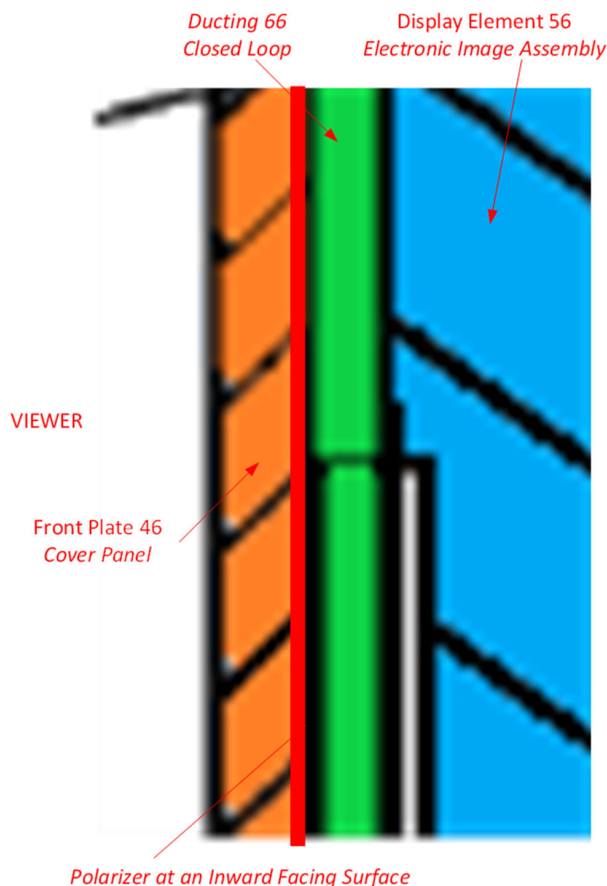
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134. Larson further states: “[r]eflected light, however, initially passes through the cover glass and is polarized by the auxiliary polarizer **20**” and that “[b]y removing one of the polarizations before it reaches the gap **9**, the reflections from each of the interfaces between the auxiliary polarizer **20** and front polarizer **8** are reduced by around 50%.” (*Id.*, 3:25-30.) Moreover, per Larson “[t]his allows for reduced overall reflections, or can be used to reduce the reflectance requirements for any antireflection coatings which may be applied to the front and auxiliary polarizers **8**, **20**.” (*Id.*, 3:30-34.) Additionally, as discussed above in § VI.A.3, a POSITA would have understood that a linear polarizer would absorb at least some light shining thereon, thereby reducing the solar energy incident on gap between the transparent front plate and the display surface, and on the display surface.

135. Thus, in light of Larson, a POSITA would have recognized that Karppanen’s display may also have a high reflectance problem at the boundary between the front plate **46** which, like Larson’s cover glass **4**, is preferable made of glass, and the ducting **66**, i.e., the air gap similar to Larson’s gap **9**. A POSITA would have further understood that this problem can be minimized by providing a anti-reflective coating on the rear surface of the front plate **46** and/or by providing an polarizer between the ducting **66**, i.e., the air gap, and the front plate **46**, where

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such a polarizer may be disposed on the rear surface of the front plate **46**. This is shown in Karppanen's zoomed-in, annotated Figure 2 below which demonstrates where a person of skill in the art would employ Larson's proposed polarizer.



(Ex. 1004, FIG. 2 (partial, zoomed-in, and annotated).)

136. A POSITA would have recognized at least three predictable benefits of these modifications obtained by combining Karppanen and Larson. In fact, Larson describes two of these benefits. First, the reflectance at the gap can be minimized by the anti-reflective coating and the absorbing polarizer, that may

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absorb a portion of the reflected light. (Ex. 1005, 3:30-34.) Second, the use of the polarizer can reduce the reflectance requirements of the anti-reflective coating, film, or sheet. (*Id.*) Third, a POSITA would have also recognized that an absorbing polarizer absorbs at least some polarizations of the ambient light, such as sunlight, which can help improve the contrast and reduce the heating of the display caused by the sunlight.

137. Moreover, to a POSITA, the combination of Karppanen and Larson would have been combining known prior art elements according to known methods (providing anti-reflective coating and/or a polarizer on a transparent plate) to obtain the predictable results described above. One of ordinary skill in the art would have also understood this combination to be the use of known techniques (using anti-reflective materials and/or polarizers) to improve a similar apparatus (Karppanen's display system) in the same way as Larson describes, to yield predictable results described above.

138. Additionally, a POSITA would have understood that these predictable, beneficial results can be obtained without requiring substantial changes or modifications to either Karppanen's or Larson's processes, and without adversely affecting the disclosed display systems. A POSITA would have also been able to apply known, conventional manufacturing techniques, such as

bonding layers. As such, a POSITA would have expected the combination of Karppanen and Larson to be feasible and that it would work together as intended. Therefore, a POSITA would have had a reasonable expectation of success from such a combination. For these reasons, it would have been obvious to one of ordinary skill in the art to combine Karppanen and Larson.

2. Independent Claim 1

139. It is my opinion that Karppanen in view of Larson discloses each and every limitation of Claim 1.

a. **“A cooling system for an electronic image assembly, the cooling system comprising:” (Claim Element 1[pre])**

140. 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.”**

141. In particular, Karppanen discloses “an electronic information board” having “a flat display element (**26**), such as a TFT LCD display or plasma display

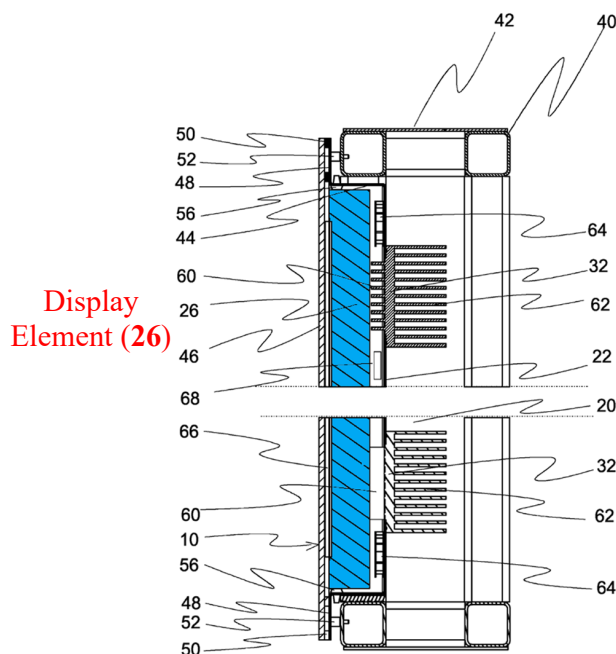
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for presenting information, and electronic equipment for controlling the display element.” (Ex. 1004, Abstract.) Karppanen provides Figures 1 and 2 as different views of the same embodiment of an electronic information board. In particular, Figure 1 “is a perspective drawing” “depicted obliquely from behind” (*id.*, 6:4-5, 6:16-17), and Figure 2 “is a cross-sectional drawing.” (*Id.*, 6:7-8, 7:27-28.)

Karppanen states: “[i]nside the display casing there is a display element **26**” that “is preferably a TFT **LCD display**.” (*Id.*, 8:4-9, 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.*, 8:9-11.)

142. 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.*, 6:21-26, FIG. 1.) Thus, Karppanen discloses or at least suggests a background light or a backlight for the LCD display **26**.

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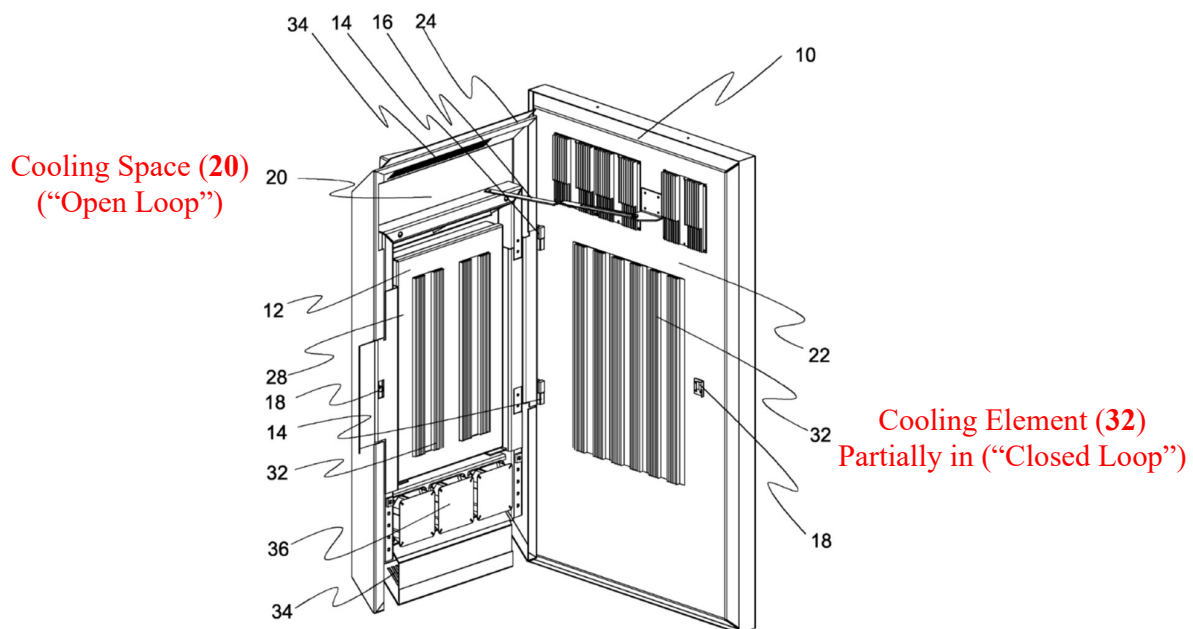


(*Id.*, FIG. 2 (annotated).)

143. The display element **26**, highlighted blue in annotated Figure 2 above, is “**an electronic image assembly.**” This is consistent with the ’142 patent, which states: the “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, 5:54-60, FIG. 2A.) Thus, like the ’142 patent, Karppanen also discloses a flat electronic display element, and in particular, an LCD display. In summary, the display element **26**, and LCD, is “**an electronic image assembly.**”

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144. 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).” (*Id.*, 7:7-11, FIG. 1.)



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

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

b. “a housing for the electronic image assembly;” (Claim Element 1[a])

146. Karppanen discloses this claim element because Karppanen’s system includes a “**housing for the electronic image assembly**” formed by a cover and a display casing.

147. In particular, Karppanen discloses:

In Fig. 1 , an electronic information board according to the invention is shown as an example, as depicted obliquely from behind. The 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**. The cover is trough-shaped, i.e. it has a flat bottom and edges turned to an angle from the plane of the bottom. A **closed device casing 12** has been **fastened to the bottom of the cover [24]**. The **display element 26** of the information board (Fig. 2) has been placed **inside**

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the display casing [10], and the electronic equipment needed in the control of the display element have been placed inside the device casing.

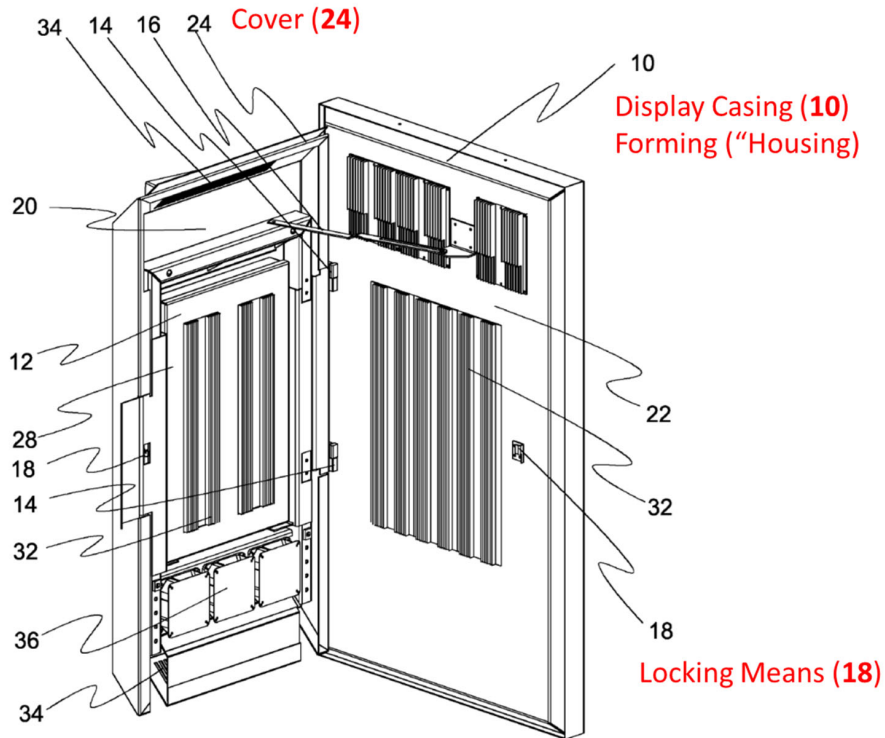
(Ex. 1004 6:16-24, FIG. 1.)

148. Karppanen further states: “Fig. 1 shows an information board according to the invention in the opened position, in which the cover **24** of the information board has been turned on the hinges so as to be separated from the display casing.” (*Id.*, 6:33-35, FIG. 1.) Per Karppanen, the “cover has been connected to the display casing by a hold-open device **16**, which keeps the cover at a certain angle in relation to the display casing.” (*Id.*, 6:36-37, FIG. 1.)

149. In addition, Karppanen discloses:

In 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** 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 **[10]** (Fig. 2).”

(*Id.*, 7:7-11, FIG. 1.)



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

150. The cover **24** and the display casing **10** (containing the display element **26**), where the display casing **10** can be locked to the device casing **12** in a closed position, together form a **“housing”** for the display element **26** (**“the electronic image assembly”**). Thus, Karppanen discloses this claim element.

c. “a cover panel forming a forward portion of the housing, wherein the cover panel is located forward of, and at least some distance from, the electronic image assembly and is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;” (Claim Element 1[b])

151. Karppanen discloses this claim element because Karppanen's display

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casing **10** has a transparent, preferably glass, front plate, i.e., **“a cover panel,”** in front of and at some distance from the display element **26** (**“the electronic image assembly”**).

152. 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 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.) It is discussed above in connection with claim element 1[a] that the display casing **10** forms a part of the **“housing.”** (*See supra*, § VI.A.2.a.) More specifically, Karppanen’s Figure 1 shows that the display casing **10** forms a forward portion of the housing. (*Id.*, FIG. 1.) Because the front plate **46** forms a part of the display casing **10**, the front plate **46** is **“a cover panel forming a forward portion of the housing.”**

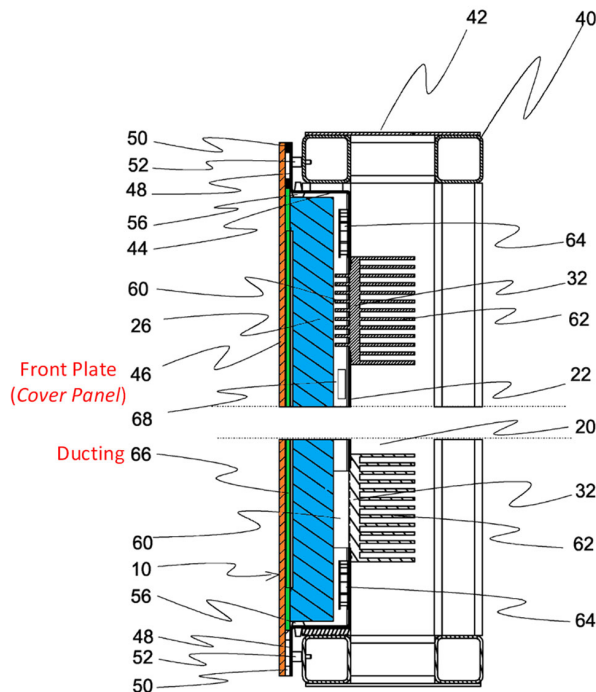
153. Additionally, Karppanen discloses that the front plate **46** is **“located forward of, and at least some distance from, the electronic image assembly.”**

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.)



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

154. 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** by the ducting **66** (highlighted green). Thus, the front plate **46** is “**located forward of, and at least some distance from, the electronic image assembly.**” Finally, because the front plate **46** is transparent, it “**is configured to permit viewing of images displayed at the**

electronic image assembly through said cover panel.” Indeed, Karppanen emphasizes the “advantages of a large viewing angle” when implementing its teachings. (*Id.*, 1:17-21.) Thus, Karppanen teaches claim element 1[b].

- d. **“a closed loop airflow pathway passing through the housing, wherein said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and wherein at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel;” (Claim Element 1[c])**

155. Karppanen discloses this claim element because Karppanen’s system includes a closed cooling path formed by ducting **66** within the display casing **10**. Specifically, Karppanen’s system includes “a **closed** display casing **10**” having a back wall **22** [and] a transparent front plate **46**.” (*Id.*, 6:17-19, 7:31-34, FIGs. 1 & 2.)

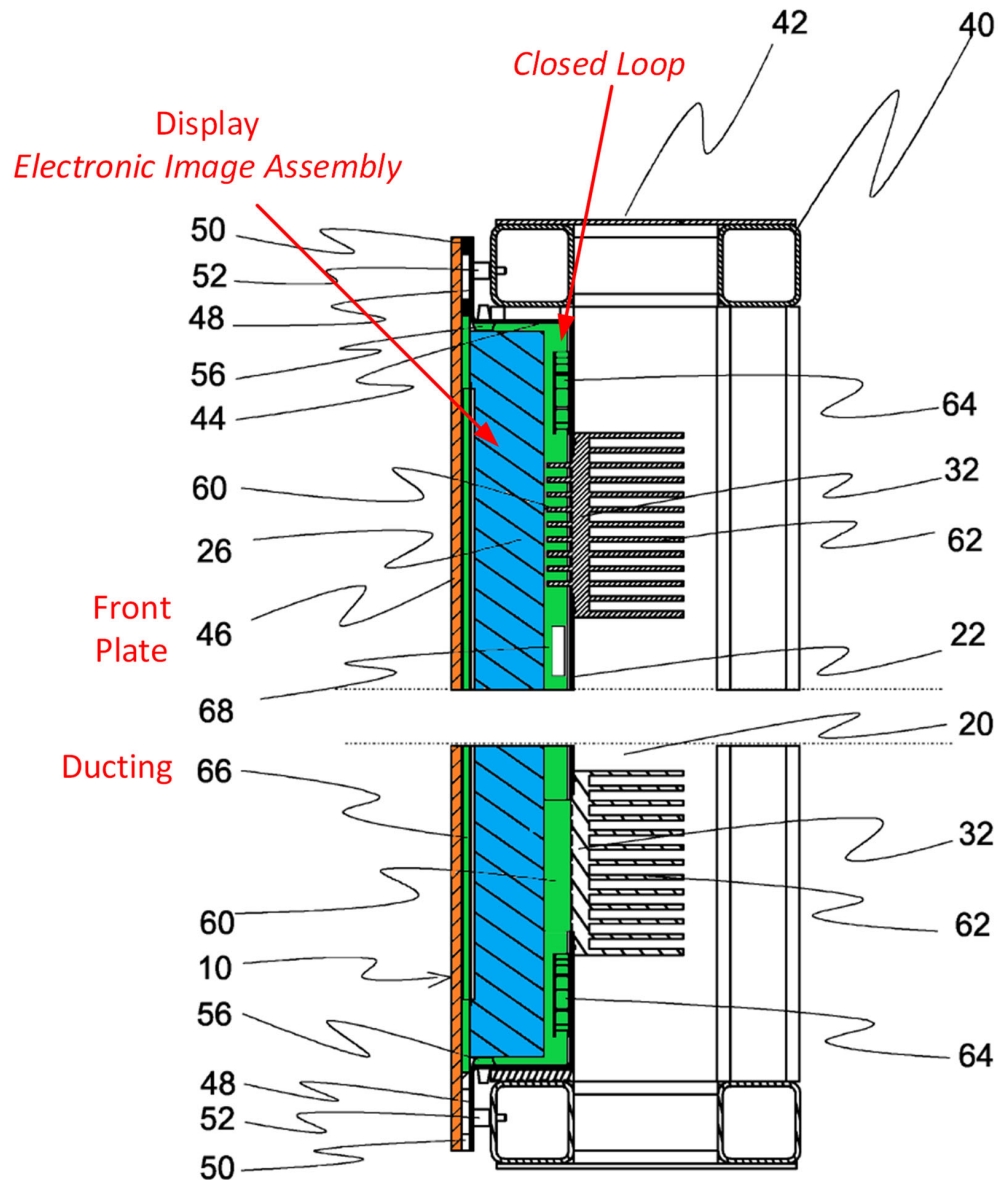
156. Karppanen states:

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.) Karppanen also states that in “preferred embodiment of the

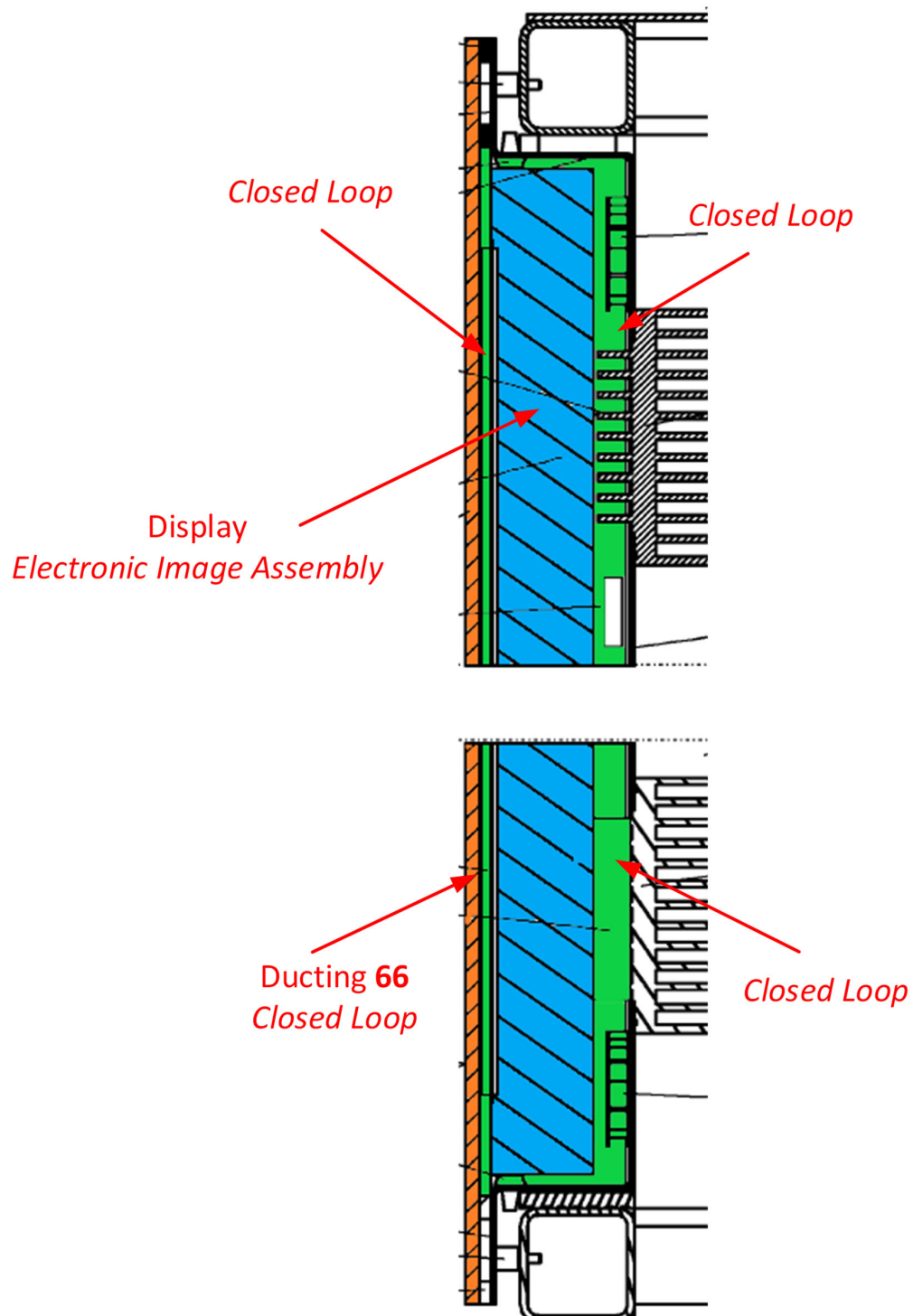
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invention, the display casing and the device casing have been made
weatherproof.” (*Id.*, 4:6-8.)



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

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

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157. As seen in the two versions of annotated Figure 2 above, within the closed, weatherproof display casing **10**, the space (highlighted green) between the display element **26** (highlighted blue) and the back wall **22**, and the ducting **66** (also highlighted green) in front of the display element **26** but behind the front plate **46** (highlighted orange), form a closed pathway (highlighted green). This closed pathway is within the display casing **10** forming the “**housing**” and thus “**through the housing.**” It is also around the display element **26** (the “electronic image assembly”). Through this closed pathway air may be circulated by the fans **64**. Because the display casing **10** is closed and weatherproof, the air circulating within the closed pathway is essentially isolated from external, ambient air. As such, the closed pathway is a “gas pathway within a display housing containing gas that is essentially isolated from external air,” (*see* Ex. 1023 at 1), i.e., “**a closed loop airflow pathway passing through the housing.**”

158. As shown above, the fans **64** and **68** which force air through the closed loop air duct are isolated by a wall from the cooling space **20**, which as explained below circulates ambient air and is open loop. (*Id.*, FIG. 2, 9:32-36.) The cooling space **20** utilizes its own isolated fans **36** to circulate the ambient air therein. (*Id.*)

159. As discussed in connection with claim element 1[a], the display

casing **10**, which contains the closed pathway, with the cover **24** forms the “**housing**.” (*See supra*, § VI.B.1.b.) Because the closed pathway is within the display casing **10** forming the “**housing**,” the closed pathway is a “gas pathway within a display housing containing gas that is essentially isolated from external air,” (*see* Ex. 1023, 1) i.e., “**a closed loop airflow pathway passing through the housing.**”

160. The two versions of annotated Figure 2 above also show that the closed pathway (highlighted green) is formed around the display element **26** (highlighted blue), i.e., “**around said electronic image assembly.**” Additionally, because air is a gas, the closed pathway circulating air “**is configured to accommodate circulating gas.**” Thus, the closed pathway through which air, a “**gas,**” is circulated around the display element **26** is “**a closed loop airflow pathway passing through the housing, wherein said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas.**”

161. As such, annotated Figure 2 also shows that the closed pathway (“**closed loop airflow pathway**”) includes the ducting **66** (highlighted green) which is in front of the display element **26** (highlighted blue) (“**said electronic image assembly**”) but behind the front plate **46** (highlighted orange) (“**cover**

panel”). Therefore, “**at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel.**” Thus, Karppanen teaches claim element 1[c].

- e. “**an open loop airflow pathway for ambient air passing through said housing and behind said electronic image assembly;**” (Claim Element 1[d])

162. Karppanen discloses this claim element because Karppanen’s system provides an open “cooling space **20**” that are interconnected with “ventilator slots” allowing ambient air from outside the device to enter and exit the “cooling space.” 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 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 [10] (Fig. 2).

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

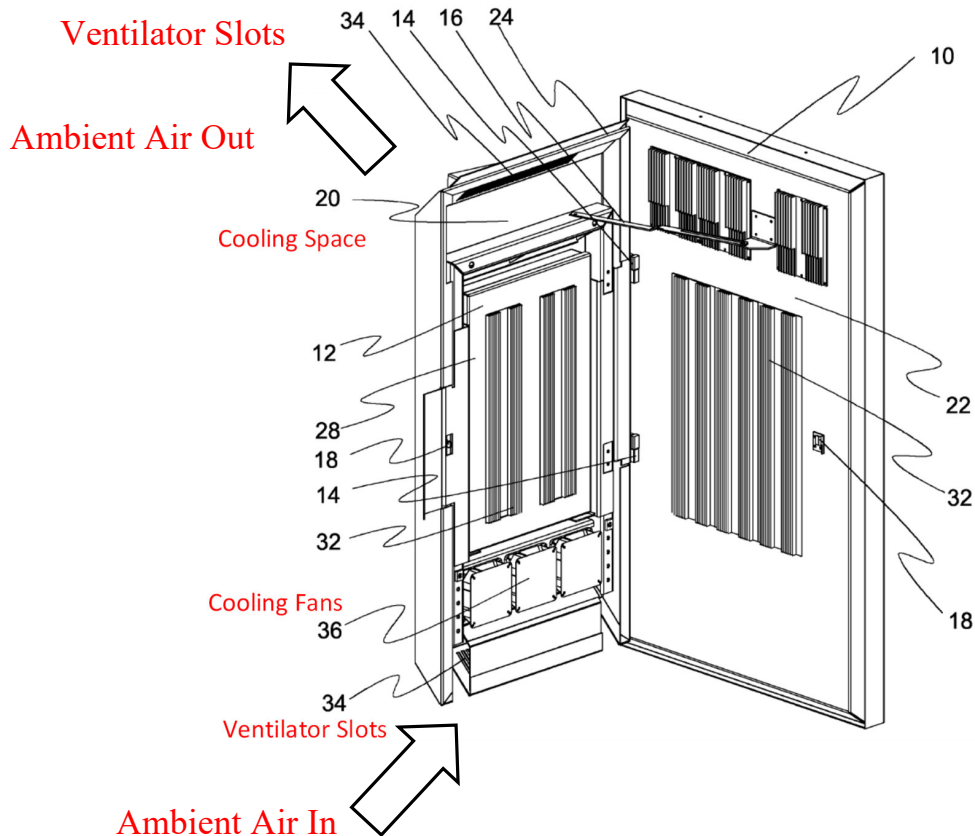
163. Karppanen further discloses:

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

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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).)

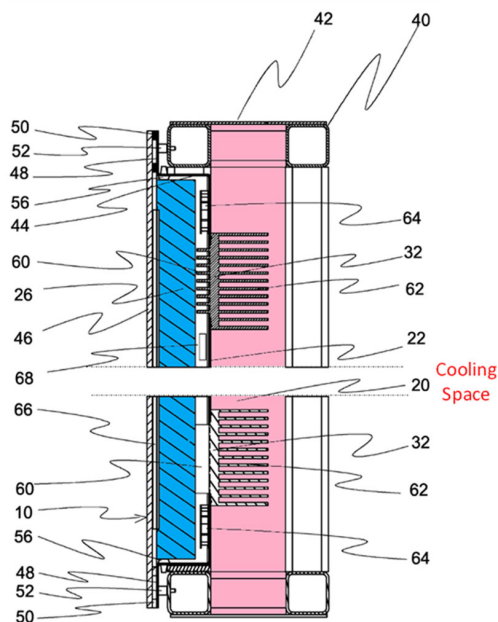
164. Karppanen's cooling space **20** is an "open loop" because air from the atmosphere is drawn in inside the cooling space **20**, passes therethrough, and is exhausted, i.e., looped back, to the atmosphere. (Ex. 1004, 7:16-22, FIG. 1). This is consistent with the '142 patent. (See Ex. 1001, 4:4-17, FIG. 1 (disclosing that

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ambient gas/air “is ingested into” and “expelled out of the display housing”).)

Thus, the cooling space [20] is “**an open loop airflow pathway for ambient air.**”

As discussed in connection with claim element 1[a], the cover **24** and the display casing **10** form the “**housing**” (*see supra* § VI.B.2.a) **Error! Reference source not found.**, and the “**housing**” contains the display element **26** (“**said electronic image assembly**”). Because the “cooling space **20** [is] between the display casing [10] and the device casing [12],” and is “delimited by the cover **24** and the display casing [10],” (Ex. 1004, 7:9-11, FIG. 2), the ambient air passing through the cooling space **20** “**pass[es] through said housing.**”



(*Id.*, FIG. 2 (annotated).) As described above, there are provided (but not shown in annotated Figure 2) ventilator slots **34**, which allow “movement of air from the

outside of the device to the cooling space.”

165. Annotated Figure 2 above shows that the cooling space **20** (highlighted pink) (“**an open loop airflow pathway**”) is behind the display element **26** (highlighted blue), i.e., “**behind said electronic image assembly.**” It should be noted that this claim element does not recite that the open loop airflow pathway is “**directly** behind” the electronic image assembly. Accordingly, Karppanen teaches claim element 1[d].

- f. “**at least one air circulation device positioned to force the circulating gas through the closed loop airflow pathway when activated; and**” (Claim Element 1[e])

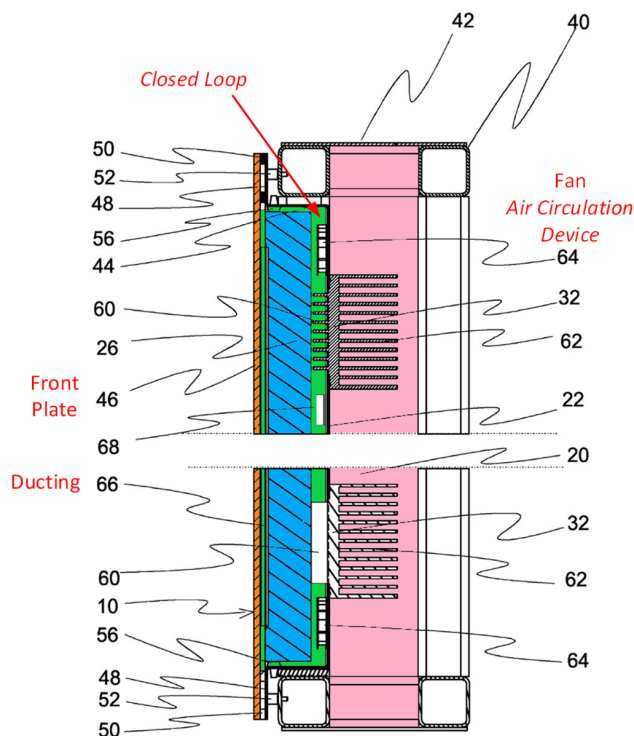
166. Karppanen discloses this claim element because Karppanen’s system includes fans **64** that force the air circulating in the closed pathway (located within the closed display casing **10**), i.e., “**to force the circulating gas through the closed loop airflow pathway when activated.**”

167. 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.**”

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



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

168. As discussed above in connection with claim element [1.d], 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 (“the closed loop airflow pathway”) through which air, a “gas,” may be circulated by the fans 64.

Therefore, the fans 64 are “at least one air circulation device positioned to force the circulating gas through the closed loop airflow pathway when activated.”

Thus, Karppanen teaches claim element 1[e].

- g. **“at least one polarizer located at an inward facing surface of said cover panel and configured to prevent at least some sunlight striking said cover panel from traveling beyond said at least one polarizer.” (Claim Element 1[f])**

169. As explained above, a person of skill in the art would have been motivated to combine the teachings of Karppanen, with the teachings of Larson, which discloses a polarizer disposed between a cover glass and an LCD display.

170. In general, Larson discloses an apparatus in which a “polarizer is disposed adjacent to a cover glass in front of [a] display.” (Ex. 1005, Abstract.) Specifically, Larson states:

In display applications, it is difficult to maintain high contrast output at **high ambient illumination levels**. However, polarized light displays and active matrix liquid crystal display (AMLCD) flat panels work well in maintaining the contrast in their displays because [the ambient] light passes through several **absorbing layers** before reflecting or scattering back out from the light producing mechanism.

(*Id.*, 1:11-17.)

171. Referring to its FIG. 1, Larson discloses a conventional polarized display **2** having a cover glass **4**, and various components of an LCD display, including a front polarizer **8** and a back polarizer **16**. (*Id.*, 1:22-27, FIG. 1.)

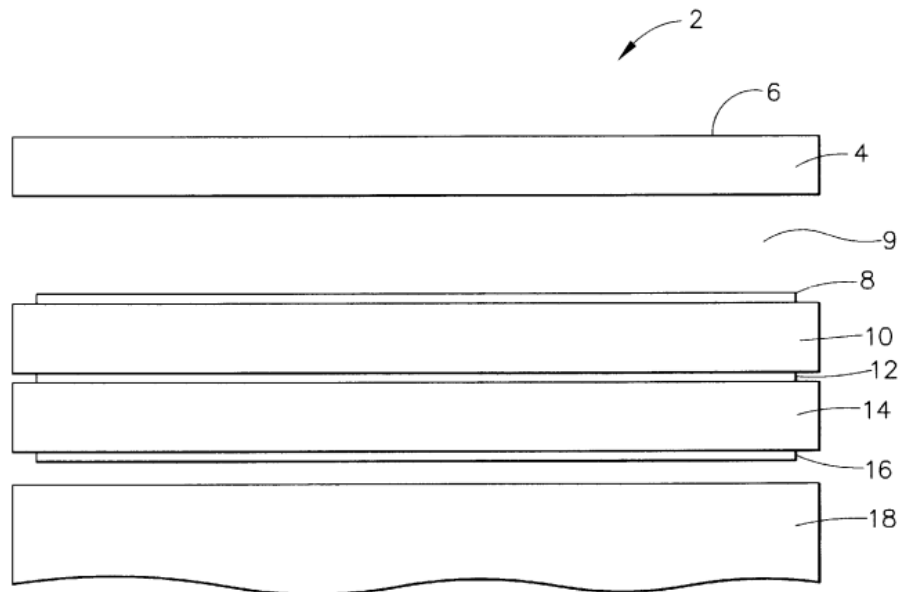


FIG. 1
(PRIOR ART)

(*Id.*, FIG. 1.)

172. The front polarizer **8** may absorb at least a portion of the ambient light, e.g., the sunlight striking the cover glass **4** (a “**cover panel**”). Larson further discloses:

Referring now to FIG. 2, a display **2** according to various aspects of the present invention comprises: a **cover glass 4**; a **front gap 9**; a front polarizer **8**; a first substrate **10**; a liquid crystal layer **12**; a second substrate **14**; a rear polarizer **16**; an **auxiliary polarizer 20**; and a backlight **18**. Each of the components of the **display 2** is suitably a **conventional LCD** component.

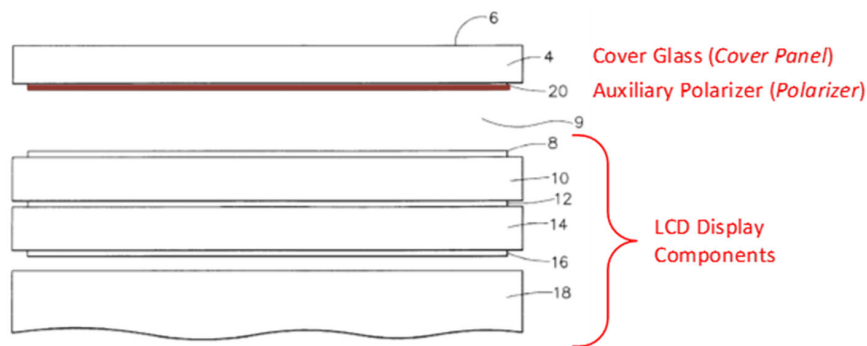
(*Id.*, 2:33-39, FIG. 2.)

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173. Larson further states:

In the present embodiment, the display includes the **auxiliary polarizer 20** between the front gap 9 and the cover glass 4. The front gap 9 separates the auxiliary polarizer 20 from the front polarizer 8. The **auxiliary polarizer 20 may be bonded to the cover glass 4** or otherwise retained in display 2, and may be coated with an antireflective coating on one or both surfaces.

(*Id.*, 3:13-19, FIG. 2.)



(*Id.*, FIG. 2.)

174. Because the auxiliary polarizer may be bonded to the cover glass 4 (a “cover panel”), Larson discloses “**at least one polarizer located at an inward facing surface of said cover panel.**”

175. In addition, Larson states:

The **auxiliary polarizer 20 is an absorbing polarizer**, preferably of a **similar type as the front polarizer [8]**, and is preferably aligned in the same direction as the front polarizer 8. Alignment of the polarizers 8, 20 in the same direction minimizes the attenuation of light coming

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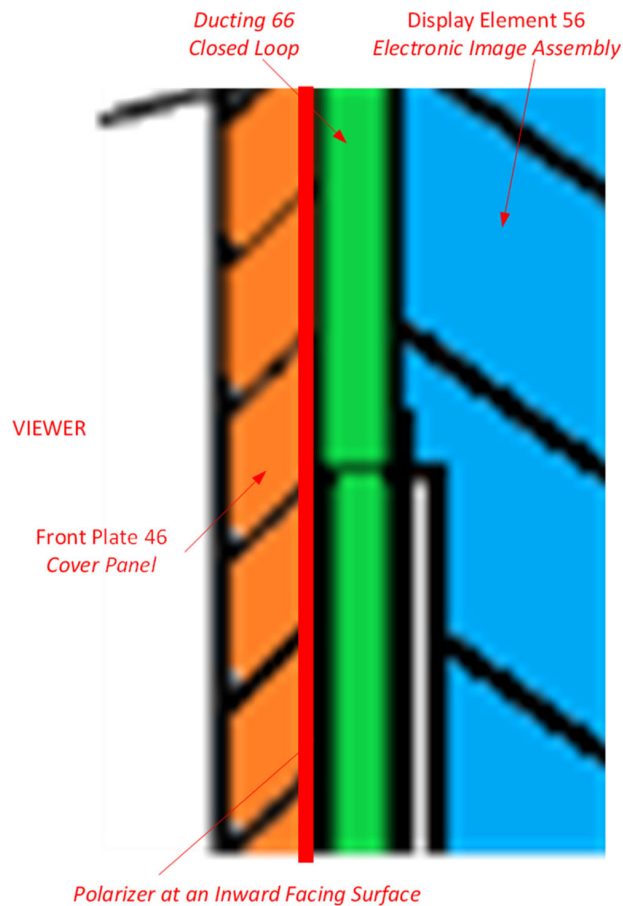
from the backlight **18**. This allows maximum transmission of the light with little to no attenuation of the light. Reflected light, however, initially passes through the cover glass and is polarized by the auxiliary polarizer **20**. By removing one of the polarizations before it reaches the gap **9**, the reflections from each of the interfaces between the auxiliary polarizer **20** and front polarizer **8** are reduced by around 50%.

(*Id.*, 3:19-30.)

176. Because the auxiliary polarizer **20** is an “absorbing polarizer” “of a similar type as the front polarizer **8**,” in addition to reducing reflections, the auxiliary polarizer may also absorb at least some of the ambient light, e.g., the sunlight striking the cover glass **4** (a “**cover panel**”). Accordingly, the auxiliary polarizer **20** may “**prevent at least some sunlight striking said cover panel from traveling beyond said at least one polarizer.**” As such, Larson teaches this claim element.

177. As described above in Section VI.B.1, a person of skill in the art would have been motivated to modify Karppanen’s disclosure to implement Larson’s proposed polarizer by adding it to the interior surface of Karppanen’s preferably glass front plate **46**, as shown below:

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(Karppanen, FIG. 2 (partial, modified per Larson, FIG. 2).)

178. Larson's proposed polarizer would have benefits that are encouraged by Karppanen, including assisting with the cooling of the air in the cooling duct of the closed loop cooling system. Therefore, Karppanen in view of Larson discloses claim element 1[f].

179. In summary, Karppanen in view of Larson discloses each and every element of claim 1 and renders obvious claim 1.

**3. Claim 2: “The cooling system of claim 1 further comprising:
at least one film having anti-reflection properties located at
said cover panel.”**

180. Larson teaches this claim element because Larson discloses a cover glass having an antireflective coating.

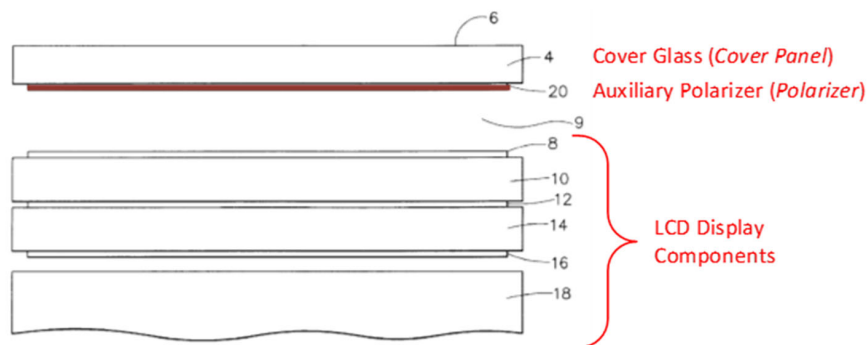
181. Referring to its FIG. 1, Larson discloses “a conventional polarized display **2**, such as a liquid crystal display (LCD), [that] includes a cover glass **4** having an **antireflective coating 6**.” (Ex. 1005, 1:22-24, FIG. 1.) Larson also states: “Several methods have been developed to reduce reflectances. For example, **antireflection coatings 6** may be added to **one or both sides of the cover glass 4**, which tends to reduce the reflection from the front of the cover glass **4**.” (*Id.*, 1:33-36.)

182. Furthermore, referring to its FIG. 2, Larson discloses “a display **2** according to various aspects of [Larson’s] invention” where the display **2** includes “a cover glass **4**.” (*Id.*, 2:33-37, FIG. 2.) Larson states:

To reduce reflections at the boundary between the cover glass **4** and the front gap **9**, the rear surface of cover glass **4** adjacent the front gap boundary **9** or auxiliary polarizer **20** may include a suitable antireflection material. For example, the **rear surface of the cover glass 4 [i.e., “cover panel”]** may include an **antireflection coating, film**, sheet, or any other form of antireflection material.

(*Id.*, 2:46-52.)

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

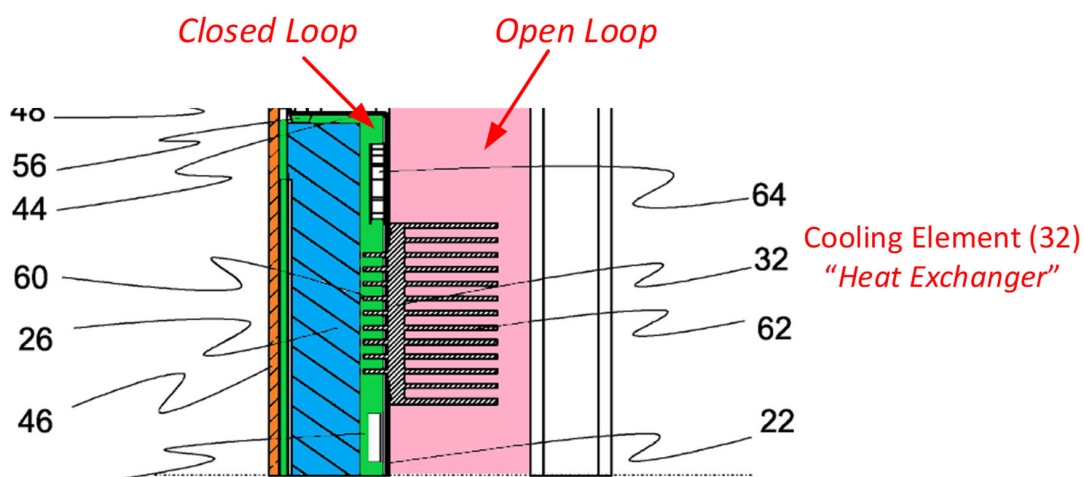
183. Thus, Larson discloses “**at least one film having anti-reflection properties located at said cover panel**” and would have been obvious to apply to Karppanen’s display in the manners described above in Sections VI.B.1 and VI.B.2.

4. **Claim 3: Element 3[a]: “The cooling system of claim 1 further comprising: a heat exchanger located rearward of the electronic image assembly,**

184. Karppanen discloses this claim element because Karppanen’s system includes a cooling element **32**. The cooling element **32** is “a heat exchanger” that is disposed behind the display element **26**, i.e., “located rearward of the electronic image assembly.”

185. 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.)

Karppanen also states that the “task of the cooling elements is to **transfer excess thermal energy from the display casing [10] to the cooling space [20]**, from which it is further conducted by the air flow produced by the cooling fans **36** out from the entire device.” (*Id.*, 8:19-22, FIG. 2.) Thus, the cooling element **32** is “**a heat exchanger.**”



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

186. As seen in the annotated Figure 2 above, the display element **26** (highlighted blue) is located behind the transparent front plate **46** (highlighted orange). The cooling element **32** is located behind the display element **26**, i.e., “**the electronic image assembly.**” Thus, Karppanen discloses “**a heat exchanger located rearward of the electronic image assembly.**”

5. Claim 3: Element 3[a][1]: “wherein a first portion of said heat exchanger forms part of said open loop airflow pathway, and”

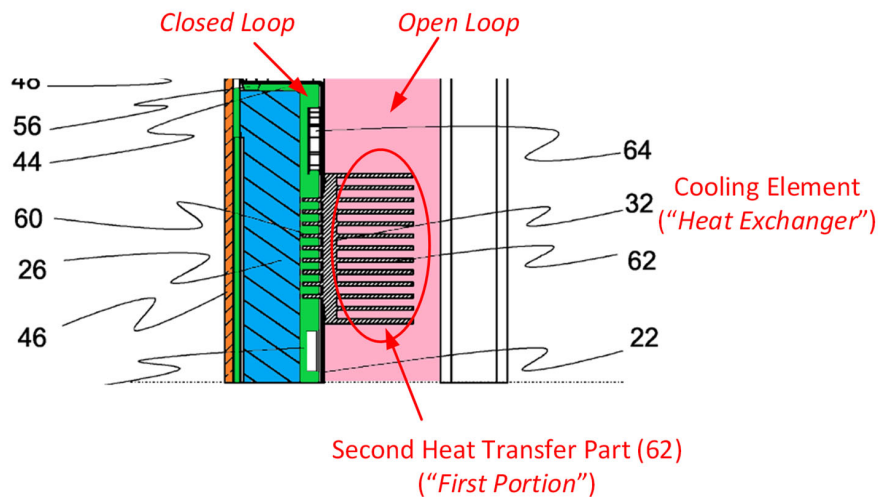
187. Karppanen discloses this claim element because the second heat transfer part **62** of the cooling element **32** (“**said heat exchanger**”) forms part of the cooling space **20**, i.e., “**said open loop airflow pathway.**”

188. The cooling element **32** (“**heat exchanger**”) includes a second heat transfer part **62**. (*Id.*, 8:13-16, FIG. 2.) Karppanen states:

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 [**20**]. 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.)

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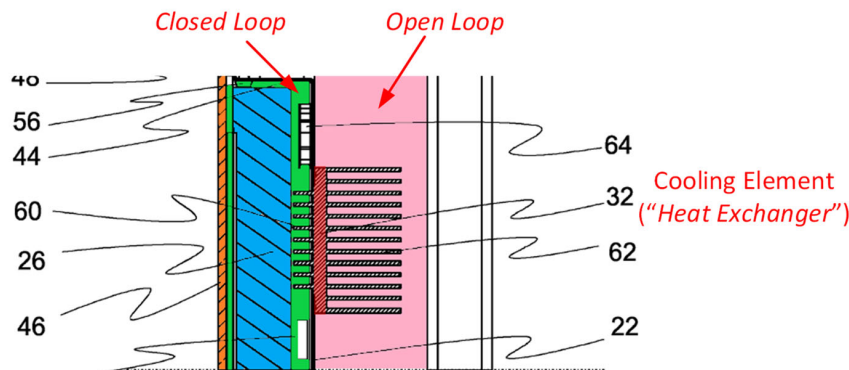


(*Id.*, FIG. 2 (partial, annotated).)

189. The second heat transfer part **62**, having the plate-like cooling fins, is located within the cooling space **20**. Also, the portion (highlighted red in annotated Figure 2 below) of the cooling element **32** from which the plate-like cooling fins extend defines in part a wall of the cooling space **20**. Together, elements **32**, **60** (inner cooling fins), and **62** (outer cooling fins) form a heat exchanger unit which transfers heat from the inner space to the outer space with the assistance of cooling fan **64** (inner space) and cooling fan **36** (outer space).

(*See id.*, 8:13–16, 8:29–9:3, 10:32–11:11, FIGs. 2 and 4.)

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

190. As discussed above in connection with claim element 1[d], the cooling space **20**, along with the ventilator slots **34**, forms an “**open loop airflow pathway.**” (*See supra* § VI.B.2.e.) Because the air flowing through the cooling space **20** circulates between the cooling element’s “plate-like cooling fins,” and because a portion of the cooling element **32** (“**said heat exchanger**”) defines in part a wall of the cooling space **20**, “**a first portion of said heat exchanger forms part of said open loop airflow pathway.**” Thus, Karppanen teaches this claim element.

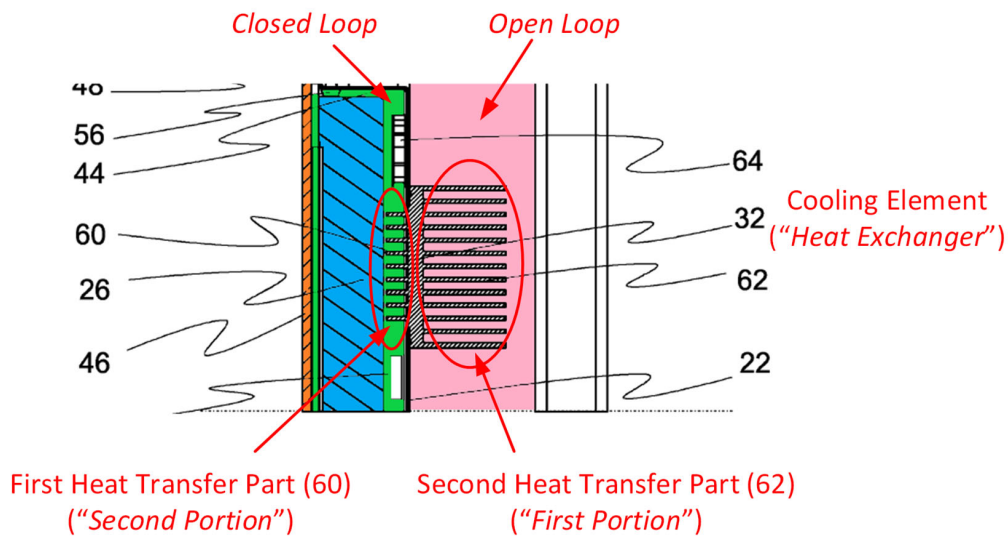
6. Claim 3: Element 3[a][2] “wherein a second portion of said heat exchanger forms part of said closed loop airflow pathway.”

191. Karppanen discloses this claim element because the first heat transfer part **60** of the cooling element **32** forms part of the closed pathway within the display casing **10**, i.e., “**said closed loop airflow pathway.**”

192. Regarding the first heat transfer part **60** of the cooling element **32** (“**said heat exchanger**”), 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 further 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 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).)

193. 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**, i.e., **“closed loop airflow pathway.”** (*See supra*, § VI.B.2.d.)

Because the air flowing through the closed pathway circulates between the fins of the first heat transfer part **60** of the cooling element **32**, **“a second portion of said heat exchanger forms part of said closed loop airflow pathway.”** Thus, Karppanen teaches this claim element.

7. Claim 4: Element 4[a] “The cooling system of claim 3 further comprising: an inlet located at a first portion of said housing for ingesting said ambient air into said open loop airflow pathway; and”

194. Karppanen teaches this claim element because in Karppanen’s system, the cover **24**, that forms the **“housing”** includes vents **34** (**“an inlet”**) at the bottom (**“a first portion of said housing”**) for ingesting ambient air into the cooling space **20** (**“said open loop airflow pathway”**).

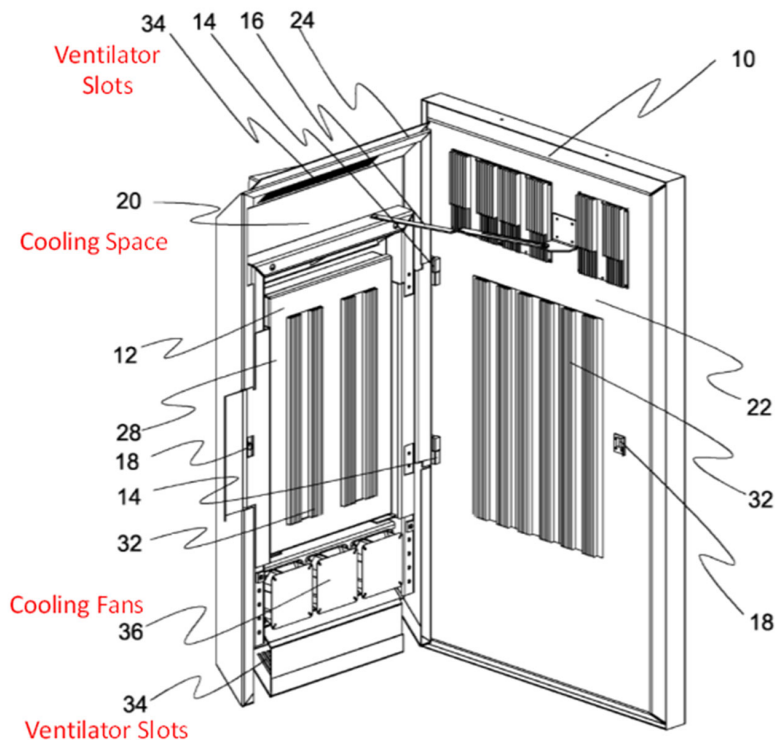
195. As discussed in connection with claim element 1[a], the cover **24** and the display casing **10** form the **“housing.”** (*See supra*, § VI.B.2.b.) As discussed above in connection with claim element 1[d], the cooling space **20**, along with the ventilator slots **34**, forms an **“open loop airflow pathway.”** (*See supra*, § VI.B.2.e.) Karppanen further discloses:

In the **first edge of the cover 24** pointed downward and the second

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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).)

196. The ventilator slots **34** in the bottom, i.e., “the **first edge of the cover 24**,” i.e., “**housing**” “enable the movement of air from the outside of the device to

the cooling space [20],” i.e., the “**open loop airflow pathway.**” Accordingly, the ventilator slots **34** at the bottom is “an inlet located at a first portion of said housing for ingesting said ambient air into said open loop airflow pathway.” Thus, Karppanen teaches this claim element.

8. Claim 4: Element 4[b] “an exhaust located at a second portion of said housing for exhausting said ambient air from said open loop airflow pathway.”

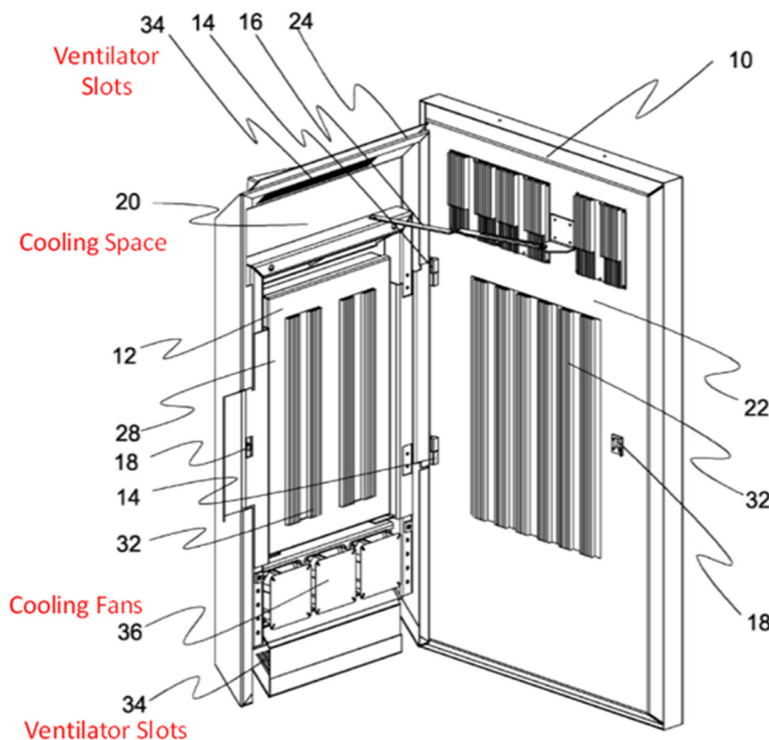
197. Karppanen teaches this claim element because in Karppanen’s system, the cover **24**, that forms the “**housing**” includes vents **34** (“**an exhaust**”) at the top (“**a second portion of said housing**”) for exhausting ambient air from the cooling space **20** (“**said open loop airflow pathway**”).

198. Karppanen 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.)

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

199. The ventilator slots **34** in the top, i.e., “the **second edge of the cover 24,**” i.e., “**housing**” “enable the movement of air . . . **from the cooling space [20] back to the outside of the device,**” i.e., air is exhausted from the cooling space **20** (“**said open loop airflow pathway**”). Accordingly, the ventilator slots **34** at the top is “an exhaust located at a second portion of said housing for exhausting said ambient air from said open loop airflow pathway.” Thus, Karppanen teaches this claim element.

9. **Claim 5: “The cooling system of claim 1 wherein: said at least one polarizer comprises a linear polarizer.”**

200. Larson teaches this claim element because Larson’s auxiliary polarizer **20** can be a linear polarizer.

201. It is discussed above in connection with claim element 1[f] that Larson’s auxiliary polarizer **20** is “**at least one polarizer located at an inward facing surface of said cover panel.**” (*See supra*, § VI.B.2.g.) Referring to its Figure 3, Larson states: “a **linear auxiliary polarizer 20** is disposed adjacent to the cover glass **4**.” (Ex. 1005, 4:32-34, FIG. 4; *see id.*, 4:30-32.)

202. Although Larson discloses “circular polarization” in the embodiment depicted in FIG. 3 (*see id.*, 4:30-32), a POSITA would have understood that the circular polarization is achieved via a combination of the “linear auxiliary polarizer **20**” and a “retarder, such as a quarter wave retarder **22a**, is disposed adjacent to the linear auxiliary polarizer **20**.” (*Id.*, 4:34-37, FIG. 3.) Larson’s embodiment of Figure 2, discussed above in connection with claim element 1[f], includes only the auxiliary polarizer **20** and not a retarder. (*See id.*, 2:33-37, FIG. 2.) A POSITA would have understood that without the retarder **22a**, the linear auxiliary polarizer **20** would perform linear polarization. Thus, Larson teaches the limitation recited in this claim.

10. Independent Claim 6

203. It is my opinion that Karppanen in view of Larson discloses each and

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every limitation of Claim 6.

- a. **“A cooling system for an electronic image assembly, the cooling system comprising:” (Claim Element 6[pre])**
- b. **“a housing for the electronic image assembly;” (Claim Element 6[a])**

204. Claims elements 6[pre] and 6[a] are identical, respectively, to claim elements 1[pre] and 1[a]. Therefore, for the reasons provided for claim elements 1[pre] and 1[a], Karppanen teaches these claim elements. (*See supra* §§ VI.B.2.a, VI.B.2.b.)

- c. **“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;” (Claim Element 6[b])**

205. This claim element recites substantially the same limitations that claim element 1[b] recites, as a side-by-side comparison below shows.

Limitation of Claim Element 6[b]	Limitation of Claim Element 1[b]
a <u>transparent</u> cover panel forming a <u>front</u> portion of the housing, the <u>transparent</u> cover panel located forward of, and at least some distance from, the electronic image assembly;	a cover panel forming a ~~forward~~ portion of the housing, ~~wherein~~ the cover panel ~~is~~ located forward of, and at least some distance from, the electronic image assembly ~~and is~~

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Limitation of Claim Element 6[b]	Limitation of Claim Element 1[b]
	~~configured to permit viewing of images~~ ~~displayed at the electronic image~~ ~~assembly through said cover panel;~~

206. In the comparison above, and also in the comparisons below for other elements of claim 6, blue underlined words indicate additions in the element of claim 6 that is being discussed and red words having strike through markings are deletions from the corresponding element of claim 1. The black words are identical to both claim elements. A cover panel “configured to permit viewing of images displays . . . through said panel” is “a transparent cover panel.” Additionally, in the discussion for claim element 1[b], Karppanen’s “front plate 46” is discloses as the cover panel. (*See supra*, § VI.B.2.c.) The front plate 46 is “transparent.” (Ex. 1004, 7:31-35, FIG. 2.)

207. Therefore, for the reasons provided for claim element 1[b], Karppanen teaches this claim element.

**d. “an open loop airflow pathway passing through the housing behind the electronic image assembly;”
(Claim Element 6[c])**

208. This claim element recites substantially the same limitations that claim element 1[d] recites, as shown below.

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an open loop airflow pathway ~~for ambient air~~ passing through ~~said~~the
housing ~~and~~ behind ~~said~~the electronic image assembly;

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

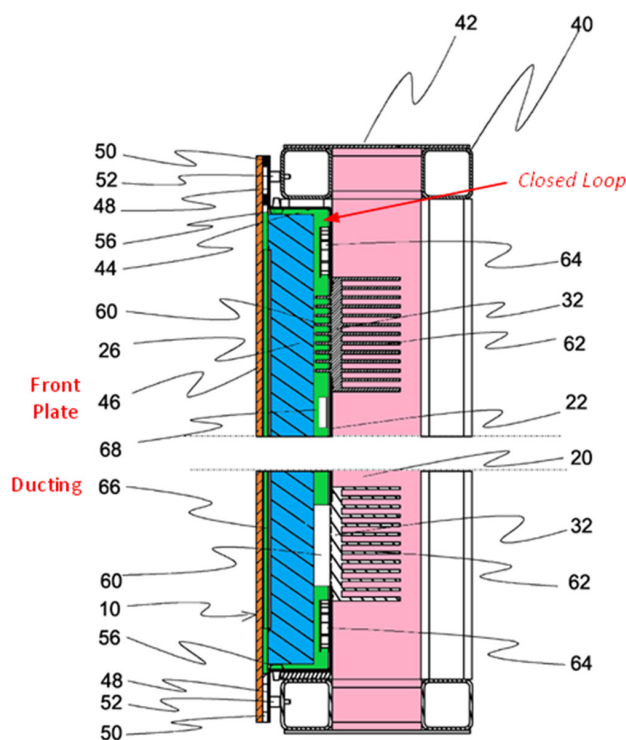
- e. **“a closed loop gas circulation pathway contained within the housing, wherein a portion of said closed loop gas circulation pathway passes between said transparent cover panel and said electronic image assembly;” (Claim Element 6[d])**

210. This claim element recites substantially the same limitations that claim element 1[c] recites, as a side-by-side comparison below shows.

Limitation of Claim Element 6[d]	Limitation of Claim Element 1[c]
a closed loop <u>gas circulation</u> pathway <u>contained within</u> the housing, wherein a portion of said closed loop <u>gas circulation</u> pathway <u>passes</u> between said <u>transparent cover panel and said</u> electronic image assembly;	a closed loop ~~airflow~~ pathway ~~passing through~~ the housing, wherein ~~said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and wherein at least~~ a portion of said closed loop ~~airflow~~ pathway ~~extends~~ between said electronic image assembly ~~and said cover panel;~~

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211. Although claim element 1[c] recites “airflow” and claim element 6[d] recites “gas circulation,” air is a gas, and flow of air in a closed loop is “gas circulation.” Moreover, while element 1[c] recites a “pathway **passing through** the housing,” claim element 6[d] recites “pathway **contained within** the housing.” Karppanen’s closed loop, however, is contained within the housing, as shown below.



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

212. It was discussed for claim element 1[a] that the cover **24** and the display casing **10** (containing the display element **26**), together form a “**housing**” for the display element **26** (“**the electronic image assembly**”). In annotated

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Figure 2 above, it can be seen that the closed loop (highlighted green) is contained entirely within the housing. Specifically, the closed loop is contained within the back wall **22**, the front plate **46**, and the “edge part **44** having a flange-like fastening collar **48**” of the display casing **10**. (*Id.*, 7:31-34, FIG. 2.)

213. Finally, annotated Figure 2 above also shows that “closed loop gas circulation pathway” (highlighted green) “**passes between**” the transparent front plate **46** (highlighted orange) (“said transparent cover panel”) and the display element **26** (highlighted blue) (“said electronic image assembly”).

214. Therefore, for the reasons provided for claim element 1[c], Karppanen teaches this claim element.

f. “an inlet located at a first portion of said housing for ingesting ambient air into said open loop airflow pathway;” (Claim Element 6[e])

215. This claim element recites substantially the same limitations that claim element 4[a] recites, as shown below.

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

216. Therefore, for the reasons provided for claim element 4[a], Karppanen teaches this claim element.

g. “an exhaust located at a second portion of said housing for exhausting said ambient air from said open loop airflow pathway;” (Claim Element 6[f])

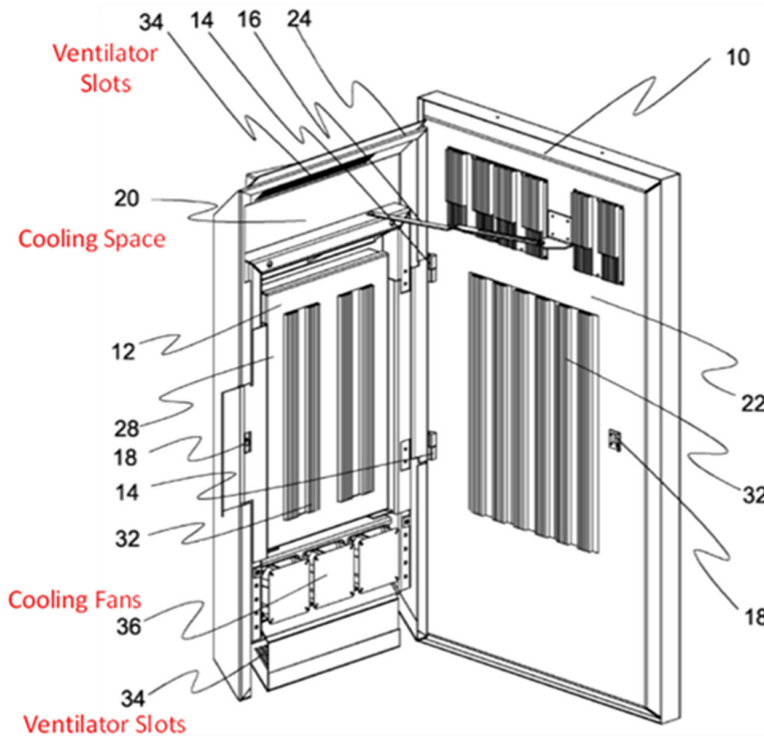
217. This claim element is identical to claim element 4[b]. Therefore, for the reasons provided for claim element 4[b], Karppanen teaches this claim element.

- h. “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;” (Claim Element 6[g])**

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

219. As discussed above in connection with claim element 1[d], the cooling space [20] is “**an open loop airflow pathway for ambient air.**” Moreover, as discussed for claim **4**, the bottom ventilator slots **34** are the “**inlet**” and the top ventilator slots **34** are the “**exhaust.**” Karppanen states that “[i]n the cover **24** there are **cooling fans 36**, by which the circulation of air through the cooling space [20] is regulated.” (*Id.*, 7:21-22, FIG. 1.) Accordingly, a cooling fan **36** is “**an air circulation device.**” Annotated Figure 2 below shows that fans **36** are located within the cooling space **20**, and between the bottom and top ventilator slots **34**.

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

220. Thus, Karppanen discloses a cooling fan 36 as “**an air circulation device positioned**” within the cooling space 20, i.e., “**along said open loop airflow pathway**” and between the bottom and top ventilator slots 34, i.e., “**between said inlet and said exhaust.**”

221. As noted above, Karppanen states that “[i]n the cover **24** there are **cooling fans 36**, by which the circulation of air through the cooling space [20] is regulated.” (*Id.*, 7:21-22, FIG. 1.) Therefore, the cooling fans **36** “**said air circulation device is configured to force said ambient air through**” the cooling space **20**, i.e., “**the open loop airflow pathway when activated.**” Thus,

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Karppanen teaches this claim element.

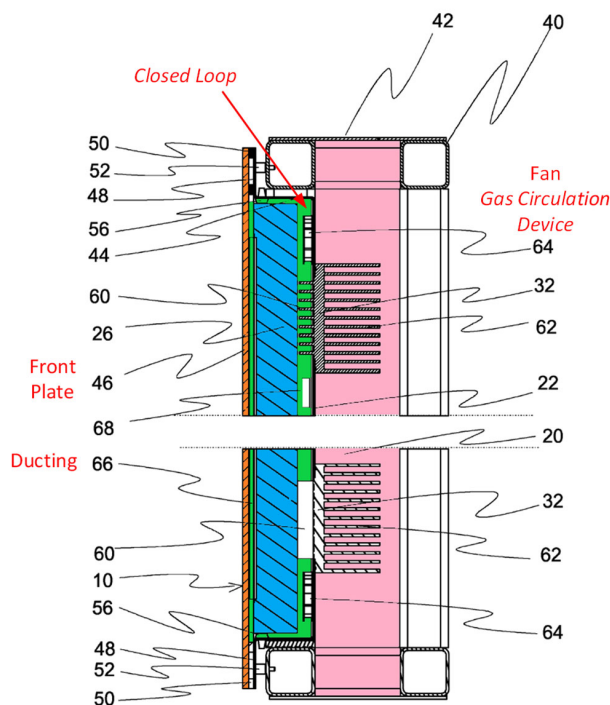
- i. **“a gas circulation device positioned along said closed loop gas circulation pathway to force circulating gas around the closed loop gas circulation pathway when activated;” (Claim Element 6[h])**

222. This claim element recites substantially the same limitations that claim element 1[e] recites, as shown below.

~~at least one air~~a gas circulation device positioned along said closed loop gas circulation pathway to force ~~the~~ circulating gas ~~through~~around the closed loop ~~airflow~~gas circulation pathway when activated;~~and~~

223. Although claim element 1[e] recites “air circulation” and claim element 6[h] recites “gas circulation,” air is a gas, and flow of air in a closed loop is “gas circulation.” Moreover, Figure 2 annotated below shows that Karppanen’s air or gas circulation device, fan **64**, is positioned within the closed loop, and thus, it is “positioned along said closed loop.”

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

224. Finally, while claim element 1[e] recites “to force the circulating gas **through** the closed loop,” claim element 6[h] recites “to force circulating gas **around** the closed loop.” Air (i.e., gas) forced “through” a **closed** loop would circulate “around” the closed loop, because it is a loop, as the annotated Figure 2 shows.

225. Therefore, for the reasons provided for claim element 1[e], Karppanen teaches this claim element.

- j. “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” (Claim Element 6[i])**

226. This claim element recites substantially the same limitations that
claim 3 recites, as shown below.

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 ~~airflow~~gas circulation
pathway-; and

227. Although claim 3 recites “airflow pathway” and claim element 6[i]
recites “gas circulation pathway,” air is a gas, and hence, an airflow pathway is a
“gas circulation pathway.” Therefore, for the reasons provided for claim 3,
Karppanen teaches this claim element. (*See supra* § VI.B.4-6.)

- k. **“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.” (Claim Element 6[j])**

228. Larson teaches this claim element for the reasons provided for claim
element 1[f].

229. First, while claim element 1[f] recites “at least one polarizer located at

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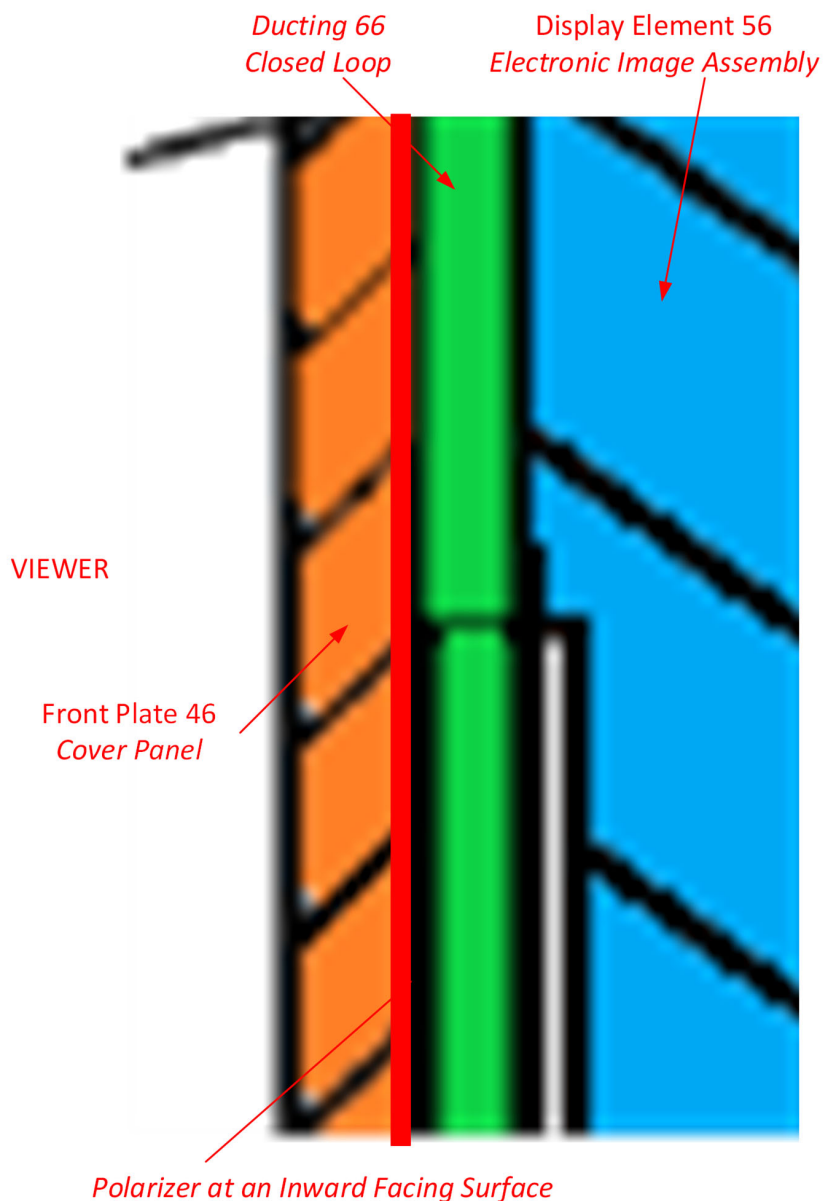
an inward facing surface of said cover panel,” claim element 6[j] recites “one or more solar energy reduction layers located at said transparent cover panel.” A polarizer is a “solar energy reduction layer.” For instance, claim 8, which depends from claim 6, recites “at least one of said one or more solar energy reduction layers comprise a polarizer.” The ’142 patent also states that “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**,” and 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**.” (Ex. 1001, 6:3-9.)

230. Second, Karppanen discloses a “transparent front plate **46**” as the cover panel, and thus discloses a transparent cover panel. (*See supra*, § VI.B.10,c. (claim element 6[b]).) Third, because Larson’s polarizer **20** is located “at an inward facing surface of said cover panel” (*see supra*, § VI.B.2.g (claim element 1[f])), that polarizer, i.e., a “solar energy reduction layer,” is located “at said transparent cover panel.”

231. As seen in annotated, partial Figure 2 below, from a viewer’s point of view, Karppanen’s transparent plate **46** (highlighted orange) is located in the front, a portion of the closed loop (highlighted green) is provided after the front

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transparent plate **46**, and the display element **26** (highlighted blue) is located after the closed loop. Larson's polarizer **20** (marked red), is provided at the "inward facing surface of" Karppanen's transparent front plate **46**, and is thus located **before** the closed loop and the display element **26**.



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

232. As discussed for claim element 1[f], Larson’s polarizer **20** is “configured to **prevent** at least some sunlight striking said cover panel **from traveling beyond**” the polarizer **20**. (*See supra*, § VI.B.2.g (claim element 1[f]).) Therefore, Larson’s polarizer **20** would prevent at least some sunlight striking the transparent front plate **46** from reaching: (1) a portion of the closed loop located between the front plate **46** and the display element **26**, and (2) the display element **26**.

233. Moreover, Larson discloses that an “antireflection coating 6 may be added to one or **both sides** of the cover glass **4**.” (Ex. 1005, 1:34-36, FIG. 1.) The antireflection coating can also block some wavelengths, i.e., some incident solar energy from entering the cover glass **4** (“**said transparent cover panel**”) from reaching the gap **9**, i.e., the front portion of the closed loop in Karppanen’s system. Thus, the antireflection coating **6** can also prevent some portion of the incident solar energy from thermally interacting with the circulating gas in the front portion of Karppanen’s closed loop gas circulation pathway.

234. Therefore, the polarizer **20** and/or the antireflection coating 6 are “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.”

235. As such, as discussed herein and for claim element 1[f], Larson teaches this claim element.

236. In summary, Karppanen in view of Larson discloses each and every element of claim 6 and renders obvious claim 6.

11. Claim 7

- a. Element 7[a]: “The cooling system of claim 6 wherein: said air circulation device comprises one or more fan assemblies; and”**

237. Karppanen teaches this claim element. Specifically, the air circulation device that Karppanen discloses are cooling fans **36**. (Ex. 1004, 7:21-22 (stating that “[i]n the cover **24** there are **cooling fans 36**, by which the circulation of air through the cooling space [**20**] is regulated”), FIG. 1; *see supra*, § VI.B.10.h.) Thus, Karppanen’s air circulation device includes “**one or more fan assemblies.**”

- b. Element 7[b]: “said gas circulation device comprises one or more fan assemblies.”**

238. Karppanen teaches this claim element. Specifically, the gas circulation device that Karppanen discloses are fans **64**. (*Id.*, 9:3-5 (stating 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 [26] and the walls of the display casing.”), FIG. 1; *see supra*, § VI.B.10.i.) Thus, Karppanen’s gas circulation device includes “**one or more fan assemblies.**”

12. Claim 8: “The cooling system of claim 6 wherein: at least one of said one or more solar energy reduction layers comprise a polarizer.”

239. Larson teaches this claim element. As discussed for claim element 6[j], the “solar energy layer” that Larson discloses is the “auxiliary polarizer **20**.” (Ex. 1005, 2:33-39 (stating that “a display **2**” “comprises: a cover glass **4**; a front gap **9**; [and] **an auxiliary polarizer 20**”).)

13. Claim 9: “The cooling system of claim 8 wherein: said polarizer comprises a linear polarizer.”

240. Larson teaches the limitation recited in this claim. Claim 9 is identical in substance to claim 5, which recites “said at least one polarizer **comprises a linear polarizer.**” Therefore, for the reasons provided for claim 5, Larson teaches this claim.

14. Claim 10: “The cooling system of claim 6 wherein: at least one of said one or more solar energy reduction layers comprise a film having anti-reflection properties.”

241. Larson teaches this claim element. It was discussed for claim element 6[j] that a “solar energy reduction layer[]” is Larson’s auxiliary polarizer **20**. (*See supra* § VI.B.10.k.) Larson further states that “the auxiliary polarizer **20** may []

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include **antireflective material**,” and that “any or all of the polarizers may be coated, plated, or otherwise integrated with or adjacent to an antireflection material.” (*Id.*, 4:9-13, FIG. 2.) In addition, Larson discloses that an “antireflection coating 6 may be added to one or **both sides** of the cover glass 4.” (*Id.*, 1:34-36, FIG. 1.) Thus, Larson teaches this claim.

15. Claim 11

- a. Element 11[a]: “The cooling system of claim 6 wherein: at least a first one of said one or more solar energy reduction layers comprise a polarizer; and”**

242. This claim element is identical, in substance, to claim 8. The only difference is that claim 8 recites “at least one of” and claim 11 recites “at least a first one of.” Therefore, for the reasons provided for claim 8, Larson teaches this claim element.

- b. Element 11[b]: “at least a second one of said one or more solar energy reduction layers comprise a film having anti-reflection properties.”**

243. This claim element is identical, in substance, to claim 10. The only difference is that claim 10 recites “at least one of” and claim 11 recites “at least a second one of.” Therefore, for the reasons provided for claim 10, Larson teaches this claim element.

16. Independent Claim 12

244. It is my opinion that Karppanen in view of Larson discloses each and

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every limitation of Claim 12.

**a. “A method for cooling an electronic image assembly,
said method comprising the steps of:” (Claim Element
12[pre])**

245. This claim element corresponds to claim element 1[pre], as shown
below.

A method for cooling ~~system for~~ an electronic image assembly, ~~the~~
~~cooling system~~ said method comprising the steps of:

246. In the comparison above, and also in the comparisons below for other
elements of claim 12, blue underlined words indicate additions in the element of
claim 12 that is being discussed and red words having strike through markings are
deletions from the corresponding element of claim 1. The black words are
identical to both claim elements.

247. Because the preamble of claim 12 corresponds to the preamble of
claim 1, to the extent the preamble of claim 12 is limiting, Karppanen discloses
this preamble for the reasons provided under Ground 1 for the preamble of claim 1.
(*See supra* § VI.B.2.a.)

**b. “placing said the electronic image assembly within a
housing;” (Claim Element 12[a])**

248. This claim element corresponds to claim element 1[a], as shown
below.

~~a housing for~~placing said the electronic image assembly within a housing;

249. Therefore, Karppanen discloses this claim element for the reasons provided for claim element 1[a] under Ground 1. (*See supra* § VI.B.2.b.)

- c. **“forcing circulating air through a closed loop airflow pathway within said housing, wherein at least a portion of said closed loop airflow pathway extends between an electronic image assembly and a cover panel forming a front portion of said housing and spaced apart from said electronic image assembly, wherein said cover panel is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;” (Claim Element 12[b])**

250. A side-by-side comparison of the limitations of claim element 12[b] and the limitations of claim elements 1[b] and 1[c] is shown below. To minimize clutter, insubstantial differences, such as “the” and “said” are not emphasized. Here and in other side-by-side comparisons below, the limitations added to the claim element at issue are shown in blue (left column), and the limitation not present in the element at issue are shown in red (right column).

Limitation of Claim Element 12[b]	Limitation of Claim Elements 1[b] and 1[c]
<u>forcing circulating air through</u> a closed loop airflow pathway <u>within</u> said	a closed loop airflow pathway ~~passing through~~ the housing, ~~wherein said~~

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Limitation of Claim Element 12[b]	Limitation of Claim Elements 1[b] and 1[c]
housing,	~~closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and~~
wherein at least a portion of said closed loop airflow pathway extends between an electronic image assembly and a cover panel	wherein at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel
forming a <u>front</u> portion of said housing and <u>spaced apart</u> from said electronic image assembly,	forming a ~~forward~~ portion of the housing, ~~wherein the cover panel is located forward of, and at least some distance~~ from, the electronic image assembly
wherein said cover panel is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;	and is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;

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251. It is seen from the comparison above that the differences: “front portion” and “forward portion”; and “spaced apart from” and “located . . . at least some distance from” are insubstantial. Karppanen’s closed loop is within the display case **10**, i.e., within the housing. (*See supra*, § VI.B.2.d (claim element 1[c]).) Claim element 12[b] recites “forcing circulating air through,” and claim element 1[e] recites “at least one air circulation device positioned to force the circulating gas through the closed loop airflow pathway when activated,” which forces the circulating air through the closed loop. (*See supra*, § VI.B.2.f.)

252. Therefore, for the reasons provided for claims elements 1[b], 1[c], and 1[e] under Ground 1, Karppanen in view of Larson teaches all of the limitations of claim element 12[b].

d. “forcing ambient air through a second airflow pathway within said housing, wherein said second airflow pathway extends behind said electronic image assembly; and” (Claim Element 12[c])

253. A side-by-side comparison of the limitations of claim element 12[c] and the limitations of claim element 1[d] is shown below. To minimize clutter, insubstantial differences, such as “the” and “said” are not emphasized.

Limitation of Claim Element 12[c]	Limitation of Claim Element 1[d]
<u>forcing ambient air through</u> a <u>second</u>	an ~~open-loop~~ airflow pathway ~~for~~

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Limitation of Claim Element 12[c]	Limitation of Claim Element 1[d]
airflow pathway <u>within</u> said housing, <u>wherein said second airflow pathway</u> <u>extends</u> behind said electronic image assembly; and	~~ambient air passing through~~ said housing and behind said electronic image assembly;

254. The difference between “a second airflow pathway within said housing” and “an open loop airflow pathway . . . passing through said housing” is insubstantial. Likewise, “an open loop airflow pathway . . . behind said electronic image assembly” is in substance the same as “a second airflow pathway [that] extends behind said electronic image assembly.”

255. Claim element 12[c] recites “forcing ambient air through a second airflow pathway” and claim element 6[g] recites “an air circulation device positioned along said open loop airflow pathway . . . said air circulation device is configured to force said ambient air through the open loop airflow pathway when activated.”

256. Therefore, for the reasons provided for claims elements 1[d] and 6[g] under Ground 1, Karppanen in view of Larson teaches all of the limitations of claim element 12[b]. (*See supra* §§VI.B.2.c, VI.B.10.h.)

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- e. “providing one or more solar energy reduction layers at an inward facing surface of said cover panel, wherein each of said one or more solar energy reduction layers is configured to reduce an amount of solar energy transferred to said circulating air in at least said portion of said closed loop airflow pathway.” (Claim Element 12[d])

257. Claim element 12[d] and the limitations of claim element 6[j] are compared below:

Limitation of Claim Element 12[d]	Limitation of Claim Element 6[j]
<u>providing</u> one or more solar energy reduction layers at <u>an inward facing surface of</u> said cover panel, wherein	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 <u>reduce an amount</u> of solar energy <u>transferred to</u> said circulating <u>air</u> in at least said portion of said closed loop <u>airflow</u> pathway.	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~~

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Limitation of Claim Element 12[d]	Limitation of Claim Element 6[j]
	~~assembly or thermally interacting with said electronic image assembly.~~

258. Claim element 1[f] recites: “at least one polarizer located at an inward facing surface of said cover panel.” “[R]educ[ing] an amount of solar energy transferred to said circulating air” is in substance the same as “prevent[ing] a portion of solar energy entering said transparent cover panel from thermally interacting with the circulating gas at said portion. Therefore, the combination of Karppanen and Larson teaches this claim element for the reasons provided in Ground 1 for claim elements 1[f] and 6[j]. (*See supra* §§ VI.B.2.g, VI.B.10.k.)

259. In summary, Karppanen in view of Larson discloses each and every element of claim 12 and renders obvious claim 12.

17. Claim 13: “The cooling method of claim 12 wherein: at least one of said one or more solar energy reduction layers comprise a polarizer.

260. This claim is identical to claim 8. Therefore, for the reasons provided for claim 8 under Ground 1, Larson teaches this claim. (*See supra* § VI.B.12.)

18. Claim 14: “The cooling method of claim 13 wherein: at least one of said one or more solar energy reduction layers comprise a film having anti-reflection properties.

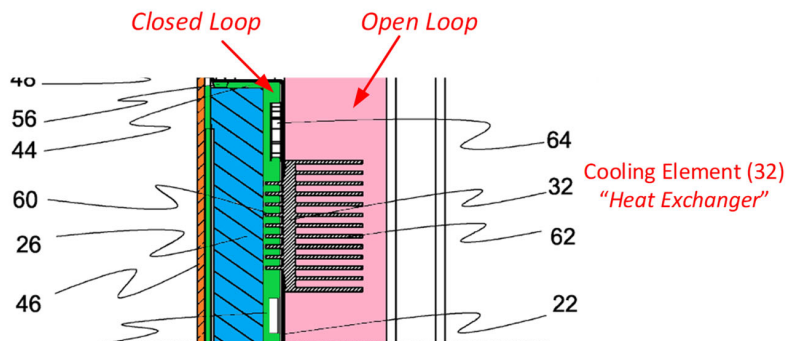
261. This claim is identical to claim 10. Therefore, for the reasons

provided for claim 10 under Ground 1, Larson teaches this claim. (*See supra* § VI.B.14.)

19. **Claim 15: “The cooling method of claim 12 further comprising the steps of: thermally transferring heat between said circulating air in said closed loop airflow pathway and said ambient air in said second airflow pathway at a heat exchanger common to said closed loop airflow pathway and said second airflow pathway.**

262. Karppanen teaches this claim. As discussed for claim element 6[i], Karppanen teaches “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.” (*See supra*, § VI.B.10.j.)

263. Because a single heat exchanger forms a “part of [the] open loop airflow pathway,” and a “part of [the] closed loop gas circulation pathway,” the heat exchanger is common to both the open loop and closed pathways. Because the heat exchanger is common to both the closed and open loops, the gas/air circulating in the closed loop and the gas/air moving through the open loop would exchange heat, e.g., via the heat exchanger.



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

264. Therefore, Karppanen teaches this claim element.

265. In summary, Karppanen in view of Larson teaches all of the elements of claims 1-15 and renders these claims unpatentable as obvious.

C. Ground 2: The Combination of Yare and Larson Renders Claims 1-15 Obvious

1. Motivation to Combine Yare and Larson

266. As explained below, Yare teaches a display cabinet that houses an LCD display for a wide variety of viewing environments, including outdoors. Yare's cabinet includes a cooling system that teaches the closed and open loop air flows. Yare is non-specific about where the LCD is located inside of the cabinet. However, it is clear from Yare's disclosure that the LCD would not be against or in contact with the front of the cabinet, as indicated by "L"-shaped airflow pathway in Figure 4. Otherwise it would suffer from design defects such as a screen that gets too hot and fogs, as described below. Nevertheless, it would have been

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obvious to place the LCD screen with a gap between the screen and the front transparent area to resolve these design defects, as explained more thoroughly below.

267. Likewise, Yare may not teach a polarizer or other solar reduction layer on its front cabinet viewing area, but Larson does and a person of skill in the art would have been motivated to implement Larson's improved polarized display, to aid in cooling the display.

268. A person of ordinary skill in the art would have been motivated to combine Yare and Larson because they both describe systems and devices in closely related fields, namely, electronic displays, such as LCDs. In particular, Yare discloses “[a] display cabinet **10** . . . for mounting a display system **20**” that may include “an LCD.” (Ex. 1006, Abstract, 3:17-18, FIGs. 1 & 4.) Like Yare, Larson also discloses an LCD. (Ex. 1005, 1:22-27 (disclosing a conventional LCD), FIG. 1, 2:33-39 (disclosing a conventional LCD in combination with a polarizer), FIG. 2.) Larson states: “[t]he subject matter of the present invention is particularly suited for use in connection with displays, such as LCDs.” (*Id.*, 2:25-26.)

269. Yare states that its cabinet and display system are “particularly suitable for use in providing large scale displays in public spaces.” (Ex. 1006, 1:4-

6.)

270. A POSITA would have understood that when used in outdoors public spaces during daytime, Yare's display system would be exposed to ambient light or sunlight. Larson describes that "it is difficult to maintain high contrast output at high ambient illumination levels," and discloses further that "polarized light displays" can maintain high contrast. (Ex. 1005, 1:11-17, 1:22-32 (disclosing "a **conventional** polarized display"), FIG. 1.) Therefore, a POSITA would have recognized that the use of polarization in Yare's system can beneficially improve the contrast of the display, when used outdoors during daytime.

271. Larson discloses a conventional polarized display structure, identifies a problem with that structure, and provides a solution. Specifically, the conventional polarized display that Larson discloses includes a "cover glass **4**" and a "front polarizer **8**" on a "substrate **10**" over "a liquid crystal layer **12**." (*Id.* at 1:22-27, FIG. 1.) Larson states that "[t]he cover glass **4** is separated from the front polarizer **8** by a **gap 9**, typically filled with air." (*Id.*, 1:27-28, FIG. 1.) The air gap **9** is similar to the gap between a front surface of Yare's cabinet and its display **20** (*See* Ex. 1006, FIG. 4 (depicting "L" shaped arrows indicating airflow through a gap between the front surface of the cabinet **10** and the display **20**).)

272. Larson identifies a problem with such structures, stating that

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“[r]eflectances associated with the boundaries between the cover glass **4**, the gap **9**, and the front polarizer **8** are especially pronounced.” (Ex. 1005, 1:30-32.) A POSITA would have recognized that the problem of reflectance at the boundaries may exist in Yare’s system as well.

273. As one solution to this problem, Larson states that “the rear surface of the cover glass **4** may include an antireflection coating, film, sheet, or any other form of antireflection material,” and that such a material can “reduce reflections at the boundary between the cover glass **4** and . . . the front gap **9**.” (*Id.*, 2:50-56.) As another solution, Larson discloses an embodiment in which “the display includes [an] auxiliary polarizer **20** between the front gap **9** and the cover glass **4**.” (*Id.*, 3:13-15, FIG. 2; *see also id.* 2:33-39.) Larson also states the “auxiliary polarizer **20** is an absorbing polarizer,” that “is preferably aligned in the same direction as the front polarizer **8**” so as to “minimize[] the attenuation of light coming from the backlight **18**.” (*Id.*, 3:19-24.)

274. Larson further states: “[r]eflected light, however, initially passes through the cover glass and is polarized by the auxiliary polarizer **20**” and that “[b]y removing one of the polarizations before it reaches the gap **9**, the reflections from each of the interfaces between the auxiliary polarizer **20** and front polarizer **8** are reduced by around 50%.” (*Id.*, 3:25-30.) Moreover, per Larson “[t]his allows

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for reduced overall reflections, or can be used to reduce the reflectance requirements for any antireflection coatings which may be applied to the front and auxiliary polarizers **8, 20.**” (*Id.*, 3:30-34.)

275. Thus, in light of Larson, a POSITA would have recognized that Yare’s display may also have a high reflectance problem at the boundary between the front surface of the cabinet **10** and the gap through which air flow can occur, i.e., the air gap similar to Larson’s gap **9**. A POSITA would have further understood that this problem can be minimized by providing an anti-reflective coating on the rear surface of the front surface of the cabinet **10** and/or by providing an polarizer between the air gap and the front surface of the cabinet **10**, where such a polarizer may be disposed on the rear surface of the front surface of cabinet **10**.

276. Alternatively, a POSITA would have recognized that Larson’s cover glass **5**, having an auxiliary polarizer **20** can be incorporated into the front portion of Yare’s cabinet **10**, and that Yare’s display **20** can be a conventional LCD that Larson discloses.

277. A POSITA would have recognized at least three predictable benefits of these modifications obtained by combining Yare and Larson. In fact, Larson describes two of these benefits. First, the reflectance at the gap can be minimized

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by the anti-reflective coating and the absorbing polarizer that may absorb a portion of the reflected light. (*Id.*, 3:25-34.) Second, the use of the polarizer can reduce the reflectance requirements of the anti-reflective coating, film, or sheet. (*Id.*) Third, a POSITA would have also recognized that an absorbing polarizer can absorb at least some polarizations of the ambient light, such as sunlight, which can help improve the contrast and reduce the heating of the display caused by the sunlight.

278. Moreover, to a POSITA, the combination of Yare and Larson would have been nothing more than combining known prior art elements according to known methods (providing anti-reflective coating and/or a polarizer on a transparent surface) to obtain the predictable results described above. A POSITA would have also understood this combination to be the use of known techniques (using anti-reflective materials and/or polarizers) to improve a similar apparatus (Yare's display system) in the same way as Larson describes, to yield predictable results described above. In the alternative, a POSITA would have found this combination of a simple replacement of one known element (the transparent front portion of Yare's cabinet) with another (Larson's glass cover 4 having the auxiliary polarizer **20**).

279. Additionally, a POSITA would have understood that these

predictable, beneficial results can be obtained without requiring substantial changes or modifications to either Yare's or Larson's processes, and without adversely affecting the disclosed display systems. A POSITA would have also been able to apply known, conventional manufacturing techniques, such as adhesives. As such, a POSITA would have expected the combination of Yare and Larson to succeed. For these reasons, it would have been obvious to one of ordinary skill in the art to combine Yare and Larson.

2. Independent Claim 1

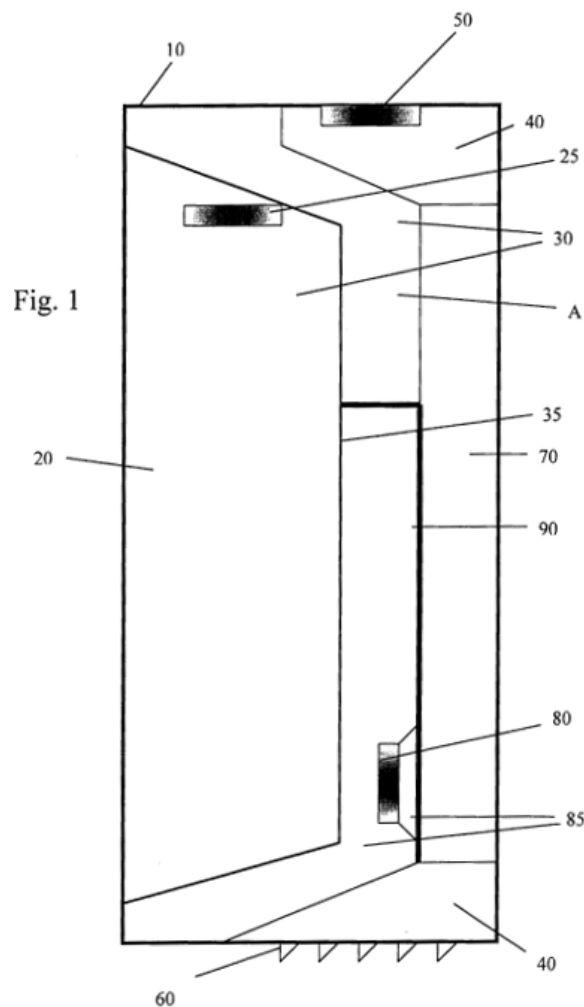
280. It is my opinion that Yare in view of Larson discloses each and every limitation of claim 1.

a. "A cooling system for an electronic image assembly, the cooling system comprising:" (Claim Element 1[pre])

281. 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). Larson discloses a **conventional** LCD display as a stack of layers, i.e., "**an electronic image assembly.**"

282. 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. 1006, 4:4-6, FIGs. 1 & 4.)

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(*Id.*, FIG. 1 (fans **50, 80** and zones **30, 40** form a cooling system).)

283. 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.*, 1:4-6.) 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.” (*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. 1005, 1:22-27 (disclosing conventional LCD having such components), FIG. 1.) Therefore, a POSITA would have understood Yare’s display **20**, that can be an LCD, as “**an electronic image assembly.**”

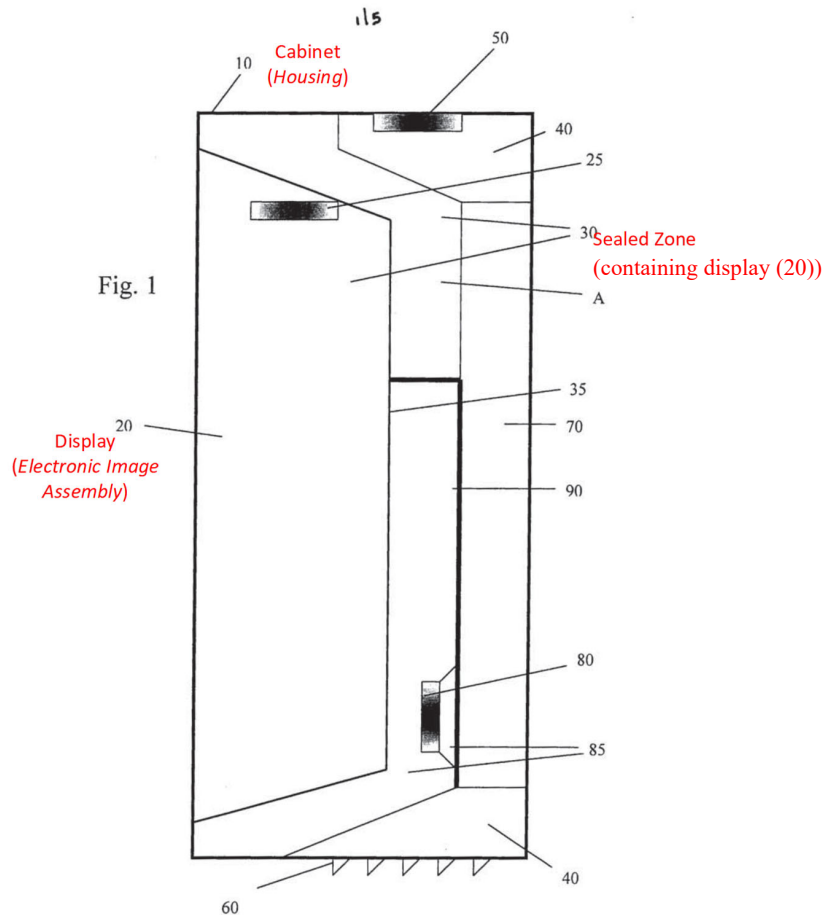
284. Thus, Yare discloses a cabinet **10** having improved cooling facilities, i.e., “[a] **cooling system**” for a display **20** such as an LCD display, i.e., “**an electronic image assembly.**” Accordingly, Yare teaches the preamble of claim 1.

b. “a housing for the electronic image assembly;” (Claim Element 1[a])

285. Yare discloses this claim element because Yare’s cabinet **10**, which contains a display **20**, is “**a housing for the electronic image assembly.**”

286. Yare states: “[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. 1006, 1:4-6.) Yare also 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.**” (*Id.*, 4:4-6, FIG. 1.)

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

287. Thus, Yare discloses this claim element.

- c. “a cover panel forming a forward portion of the housing, wherein the cover panel is located forward of, and at least some distance from, the electronic image assembly and is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;” (Claim Element 1[b])**

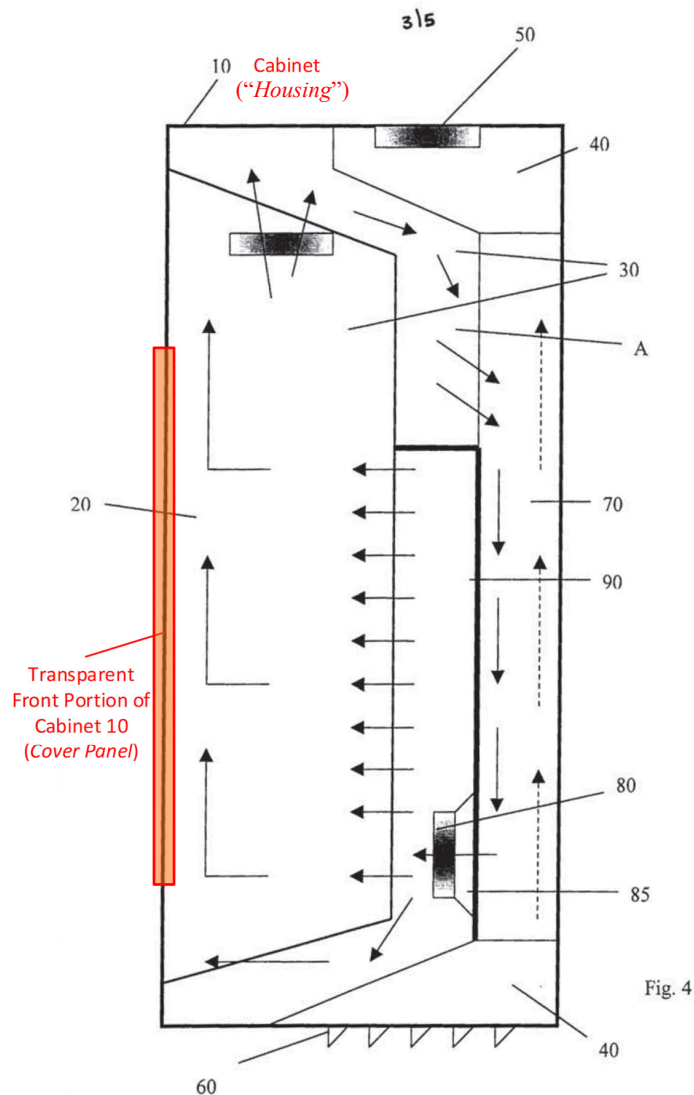
288. Yare individually and in combination with Larson discloses this claim element.

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289. First, a POSITA would have understood that at least a portion of the front part of Yare’s cabinet **10** would be transparent, to allow viewers to view contents displayed on the display **20**. *See* (Ex. 1006, 4:4-5 (“[a] cabinet **10** is arranged to **contain a display 20** for displaying information, advertisements or other visual media), 1:4-6 (disclosing that the “cabinet for mounting a display system . . . is particularly suitable for use in providing large scale displays in public places”), FIGs. 1 & 4.) A person of skill in the art would have understood that the LCD (or other display) included within cabinet **10** could not be viewed unless the at least the portion of the cabinet in the front of the display itself was transparent and, most likely, some type of glass.

290. The transparent front portion at the front of the cabinet **10**, shown in annotated Figure 4 below, is “**a cover panel forming a forward portion of the**” cabinet **10**, i.e., the “**housing.**”

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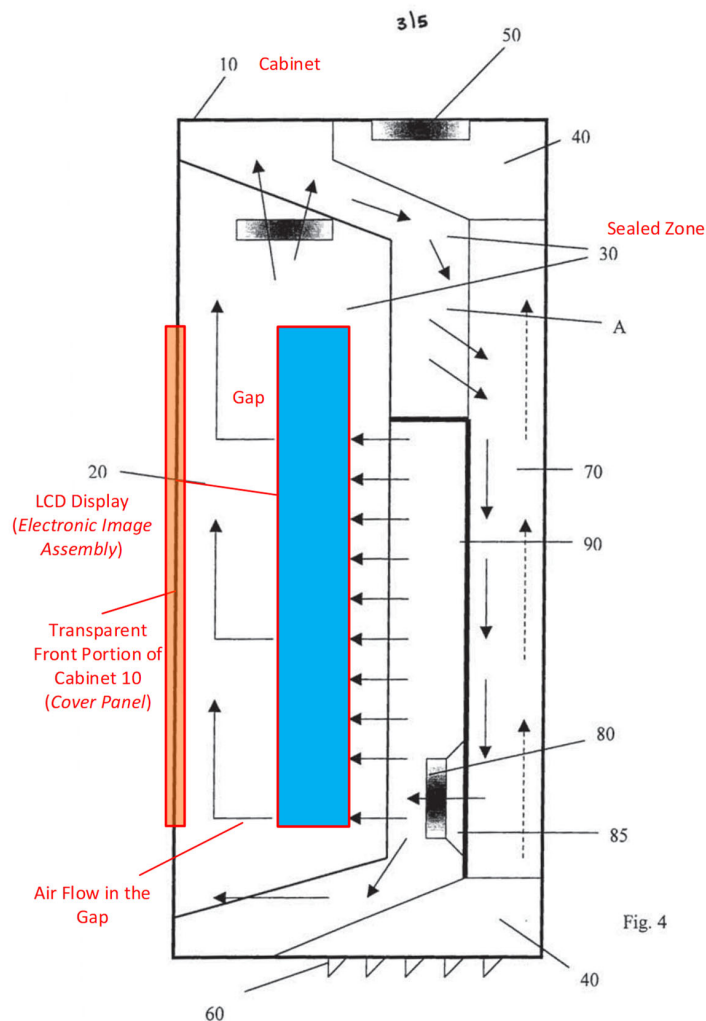
(*Id.*, FIG. 4 (annotated).)

291. In Yare’s system, the display cabinet **10** includes a sealed zone **30**, and the display **20** is located within the sealed zone **30**. (*Id.*, 4:4-6 (stating that the “cabinet **10** is arranged to contain a display **20**” “sealed within the cabinet **in a sealed zone 30**”).) Yare also states:

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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.)



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

292. The “L”-shaped arrows in Figure 4 show that a part of the air flow within the sealed zone **30** occurs in front of the display **20**. Therefore, the transparent portion of the display cabinet **10** is not in contact with, but is spaced apart from the display **20**, which would allow an airflow in the front of the display **20**, as seen in Yare’s annotated Figure 4 above. Yare further states that “[t]he above-described embodiment significantly reduces the possibility of operational failure by removal of ingress of dirt and the like from the display system **20**” acknowledging the issue of display contamination caused by dirty air as in unsealed systems. (*Id.*, 7:4-5)

293. From a design perspective this is where a POSITA would understand Yare’s display screen is separated from the transparent surface to allow the air to flow past the screen, which is a heat source. 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 but not so far as to reduce the side-to-side viewability of the information display. As such, it would have been obvious to do so since the such a placement would yield predictable results.

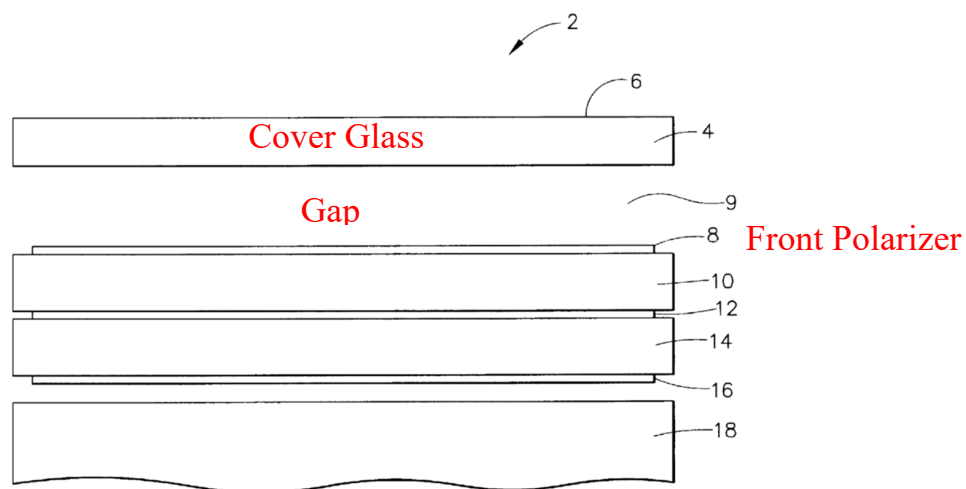
294. Therefore, the transparent front portion of the display **10** (the “**cover panel forming a forward portion of the housing**”), “**is located forward of, and at least some distance from,**” the display **20**, i.e., “**the electronic image**

assembly and is configured to permit viewing of images displayed at the electronic image assembly through said cover panel.”

295. To the extent Yare does not explicitly depict a cover panel “located forward of, and at least some distance from” the display **20**, Larson discloses such a configuration. Larson states:

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**. The cover glass **4** is separated from the front polarizer **8** by a **gap 9**, typically **filled with air**.

(Ex. 1005, 1:22-28, FIG. 1.)



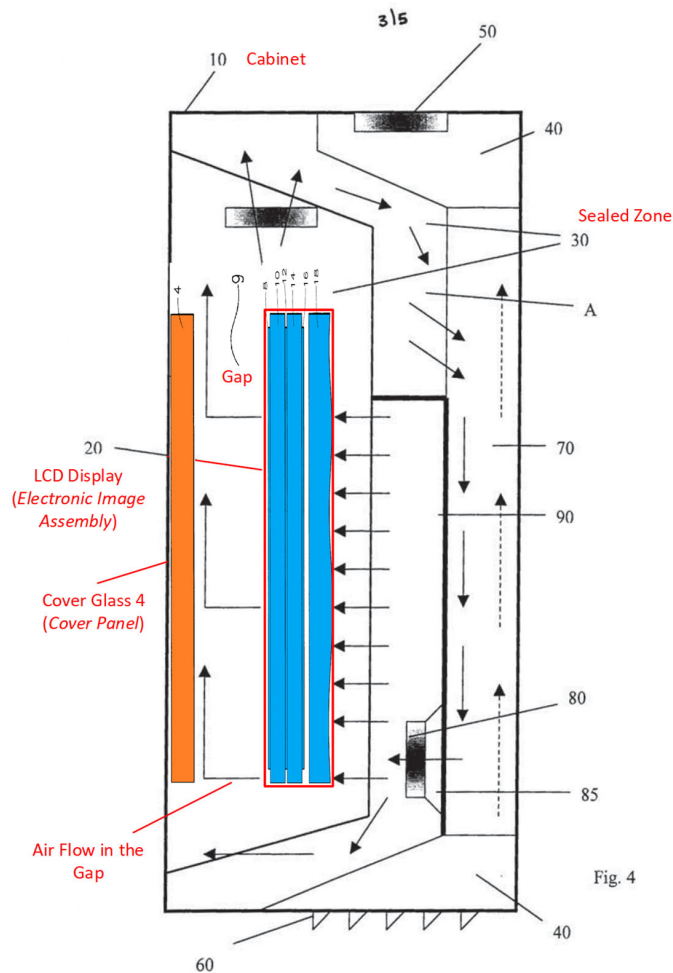
(*Id.*, FIG. 1.)

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296. Larsen also states that “the cover glass 4 suitably comprises a conventional cover glass for use **in conjunction with** LCDs.” (*Id.*, 2:39-43.) Thus, the cover glass 4 is part of an overall “polarized display 2,” but is not a part of the LCD itself.

297. In light of Larson’s teachings, a POSITA would have understood that a front portion of Yare’s cabinet 10 can be glass, such as Larson’s cover glass 4, that is separated by a gap from Yare’s display 20, that can be a conventional LCD that Larson discloses. Such a configuration is shown below by combining Larson’s Figure 1 with Yare’s Figure 4, annotated.

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(Ex. 1006, FIG. 4 (modified according to Larson, FIG. 1).)

298. The figure above according to the Yare-Larson combination shows Larson's cover glass 4 (highlighted orange) integrated with a front portion of Yare's cabinet 10 (**"a cover panel forming a forward portion of the housing"**). The cover glass 4 is in front of and at a distance from Yare's display 20, e.g., Larson's conventional LCD (highlighted blue) (**"electronic display assembly"**). Thus, the Yare-Larson combination also shows that **"the cover panel is located**

forward of, and at least some distance from, the electronic image assembly and is configured to permit viewing of images displayed at the electronic image assembly through said cover panel.”

299. Thus, Yare alone, and also in combination with Larson, teaches this claim element.

- d. “a closed loop airflow pathway passing through the housing, wherein said closed loop airflow passes around said electronic image assembly and is configured to accommodate circulating gas, and wherein at least a portion of said closed loop airflow pathway extends between said electronic image assembly and said cover panel;” (Claim Element 1[c])**

300. Yare discloses this claim element because Yare’s cabinet **10** includes a sealed zone **30** through which air is circulated around the display **20**, without contamination from atmospheric air, dust, etc.

301. 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**.

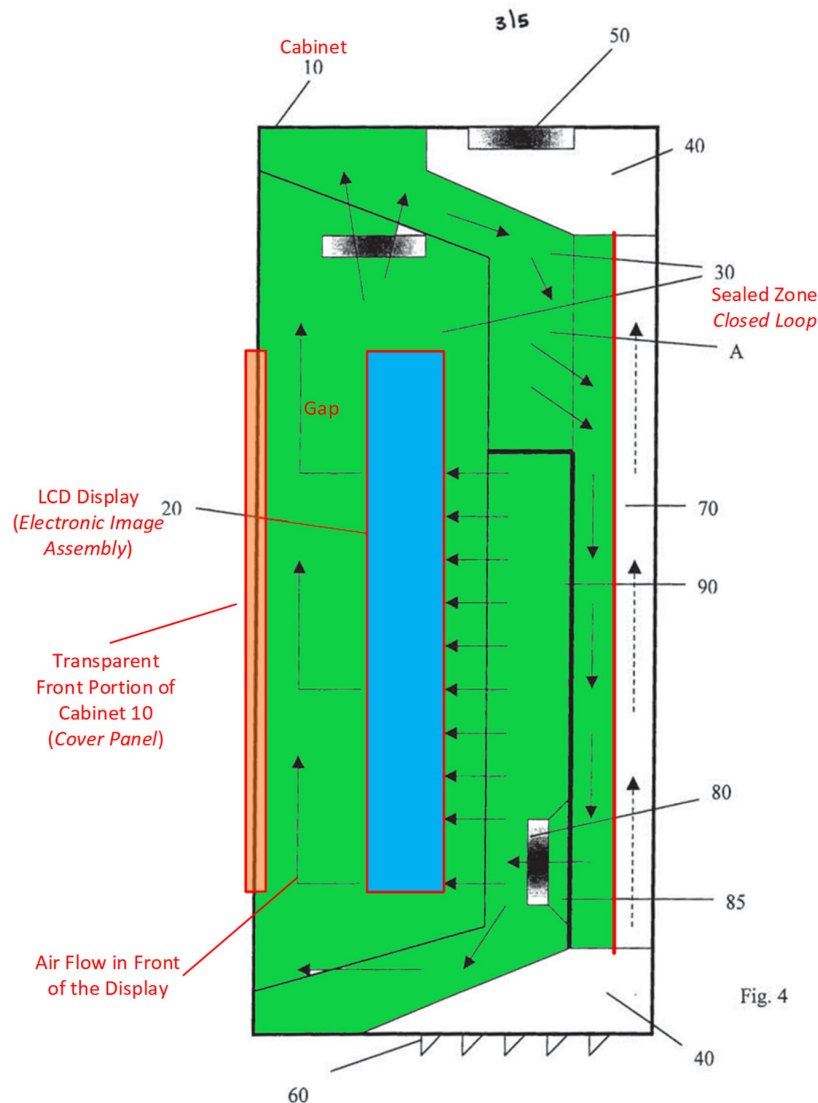
(Ex. 1006, 4:4-9, Figures 1 and 4.) Yare also discloses that “[w]ithin the sealed compartment at least one fan **25** circulates air through a rear portion **35**, behind a

baffle plate 90 and also across the heat exchanger 70.” (Ex. 1006, Abstract.)

302. 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, FIGs. 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.)

303. Yare also states that the “[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.)

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

304. In the annotated Figure 4 above, the transparent front portion of the cabinet **10** is highlighted orange, the display **20** is highlighted blue, and the sealed zone **30** is highlighted green. Because the sealed zone **30** is contained within the cabinet **10** (the “**housing**”), and because the sealed zone **30** and the ambient air

zone **40** are sealed from each other, the sealed zone **30** is a “gas pathway within a display housing containing gas that is essentially isolated from external air,” (*see* Ex. 1023 at 1) i.e., a **“closed loop airflow pathway passing through”** the cabinet **10 (“the housing”)**, that surrounds the display **20 (“passes around said electronic image assembly”)**. Air, which is a gas, circulates within the sealed zone **30**, and thus the sealed zone **30 “is configured to accommodate circulating gas.”**

305. Moreover, a portion of the airflow in the sealed zone **30** extends along a pathway between the front of the display **20 (“electronic image assembly”)** and the transparent front portion of the cabinet **10 (“cover panel”)**. To the extent Yare does not explicitly depict a cover panel at some distance from the display **20**, Larson discloses such a configuration, that can be included in Yare’s system, as discussed above for claim element 1[b]. (*See supra* § VI.C.2.c.)

306. Thus, Yare individually and also in combination with Larson teaches this claim element.

- e. **“an open loop airflow pathway for ambient air passing through said housing and behind said electronic image assembly;” (Claim Element 1[d])**

307. Yare discloses this claim element as atmospheric zone **40** within the display cabinet **10** as described below.

308. Yare states:

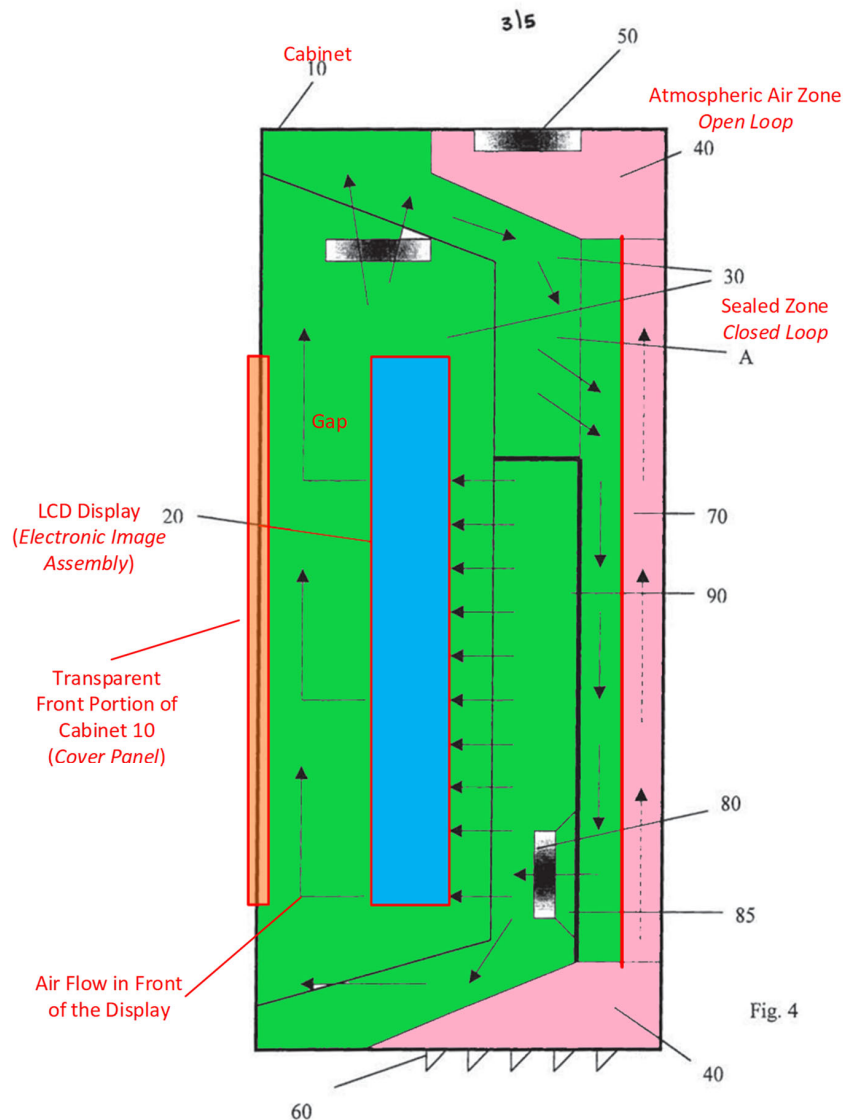
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The cabinet **10** also includes an **atmospheric air zone 40**. Air from the outside of the cabinet **10** is drawn through vents **60** into the atmospheric air zone **40** by fans **50**. The fans **50** draw the air up through the atmospheric air 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. 1006, 4:11-16, FIGs. 1-4.)

309. Yare's atmospheric air zone **40** is an "open loop" because air from the atmosphere is drawn in inside the atmospheric air zone **40**, passes therethrough, and is exhausted, i.e., looped back, to the atmosphere. (*Id.*). This is consistent with the '142 patent. (*See* Ex. 1001, 4:4-17, FIG. 1 (disclosing that ambient gas/air "is ingested into" and "expelled out of the display housing").) Thus, the atmospheric air zone **40** is "**an open loop airflow pathway for ambient air passing through**" the cabinet **10**, i.e., "**said housing.**" 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.)

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

310. In the annotated Figure 4 above, the transparent front portion of the cabinet **10** is highlighted orange, the display **20** is highlighted blue, the sealed zone **30** (the “**closed loop**”) is highlighted green, and the atmospheric air zone **40** (“**an open loop airflow pathway for ambient air passing through said housing**”) 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**”).

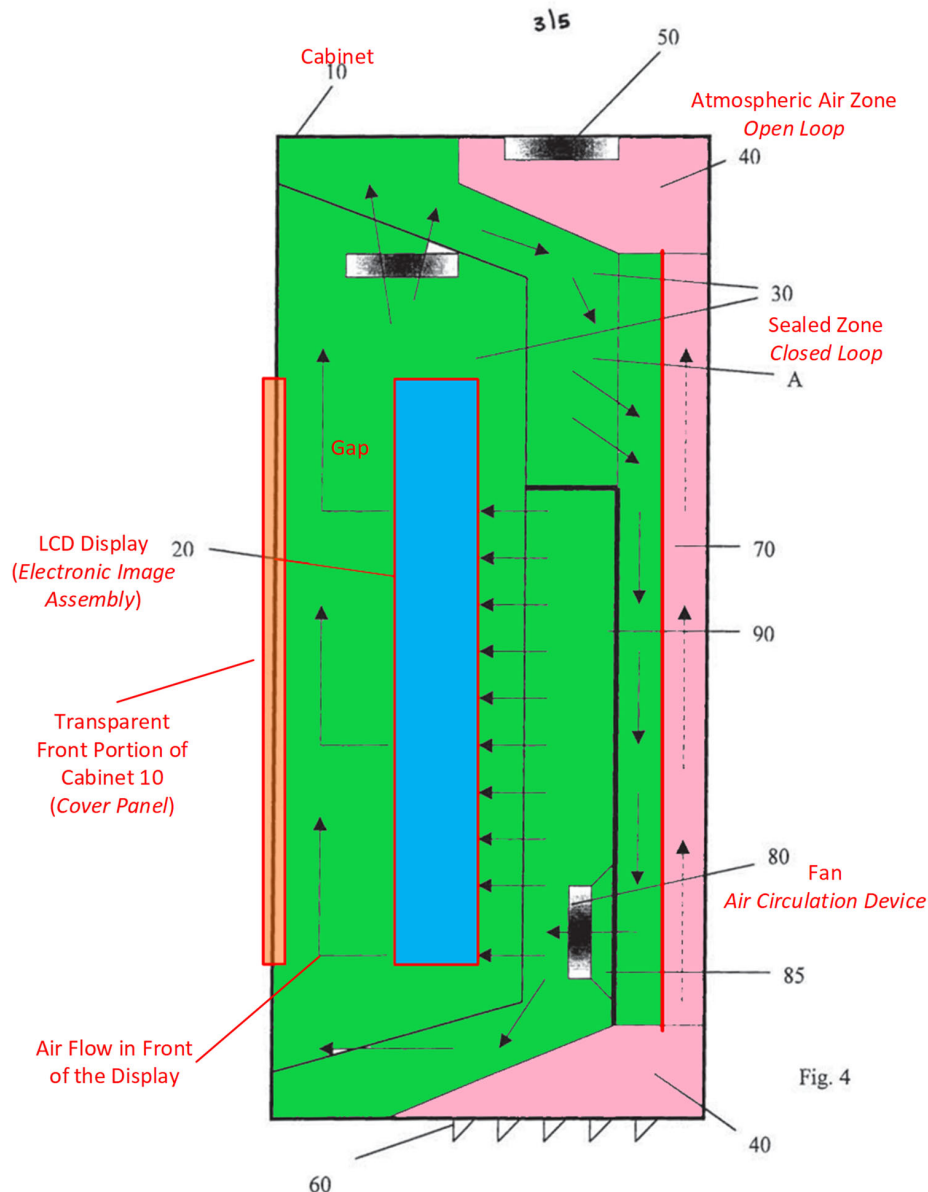
311. Thus, Yare teaches this claim element.

f. “**at least one air circulation device positioned to force the circulating gas through the closed loop airflow pathway when activated; and**” (Claim Element 1[e])

312. Yare discloses this claim element because Yare’s display cabinet **10** includes fans **80** and **25** within the sealed zone **30** (the “**closed loop airflow pathway**”).

313. 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**.” (*Id.*, 4:18-19, FIGs. 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.)

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

314. Because “[a]ir is circulated **within the sealed zone 30** due to **operation of the fans 80**” (*id.*, 5:1-2), fan 80 is “**at least one air circulation device positioned to force**” the air sealed within the sealed zone **30**, i.e., “**the**

circulating gas through the closed loop airflow pathway when activated.”

315. Thus, Yare teaches this claim element.

g. “at least one polarizer located at an inward facing surface of said cover panel and configured to prevent at least some sunlight striking said cover panel from traveling beyond said at least one polarizer.” (Claim Element 1[f])

316. Yare in combination with Larson teaches this claim element because, as discussed for this claim element under Ground 1, Larson discloses a polarizer disposed between a cover glass and an LCD display. (*See supra*, § VI.B.2.g.)

317. In general, Larson discloses an apparatus in which a “polarizer is disposed adjacent to a cover glass in front of [a] display.” Larson, Abstract. Specifically, Larson states: “[i]n display applications, it is difficult to maintain high contrast output at **high ambient illumination levels**. However, polarized light displays and active matrix liquid crystal display (AMLCD) flat panels work well in maintaining the contrast in their displays because [the ambient] light passes through several **absorbing layers** before reflecting or scattering back out from the light producing mechanism.” (*Id.*, 1:11-17.)

318. Referring to its Figure 1, Larson discloses a conventional polarized display **2** having a cover glass **4**, and various components of an LCD display, including a front polarizer **8** and a back polarizer **16**. (*Id.*, 1:22-27, FIG. 1.)

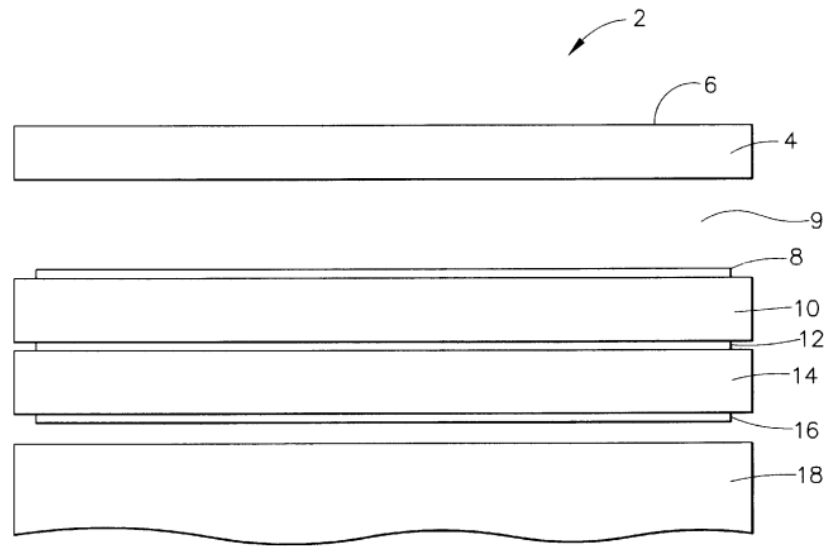


FIG. 1
(PRIOR ART)

(*Id.*, FIG. 1.)

319. The front polarizer **8** may absorb at least a portion of the ambient light, e.g., the sunlight striking the cover glass **4** (a “**cover panel**”). Larson further discloses an auxiliary polarizer:

Referring now to FIG. 2, a display **2** according to various aspects of the present invention comprises: a **cover glass 4**; a **front gap 9**; a front polarizer **8**; a first substrate **10**; a liquid crystal layer **12**; a second substrate **14**; a rear polarizer **16**; an **auxiliary polarizer 20**; and a backlight **18**. Each of the components of the **display 2** is suitably a **conventional LCD** component.

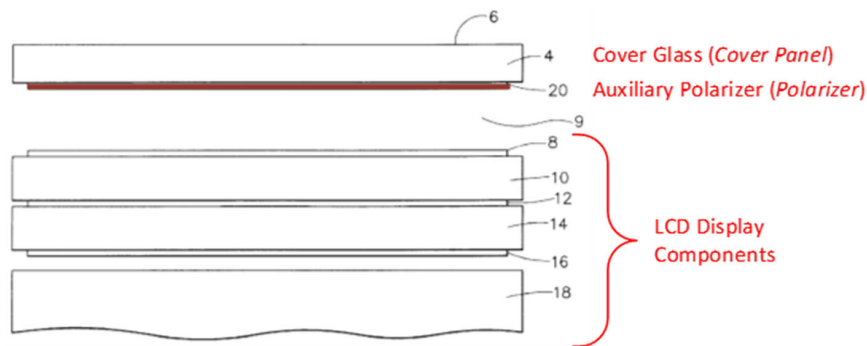
(*Id.*, 2:33-39, FIG. 2.)

320. Larson further states:

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In the present embodiment, the display includes the **auxiliary polarizer 20** between the front gap **9** and the cover glass **4**. The front gap **9** separates the auxiliary polarizer **20** from the front polarizer **8**. The **auxiliary polarizer 20** may be bonded to the cover glass **4** or otherwise retained in display **2**, and may be coated with an antireflective coating on one or both surfaces.

(*Id.*, 3:13-19, FIG. 2.)

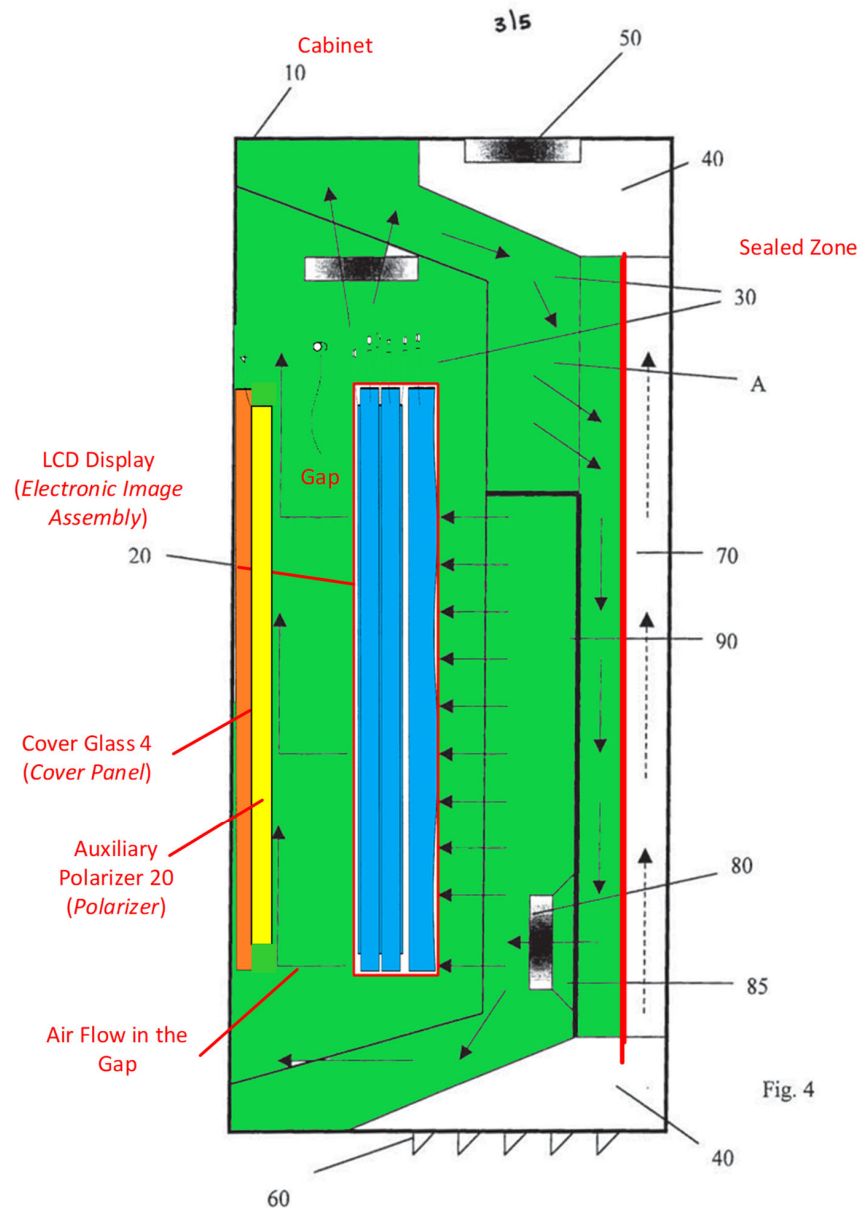


(*Id.*, FIG. 2 (annotated).)

321. Because the auxiliary polarizer may be bonded to the cover glass **4** (a “cover panel”), Larson discloses “**at least one polarizer located at an inward facing surface of said cover panel.**”

322. Yare’s system, modified to incorporate Larson’s polarized display, is shown below.

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(*Id.*, FIG. 4 (incorporating Larson's FIG. 2 and annotated).)

323. In the system depicted above, the auxiliary polarizer **20** (highlighted yellow) is located at the inward surface of the cover glass 4 (highlighted orange).

324. In addition, Larson states:

The **auxiliary polarizer 20 is an absorbing polarizer**, preferably of a **similar type as the front polarizer [8]**, and is preferably aligned in the same direction as the front polarizer **8**. Alignment of the polarizers **8, 20** in the same direction minimizes the attenuation of light coming from the backlight **18**. This allows maximum transmission of the light [from the LCD panel] with little to no attenuation of the light.

Reflected light, however, initially passes through the cover glass and is polarized by the auxiliary polarizer **20**. By removing one of the polarizations before it reaches the gap **9**, the reflections from each of the interfaces between the auxiliary polarizer **20** and front polarizer **8** are reduced by around 50%.

(Ex. 1005, 3:19-30, with clarifying addition)

325. Because the auxiliary polarizer **20** is an “absorbing polarizer” “of a similar type as the front polarizer **8**,” in addition to reducing reflections, the auxiliary polarizer may also absorb at least some of the ambient light, e.g., the sunlight striking the cover glass **4** (a “**cover panel**”). Accordingly, the auxiliary polarizer **20** may “**prevent at least some sunlight striking said cover panel from traveling beyond said at least one polarizer.**” As such, Yare in combination with Larson, teaches this claim element.

326. In summary, Yare in view of Larson discloses each and every element of claim 1 and renders obvious claim 1.

**3. Claim 2: “The cooling system of claim 1 further comprising:
at least one film having anti-reflection properties located at
said cover panel.”**

327. Larson teaches the limitation recited in this claim for the reasons
provided under Ground 1 for claim 2 (Ex. 1005, 3:13-19; *see supra* § VI.B.3.)

**4. Claim 3: Element 3[a]: “The cooling system of claim 1
further comprising: a heat exchanger located rearward of
the electronic image assembly,**

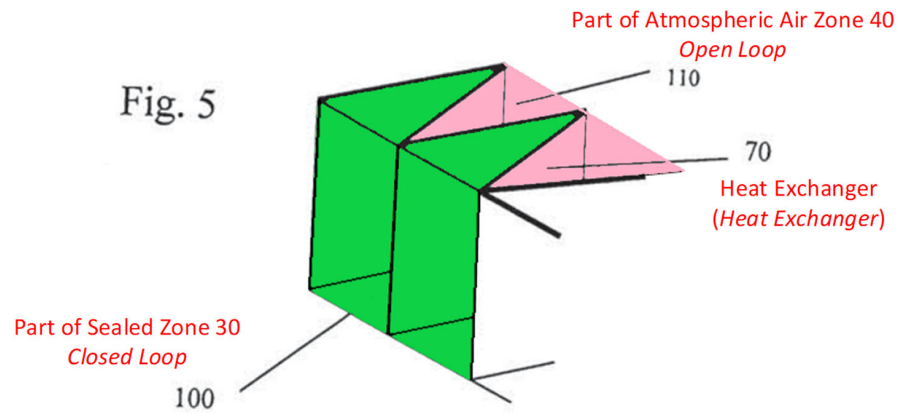
328. Yare discloses this claim element as heat exchanger **70**.

329. Yare states that “[t]he cabinet **10** includes a **heat exchanger 70**
mounted on a baffle plate 90.” (Ex. 1006, 4:18, FIGs. 1, 4, & 6.) Yare further
discloses:

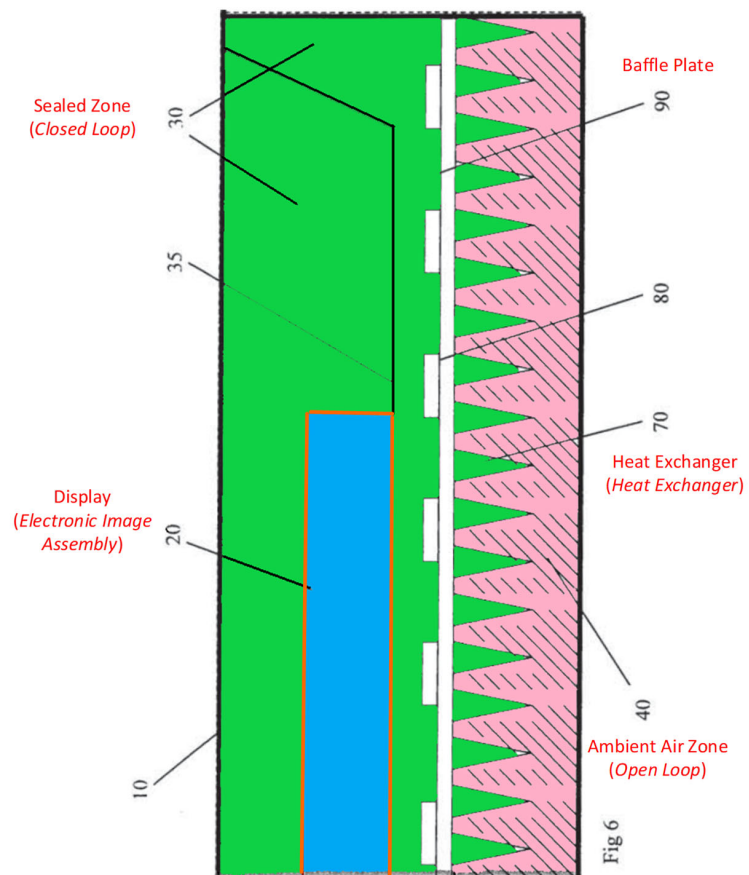
In the illustrated embodiment of the present invention, the **heat
exchanger 70** is formed from corrugated metal, thereby increasing the
surface area **in contact with both the atmospheric air zone 40 and
the sealed zone 30**. The heat exchanger is sealed at the top and the
bottom on the inner side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

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



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

330. It is seen in the annotated Figure 6 above, the corrugated heat exchanger **70** is located rearward of the display **20** (highlighted blue) (“**the electronic image assembly**”). Thus, Yare discloses this claim element.

5. Claim 3: Element 3[a][1]: “wherein a first portion of said heat exchanger forms part of said open loop airflow pathway, and”

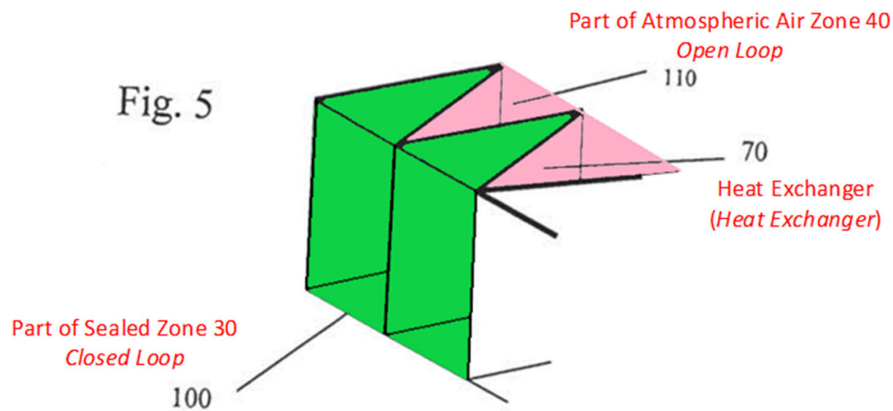
331. Yare discloses this claim element because the rear side of the heat exchanger **70** (“**a first portion of said heat exchanger**”) forms a part of the atmospheric air zone **40**, i.e., “**said open loop airflow pathway.**”

332. Yare states:

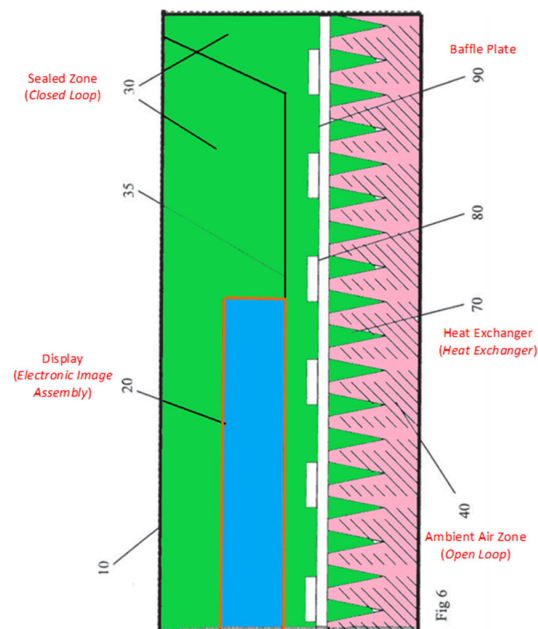
In the illustrated embodiment of the present invention, the **heat exchanger 70** is formed from corrugated metal, thereby increasing the surface area **in contact with both the atmospheric air zone 40 and the sealed zone 30**. The heat exchanger is sealed at the top and the bottom on the inner side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

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



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

333. Annotated Figures 5 and 6 show that the rear (right) side (“a **first portion**”) of the corrugated heat exchanger 70 (“**said heat exchanger**”) forms a part of the atmospheric air zone 40 (highlighted pink), i.e., “**said open loop**

airflow pathway.” Thus, Yare teaches this claim element.

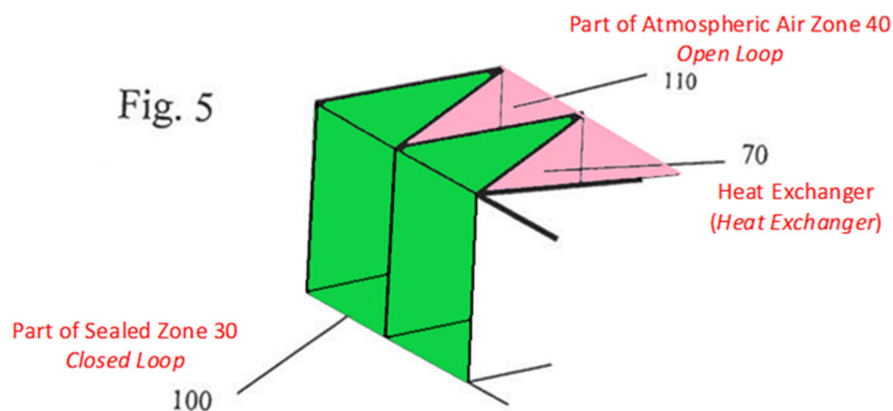
6. Claim 3: Element 3[a][2] “wherein a second portion of said heat exchanger forms part of said closed loop airflow pathway.”

334. Yare discloses this claim element as the front side of the heat exchanger **70** (“**a second portion of said heat exchanger**”) that forms a part of the sealed air zone **30**, i.e., “**said closed loop airflow pathway.**”

335. Yare states:

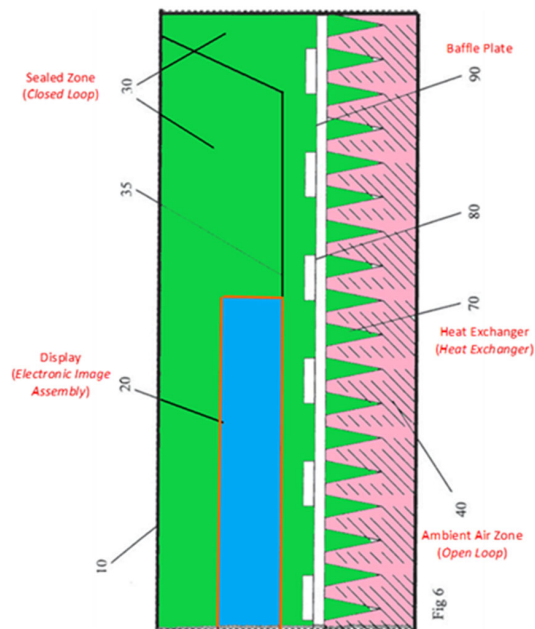
In the illustrated embodiment of the present invention, the **heat exchanger 70** is formed from corrugated metal, thereby increasing the surface area **in contact with both the atmospheric air zone 40 and the sealed zone 30**. The heat exchanger is sealed at the top and the bottom on the inner side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



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



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

336. As explained above, Yare teaches that the heat exchanger is preferably mounted to baffle plate 90. The baffle plate constricts, but does not fully block air flow and thereby causing the closed loop airflow to be in contact with the second portion of the heat exchanger.

337. Annotated Figures 5 and 6 show that the front (left) side (“**a second portion**”) of the corrugated heat exchanger 70 (“**said heat exchanger**”) forms a part of the sealed zone 30 (highlighted green), i.e., “**said closed loop airflow pathway**.” Thus, Yare teaches this claim element.

338. In summary, Yare in view of Larson discloses each and every element

of claim 3 and renders obvious claim 3.

7. **Claim 4: Element 4[a] “The cooling system of claim 3 further comprising: an inlet located at a first portion of said housing for ingesting said ambient air into said open loop airflow pathway; and”**

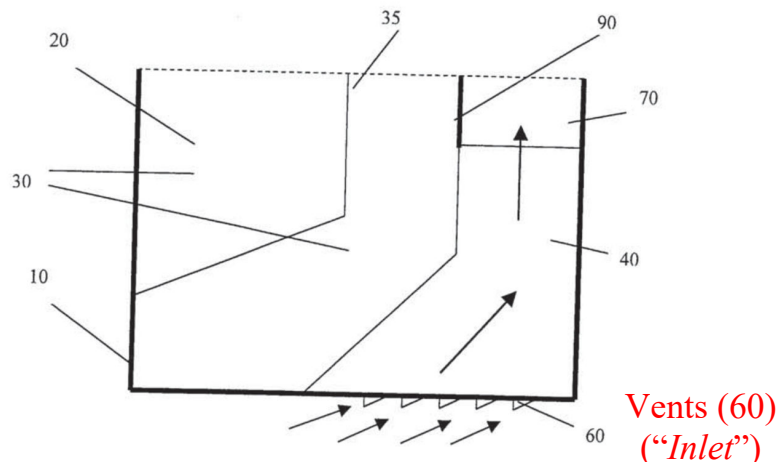
339. Yare teaches this claim element because Yare’s system includes vents **60** for drawing outside air into the atmospheric air zone **40** (“**open loop airflow pathway**”).

340. Yare states:

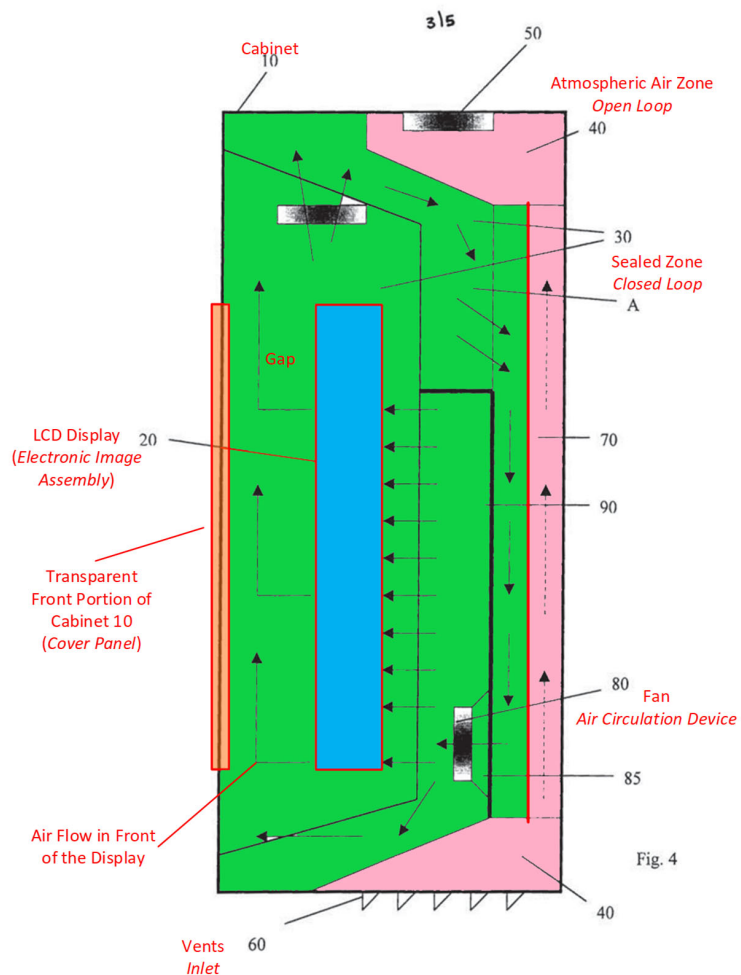
The **cabinet 10** also includes an **atmospheric air zone 40**. Air from **the outside** of the cabinet **10** is drawn through **vents 60 into the atmospheric air zone 40** by fans **50**. The fans **50** draw the air up through the atmospheric air zone **40**. The air is then expelled from the cabinet **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. 1006, 4:11-16, Figures 1-4.)

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(*Id.*, Figure 2.)



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

341. Vents **60** provide “**an inlet located at**” the bottom of the cabinet **10** (“**a first portion of said housing**”) “for ingesting” outside air (“**said ambient air**”) into the atmospheric air zone **40** (“**said open loop airflow pathway**”). Thus, Yare teaches this claim element. (Ex. 1006, 4:7-9)

8. Claim 4: Element 4[b] “an exhaust located at a second portion of said housing for exhausting said ambient air from said open loop airflow pathway.”

342. Yare teaches this claim element because Yare’s system includes fans **50** for expelling air from the atmospheric air zone **40** (“**open loop airflow pathway**”).

343. Yare states:

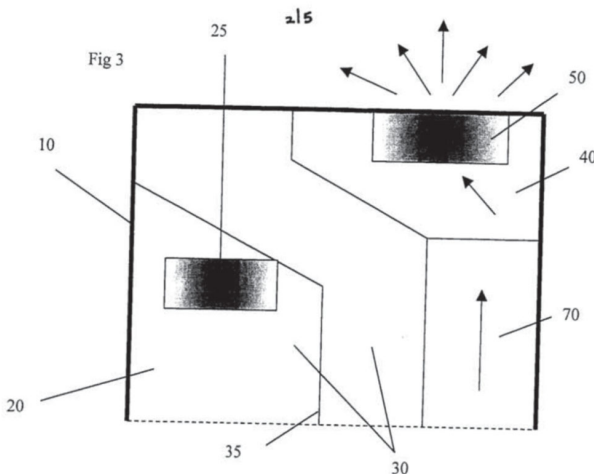
The **cabinet 10** also includes an **atmospheric air zone 40**. Air from the outside of the cabinet **10** is drawn through vents **60** into the atmospheric air zone **40** by fans **50**. The fans **50** draw the air up through the atmospheric air zone **40**. The **air is then expelled from the cabinet 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. 1006, 4:11-16, Figures 1-4.)

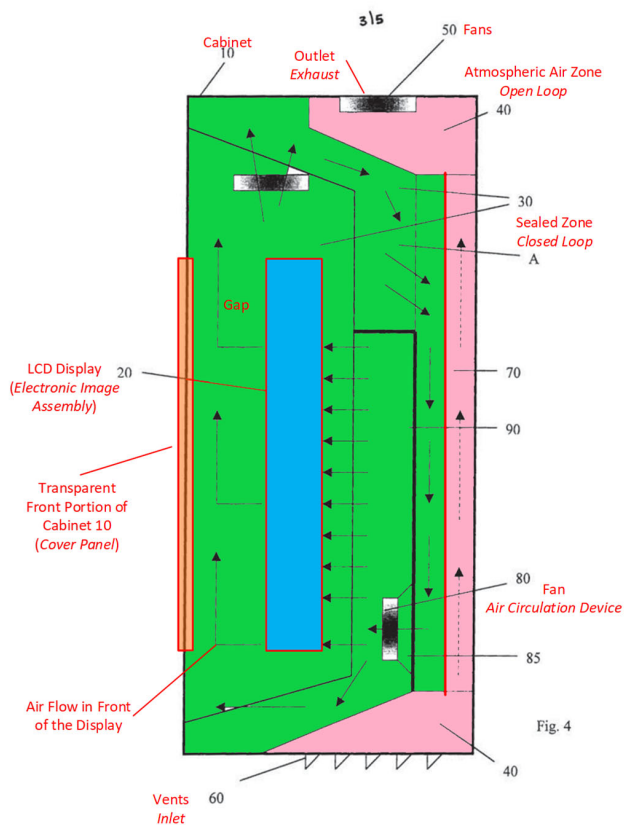
344. A POSITA, looking at Yare’s Figure 3, would have understood that for the fans **50** to expell air from the cabinet **10**, an outlet would be provided in the

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cabinet **10**, and would have recognized that outlet as an “**exhaust.**”



(*Id.*, Figure 3.)



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

345. The outlet (“**an exhaust**”) at the top of the cabinet **10** (“**a second portion of said housing**”) is provided for expelling air from the atmospheric air zone **40** (“**for exhausting said ambient air**”) from the atmospheric air zone **40** (“**said open loop airflow pathway**”). Thus, Yare teaches this claim element.

346. In summary, Yare in view of Larson discloses each and every element of claim 4 and renders obvious claim 4.

9. Claim 5: “The cooling system of claim 1 wherein: said at least one polarizer comprises a linear polarizer.”

347. Larson teaches the limitation recited in this claim for the reasons provided under Ground 1 for claim 5. (*See supra* § VI.B.9.)

10. Independent Claim 6

348. It is my opinion that Yare in view of Larson discloses each and every limitation of claim 6.

a. “A cooling system for an electronic image assembly, the cooling system comprising:” (Claim Element 6[pre])

b. “a housing for the electronic image assembly;” (Claim Element 6[a])

349. Claims elements 6[pre] and 6[a] are identical, respectively, to claim elements 1[pre] and 1[a]. Therefore, for the reasons provided for claim elements 1[pre] and 1[a], Yare individually and in combination with Larson teaches these

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claim elements. (*See supra* §§ VI.C.2.a-b.)

- c. “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;” (Claim Element 6[b])

350. This claim element recites substantially the same limitations that claim element 1[b] recites, as shown below.

a transparent cover panel forming a ~~forward~~front portion of the housing, ~~wherein~~ the transparent cover panel ~~is~~ located forward of, and at least some distance from, the electronic image assembly ~~and is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;~~

351. In the comparison above, and also in the comparisons below for other elements of claim 6, blue underlined words indicate additions in the element of claim 6 that is being discussed and red words having strike through markings are deletions from the corresponding element of claim 1. The black words are identical to both claim elements.

352. A cover panel “configured to permit viewing of images displays . . . through said panel” is “a transparent cover panel.” Therefore, a POSITA would have understood that at least a portion of the front surface of Yare’s cabinet **10** would be transparent (i.e., “**transparent cover panel**”), to allow viewing of the display **20**. Additionally, in the discussion for claim element 1[b], Larson’s “cover

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glass 4” is disclosed as the “**cover panel.**” Larson states that “the cover glass 4 can be made from glass, plastic or any other **fully** or partially **transparent material.**” (Ex. 1005, 2:43-46, FIGS. 1, 2.) Thus, Larson discloses a transparent cover panel. (*See supra*, § VI.C.2.c (claim element 1[b]).)

353. Therefore, for the reasons provided for claim element 1[b], Yare individually and in combination with Larson teaches this claim element.

d. “an open loop airflow pathway passing through the housing behind the electronic image assembly;” (Claim Element 6[c])

354. This claim element recites substantially the same limitations that claim element 1[d] recites, as shown below.

an open loop airflow pathway ~~for ambient air~~ passing through ~~said~~the housing ~~and~~ behind ~~said~~the electronic image assembly;

355. Therefore, for the reasons provided in Ground 2 for claim element 1[d], Yare teaches this claim element. (*See supra* § VI.C.2.e.)

e. “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;” (Claim Element 6[d])

356. This claim element recites substantially the same limitations that claim element 1[c] recites, as shown below.

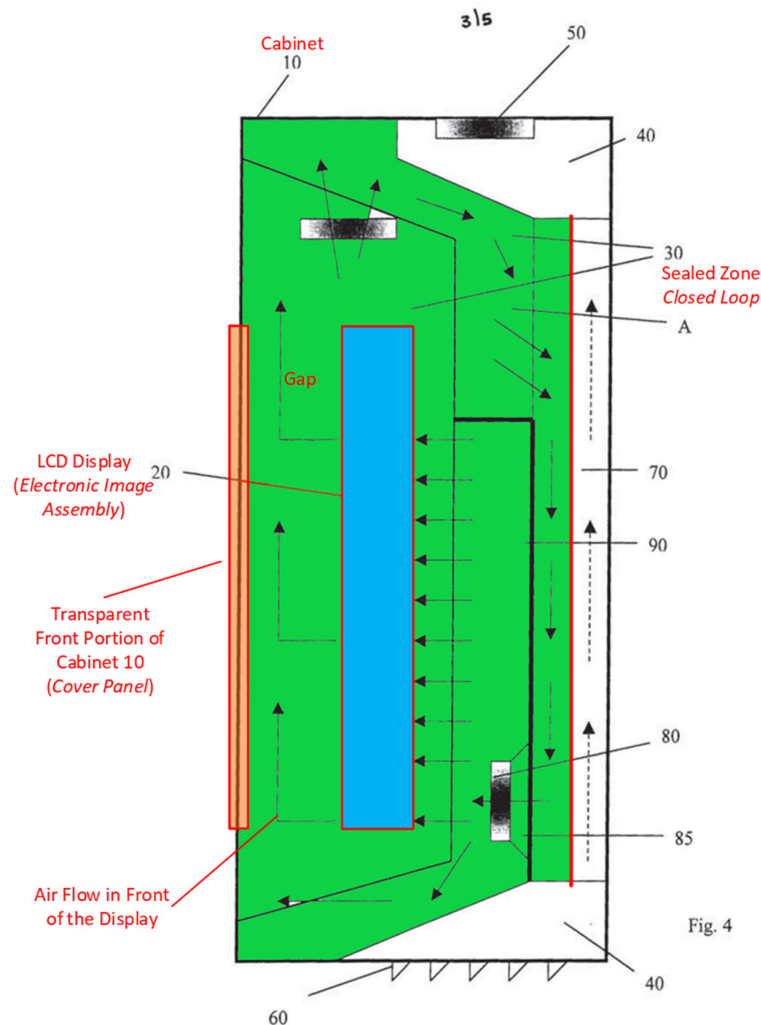
a closed loop ~~airflow~~gas circulation pathway ~~passing~~

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~~through~~contained within the housing, wherein ~~said closed loop~~
~~airflow passes around said electronic image assembly and is~~
~~configured to accommodate circulating gas, and wherein at least a~~
portion of said closed loop ~~airflow~~gas circulation pathway
~~extends~~passes between said transparent cover panel and said
electronic image assembly ~~and said cover panel~~;

357. Although claim element 1[c] recites “airflow” and claim element 6[d]
recites “gas circulation,” air is a gas, and flow of air in a closed loop is “gas
circulation.” Moreover, while element 1[c] recites a “pathway **passing through**
the housing,” claim element 6[d] recites “pathway **contained within** the housing.”
Yare’s sealed zone **30** (“**closed loop**”), however, is contained within the cabinet
 (“**housing**”), as shown below.

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(Ex. 1006, FIG. 4 (annotated).)

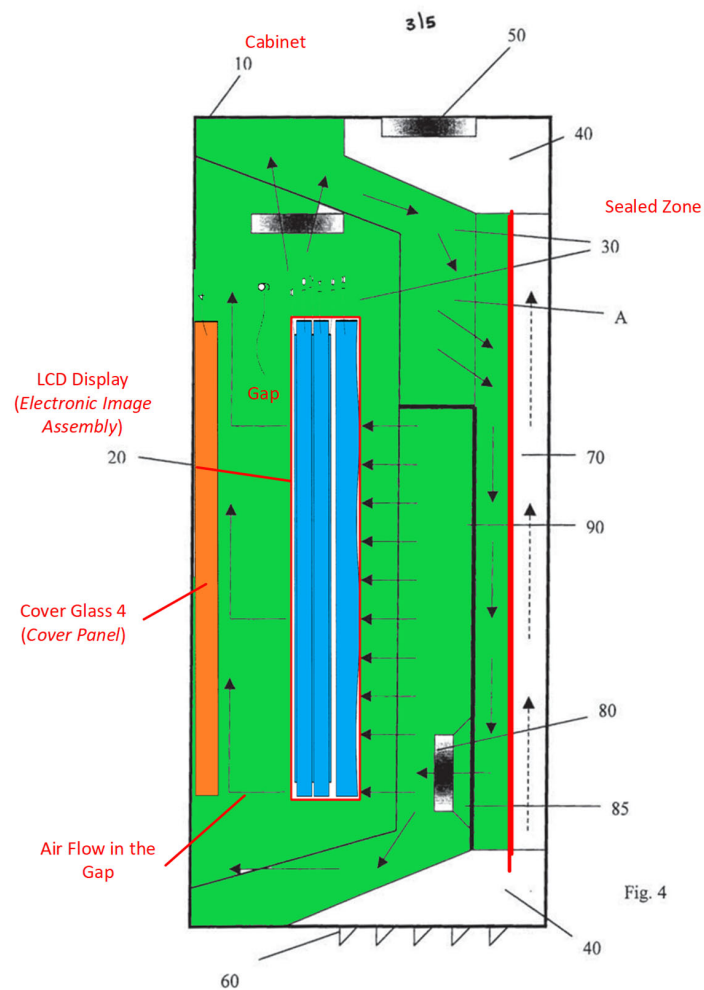
358. It was discussed for claim element 1[a] that the cabinet **10** is the “**housing**” for the display **20** (“**the electronic image assembly**”). In annotated Figure 4 above, it can be seen that the closed loop (highlighted green) is contained entirely within the cabinet **10** (“**housing**”).

359. Finally, annotated Figure 4 above also shows that “closed loop gas

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circulation pathway” (highlighted green) “**passes between**” the transparent front portion of the cabinet **10** (highlighted orange) (“**said transparent cover panel**”) and the display **20** (highlighted blue) (“**said electronic image assembly**”).

360. Additionally, Yare’s system incorporating Larson’s LCD display is shown below.



(Ex. 1006, Figure 4 (modified according to Larson, FIG. 1).)

361. In this configuration also the “closed loop gas circulation pathway” (highlighted green) “**passes between**” the cover glass **4** (highlighted orange) (“**said transparent cover panel**”) and the display **20** (highlighted blue) (“**said electronic image assembly**”).

362. Therefore, for the reasons provided for claim element 1[c], Yare individually and also in combination with Larson teaches this claim element. (*See supra* § VI.C.2.d.)

f. “an inlet located at a first portion of said housing for ingesting ambient air into said open loop airflow pathway;” (Claim Element 6[e])

363. This claim element recites substantially the same limitations that claim element 4[a] recites, as shown below.

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

364. Therefore, for the reasons provided for claim element 4[a], Yare teaches this claim element. (*See supra* § VI.C.7.)

g. “an exhaust located at a second portion of said housing for exhausting said ambient air from said open loop airflow pathway;” (Claim Element 6[f])

365. This claim element is identical to claim element 4[b]. Therefore, for the reasons provided for claim element 4[b], Yare teaches this claim element. (*See supra* § VI.C.8.)

- h. **“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;” (Claim Element 6[g])**

366. Yare discloses this claim element as fans **50** which force ambient air through the atmospheric air zone **40**.

367. As discussed above in connection with claim element 1[d], Yare’s atmospheric air zone **40** is **“an open loop airflow pathway for ambient air.”** Moreover, as discussed for claim 4, the bottom vents **60** are the **“inlet”** and outlets (formed coincident with fans **50**) for expelling air at the top of the cabinet **10** are the **“exhaust.”** Yare states:

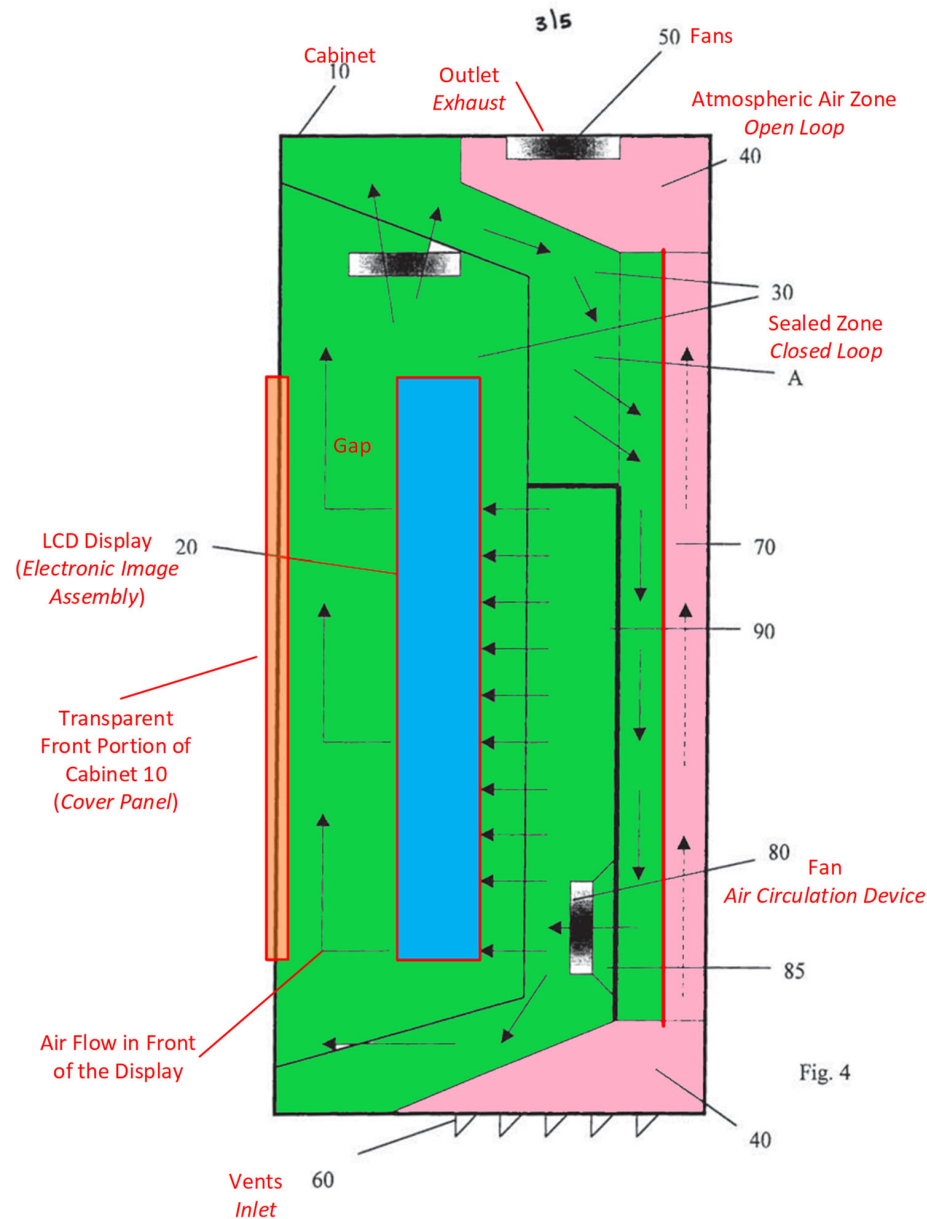
The cabinet **10** also includes an atmospheric air zone **40**. **Air from the outside of the cabinet 10 is drawn** through vents **60** into the atmospheric air zone **40** by fans **50**. **The fans 50 draw the air up** through the atmospheric air zone **40**. **The air is then expelled from the cabinet 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. 1006, 4:11-16, FIGs. 1-4.)

368. Accordingly, a fan **50** is **“an air circulation device.”** Annotated Figure 4 below shows that fans **40** are located within the atmospheric air zone **40**,

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and between the bottom vents **60** and top outlet.



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

369. Thus, Yare discloses a fan **50** as “an air circulation device
positioned” within the atmospheric air zone **40**, i.e., “along said open loop

airflow pathway” and between the bottom vents 60 and top outlet, i.e., “between said inlet and said exhaust.”

370. As noted above, Yare states that the fans 50 draw air through vents 60, “up through the atmospheric zone 40” and then expel the drawn air. (Ex. 1006, 4:11-16, Figures 1-4.) Therefore, the fans 50 **“said air circulation device is configured to force said ambient air through”** the atmospheric zone 50, i.e., **“the open loop airflow pathway when activated.”** Thus, Yare teaches this claim element.

- i. **“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;” (Claim Element 6[h])**

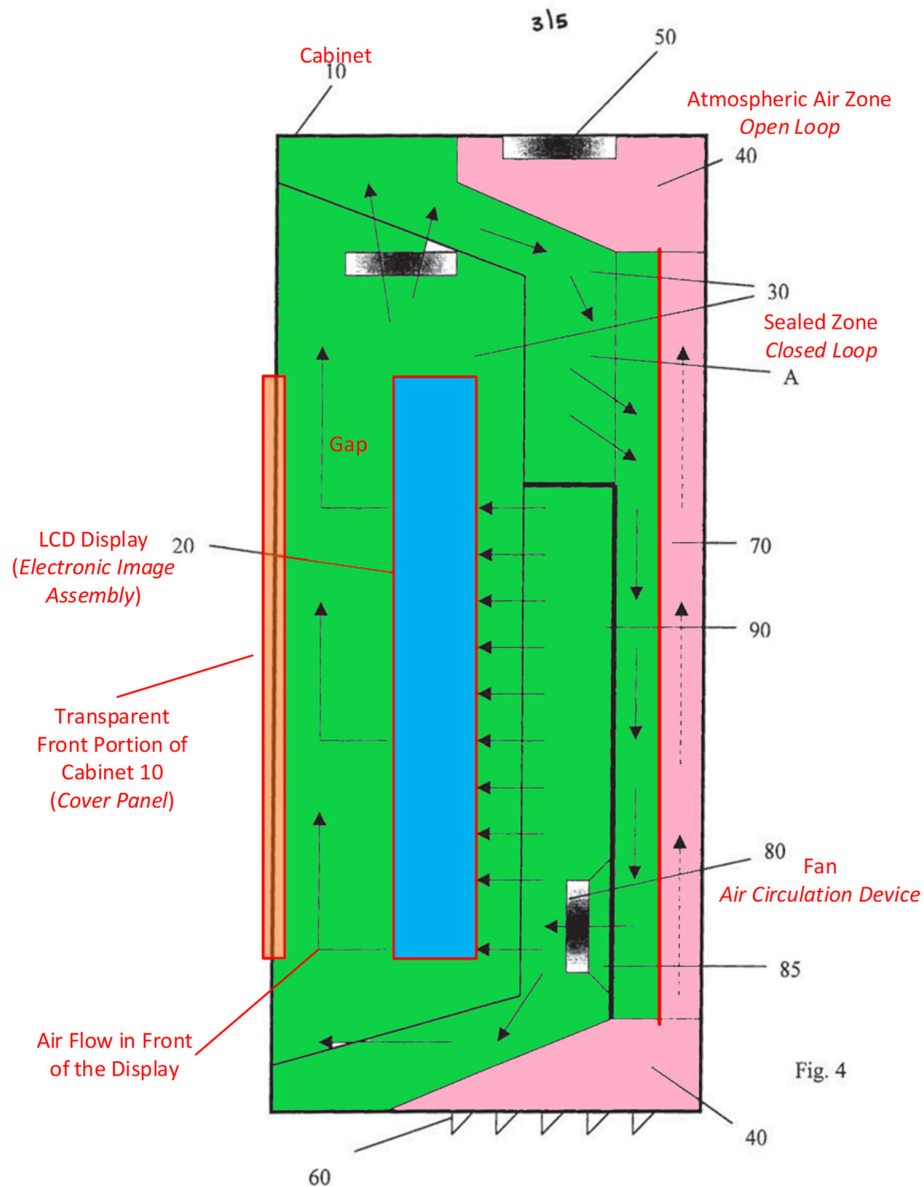
371. This claim element recites substantially the same limitations that claim element 1[e] recites, as shown below.

~~at least one air~~a gas circulation device positioned along said closed loop gas circulation pathway to force ~~the~~ circulating gas ~~through~~around the closed loop ~~airflow~~gas circulation pathway when activated;~~and~~

372. Although claim element 1[e] recites “air circulation” and claim element 6[h] recites “gas circulation,” air is a gas, and flow of air in a closed loop is “gas circulation.” Moreover, Figure 4 annotated below shows that Yare’s air or gas circulation device, fan 80, is positioned within the closed loop (highlighted

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green), and thus, it is “positioned along said closed loop.”



(Ex. 1006, Figure 4 (annotated).)

373. Finally, while claim element 1[e] recites “to force the circulating gas
through the closed loop,” claim element 6[h] recites “to force circulating gas

around the closed loop.” Air (i.e., gas) forced “through” a **closed** loop would circulate “around” the closed loop.

374. Therefore, for the reasons provided for claim element 1[e], Yare teaches this claim element. (*See supra* § VI.C.2.f.)

- j. “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” (Claim Element 6[i])**

375. This claim element recites substantially the same limitations that claim 3 recites, as shown below.

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 ~~airflow~~gas circulation pathway ~~;~~ and

376. Although claim 3 recites “airflow pathway” and claim element 6[i] recites “gas circulation pathway,” air is a gas, and hence, an airflow pathway is a “gas circulation pathway.” Therefore, for the reasons provided for claim 3, Yare teaches this claim element. (*See supra* §§ VI.C.4-6.)

- k. “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**

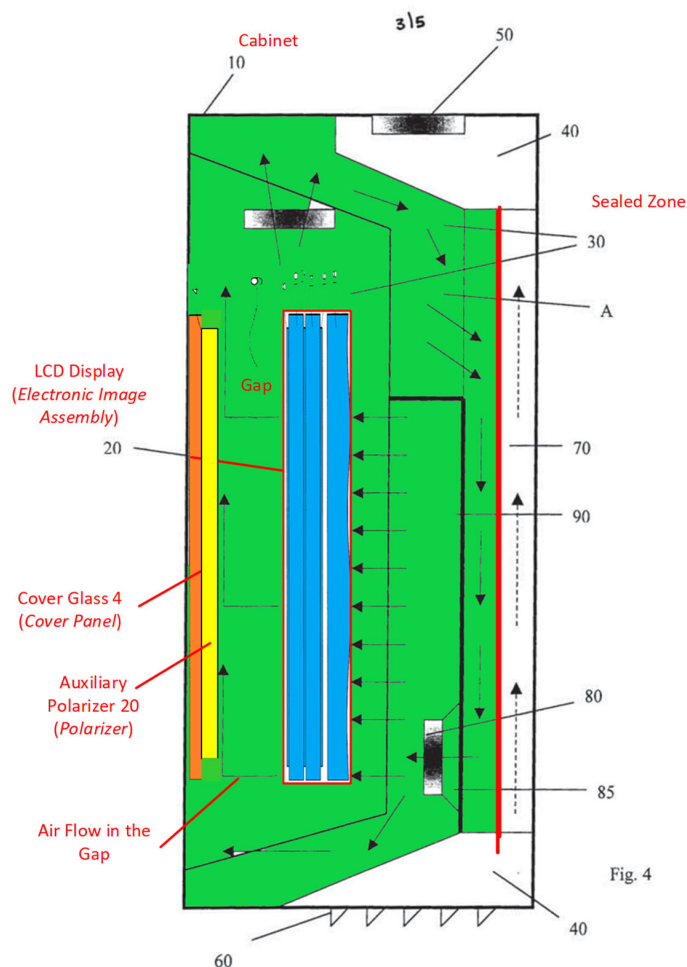
prevent a portion of solar energy entering said transparent cover panel from thermally interacting with the circulating gas at said portion of said closed loop gas circulation pathway passing between said transparent cover panel and said electronic image assembly or thermally interacting with said electronic image assembly.” (Claim Element 6[j])

377. Yare in combination with Larson teaches this claim element for the reasons provided for claim element 1[f].

378. First, while claim element 1[f] recites “at least one polarizer located at an inward facing surface of said cover panel,” claim element 6[j] recites “one or more solar energy reduction layers located at said transparent cover panel.” A polarizer is a “solar energy reduction layer.” For instance, claim 8, which depends from claim 6, recites “at least one of said one or more solar energy reduction layers comprise a polarizer.” Second, the front portion of Yare’s cabinet **10** allows viewing of the display **20**, and is therefore a “transparent cover panel.” In the alternative, Larson’s transparent glass cover **4** can form a front portion of Yare’s cabinet **10**, providing a “transparent cover panel.” (*See supra*, § VI.C.10.c (claim element 6[b]).) Third, because Larson’s auxiliary polarizer **20** is located “at an inward facing surface of said cover panel,” (*see supra*, § V.B.2.g (claim element 1[f])), that polarizer, i.e., a “solar energy reduction layer,” it is located “at said transparent cover panel.”

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379. As seen in annotated, Figure 4 below, from a viewer's point of view, Yare's portion of the cabinet, modified to incorporate Larson's cover glass 4 (highlighted orange) is located in the front. A portion of the closed loop (highlighted green) is provided after the front transparent portion, and the display 20 (highlighted blue) is located after the closed loop. The auxiliary polarizer 20 (highlighted yellow) is provided at the "inward facing surface of" the cover glass 4, and is thus located **before** the closed loop and the display 20.



(Ex. 1006, Figure 4 (incorporating Larson’s FIG. 2 and annotated).)

380. As discussed for claim element 1[f], Larson’s auxiliary polarizer **20** is “configured to **prevent** at least some sunlight striking said cover panel **from traveling beyond**” the polarizer **20**, thereby **prevent[ing]** a portion of the sunlight **from "thermally interacting with said electronic image assembly."** (*See supra*, § VI.C.2.g (claim element 1[f]).)

381. Moreover, Larson discloses that an “antireflection coating 6 may be added to one or **both sides** of the cover glass **4**.” (Ex. 1005, 1:34-36, FIG. 1.) The antireflection coating can also block some wavelengths, i.e., some incident solar energy from entering the cover glass **4** (“**said transparent cover panel**”) from reaching the gap **9**, i.e., the front portion of the closed loop in Yare’s system. Thus, the antireflection coating **6** can also prevent some portion of the incident solar energy from thermally interacting with the circulating gas in the front portion of Yare’s closed loop gas circulation pathway.

382. Therefore, Larson’s polarizer **20** and/or the antireflection layer **6** would prevent at least some sunlight striking the transparent cover glass **4** from reaching: (1) a portion of the closed loop located between the cover glass **4** and the display **20**, and (2) the display **20**. Therefore, the polarizer **20** “is configured to prevent a portion of solar energy entering said transparent cover panel from

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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.”

383. As such, the combination of Yare and Larson teaches this claim element, as discussed under Ground 2 for claim element 1[f].

384. In summary, Yare in view of Larson discloses each and every element of claim 6 and renders obvious claim 6.

11. Claim 7: Element 7[a]: “The cooling system of claim 6 wherein: said air circulation device comprises one or more fan assemblies; and”

385. Yare teaches this claim element. Specifically, the air circulation device that Yare discloses are fans **50**. (Ex. 1006, 4:11-14 (stating that “[a]ir from the outside of the cabinet 10 is drawn . . . by **fans 50**” which “draw the air up through the atmospheric air zone 40” and “then expell[]” it from the cabinet 10”), Figures 1-4.) Thus, Yare’s air circulation device includes “**one or more fan assemblies.**”

12. Claim 7: Element 7[b]: “said gas circulation device comprises one or more fan assemblies.”

386. Yare teaches this claim element. Specifically, the gas circulation device that Yare discloses are fans **80**. Yare 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**.” (Ex. 1006, 5:1-2.) Thus, Yare’s gas circulation device includes “**one or more fan assemblies**.” Therefore, Yare teaches each element of this claim.

13. Claim 8: “The cooling system of claim 6 wherein: at least one of said one or more solar energy reduction layers comprise a polarizer.”

387. Larson teaches this claim element. As discussed for claim element 6[j], the “solar energy layer” that Larson discloses is the “auxiliary polarizer **20**.” (Ex. 1005, 2:33-39 (stating that “a display **2**” “comprises: a cover glass **4**; a front gap **9**; [and] **an auxiliary polarizer 20**”); *supra* § VI.C.10.k.)

14. Claim 9: “The cooling system of claim 8 wherein: said polarizer comprises a linear polarizer.”

388. Larson teaches the limitation recited in this claim. Claim 9 is identical in substance to claim 5, which recites “said at least one polarizer **comprises a linear polarizer**.” Therefore, for the reasons provided for claim 5, Larson teaches this claim. (*See supra* § VI.C.9.)

15. Claim 10: “The cooling system of claim 6 wherein: at least one of said one or more solar energy reduction layers comprise a film having anti-reflection properties.”

389. Larson teaches this claim element. It was discussed for claim element 6[j] that a “solar energy reduction layer[]” is Larson’s auxiliary polarizer **20**.

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Larson further states that “the auxiliary polarizer **20** may [] include **antireflective material**,” and that “any or all of the polarizers may be coated, plated, or otherwise integrated with or adjacent to an antireflection material. (Ex. 1005, 4:9-13, FIG. 2; *supra* § VI.C.10.k.) In addition, Larson discloses that an “antireflection coating 6 may be added to one or **both sides** of the cover glass 4.” (Ex. 1005, 1:34-36, FIG. 1.) Thus, Larson teaches this claim.

16. Claim 11: Element 11[a]: “The cooling system of claim 6 wherein: at least a first one of said one or more solar energy reduction layers comprise a polarizer; and”

390. This claim element is identical, in substance, to claim 8. The only difference is that claim 8 recites “at least one of” and claim 11 recites “at least [a first](#) one of.” Therefore, for the reasons provided for claim 8, Larson teaches this claim element. (*See supra* § VI.C.13.)

17. Claim 11: Element 11[b]: “at least a second one of said one or more solar energy reduction layers comprise a film having anti-reflection properties.”

391. This claim element is identical, in substance, to claim 10. The only difference is that claim 8 recites “at least one of” and claim 11 recites “at least [a second](#) one of.” Larson teaches a second solar energy reduction layer in the form of an anti-reflection film added to the auxiliary polarizer **20**. (Ex. 1005, 4:9-11) Therefore, for the reasons provided for claim 10, Larson teaches this claim

element. (*See supra* § VI.C.15.)

18. Independent Claim 12

392. It is my opinion that Yare in view of Larson discloses each and every limitation of claim 12.

a. “A method for cooling an electronic image assembly, said method comprising the steps of:” (Claim Element 12[pre])

393. It is discussed under Ground 1 that the preamble of claim 12 corresponds to the preamble of claim 1.

394. Therefore, to the extent the preamble of claim 12 is limiting, Yare individually and in combination with Larson teaches this preamble for the reasons provided under Ground 2 for the preamble of claim 1. (*See supra* § VI.C.2.a.)

b. “placing said the electronic image assembly within a housing;” (Claim Element 12[a])

395. It is discussed under Ground 1 that claim element 12[a] corresponds to claim element 1[a]. Therefore, Yare individually and in combination with Larson teaches this claim element for the reasons provided under Ground 2 for claim element 1[a]. (*See supra* § VI.C.2.b.)

c. “forcing circulating air through a closed loop airflow pathway within said housing, wherein at least a portion of said closed loop airflow pathway extends between an electronic image assembly and a cover panel forming a front portion of said housing and spaced apart from said electronic image assembly,

wherein said cover panel is configured to permit viewing of images displayed at the electronic image assembly through said cover panel;” (Claim Element 12[b])

396. It is discussed under Ground 1 that claim element 12[b] corresponds to claim elements 1[b], 1[c], and 1[e]. Therefore, Yare individually and in combination with Larson teaches this claim element for the reasons provided under Ground 2 for claim elements 1[b], 1[c], and 1[e]. (*See supra* §§ VI.C.2.c, VI.C.2.d, VI.C.2.f.)

d. “forcing ambient air through a second airflow pathway within said housing, wherein said second airflow pathway extends behind said electronic image assembly; and” (Claim Element 12[c])

397. It is discussed under Ground 1 that claim element 12[c] corresponds to claim elements 1[d] and 6[g]. Therefore, Yare individually and in combination with Larson teaches this claim element for the reasons provided under Ground 2 for claim elements 1[d] and 6[g]. (*See supra* §§ VI.C.2.e, VI.C.10.h.)

e. “providing one or more solar energy reduction layers at an inward facing surface of said cover panel, wherein each of said one or more solar energy reduction layers is configured to reduce an amount of solar energy transferred to said circulating air in at least said portion of said closed loop airflow pathway.” (Claim Element 12[d])

398. It is discussed under Ground 1, that this claim element is substantially the same as claims elements 1[f] and 6[j]. Therefore, Yare in combination with

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Larson teaches this claim element for the reasons provided for claim elements 1[f] and 6[j], under Ground 2. (*See supra* §§ VI.C.2.g, VI.C.10.k.)

399. In summary, Yare in view of Larson discloses each and every element of claim 12 and renders obvious claim 12.

19. Claim 13: “The cooling method of claim 12 wherein: at least one of said one or more solar energy reduction layers comprise a polarizer.

400. This claim is identical to claim 8. Therefore, for the reasons provided for claim 8, Larson teaches this claim. (*See supra* § VI.C.13.)

20. Claim 14: “The cooling method of claim 13 wherein: at least one of said one or more solar energy reduction layers comprise a film having anti-reflection properties.

401. This claim is identical to claim 10. Therefore, for the reasons provided for claim 10, Larson teaches this claim. (*See supra* § VI.C.15.)

21. Claim 15: “The cooling method of claim 12 further comprising the steps of: thermally transferring heat between said circulating air in said closed loop airflow pathway and said ambient air in said second airflow pathway at a heat exchanger common to said closed loop airflow pathway and said second airflow pathway.

402. Yare teaches this claim. As discussed for claim element 6[i], Yare teaches “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.” (*See supra* § VI.C.10.i.)

403. Because a single heat exchanger 70 forms a “part of [the] open loop airflow pathway,” and a “part of [the] closed loop gas circulation pathway,” the heat exchanger is common to both the open loop and closed pathways. Because the heat exchanger is common to both the closed and open loops, the gas/air circulating in the closed loop and the gas/air moving through the open loop would exchange heat, e.g., via the heat exchanger. Therefore, Yare teaches this claim.

404. In summary, Yare in view of Larson teaches each and every element of claims 1-15, and renders these claims unpatentable as obvious.

VII. NO SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

405. 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.

406. 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 '142 patent's claims. Since the Patent Owner has not yet

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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.

407. Thus, based on my review of the evidence to date, I can summarize my opinions regarding any alleged secondary considerations of non-obviousness relating to the '142 Patent, as follows:

408. *No commercial success of the claimed invention.* The Patent Owner has not cited any evidence of particular commercial success of products embodying the '142 patent as opposed to products that do not embody the '142 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 '142 patent's claims and not due to any other facts.

409. *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 '142 patent. To the contrary, as discussed above, the prior art solved the problems that the '142 patent purported to address.

410. *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 '142 patent.

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As shown by my analysis above, there existed prior art references that successfully disclosed and rendered obvious the subject matter claimed by the '142 patent.

411. *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 '142 patent and its claimed invention.

412. *No unexpected results of the claimed invention.* The Patent Owner has not cited any evidence of unexpected results achieved by the '142 patent's claimed invention. To the contrary, the prior art disclosed the predictable, expected results that show why the '142 patent's claims are obvious as discussed in my Declaration.

413. *No praise for the claimed invention.* The Patent Owner has not cited any evidence of praise for the claimed invention recited in the '142 patent.

414. *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 '142 patent.

415. *No departure from the wisdom of the prior art.* The Patent Owner has not cited any evidence that the claimed inventions of the '142 patent departed from the wisdom of the prior art. The '142 patent claims subject matter that was already present in the prior art, including in the references discussed in my analysis above.

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416. 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 '142 patent is directed to techniques known in the prior art and does not provide any inventive technology.

417. To the extent the Patent Owner at a later date cites or provides any other evidence regarding secondary considerations, including any expert opinions, I reserve the right to supplement my analysis and opinions to comment on it.

VIII. CONCLUSION

418. In my opinion, based on my review of the '142 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 '142 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 references discussed above. It is also my opinion that a POSITA would have understood all of the limitations of the challenged claims to be obvious over the prior art combinations discussed above.

419. Accordingly, it is my opinion that challenged claims should be found unpatentable.

420. Furthermore, I reserve the right to supplement my opinions in the

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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.

421. 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.

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Respectfully submitted,

Dated: December 5, 2022


Robert Smith-Gillespie