

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

MANUFACTURING RESOURCES INTERNATIONAL, INC.,
Patent Owner

IPR2023-00255

U.S. Patent No. 9,629,287

Issue Date: April 18, 2017

Title: SYSTEM FOR USING CONSTRICTED CONVECTION WITH CLOSED LOOP
COOLING SYSTEM AS THE CONVECTION PLATE

**DECLARATION OF ROBERT SMITH-GILLESPIE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,629,287**

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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. 9,629,287 (“’287 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 ’287 patent issued on April 18, 2017 from U.S. Application Ser. No. 15/180,968, naming William Dunn as inventor. I have been advised and it is my understanding that the earliest provisional priority date of the ’287 patent is March 3, 2008, the filing date of Provisional Application No. 61/033,064, to which the ’287 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 Petitioner to offer opinions regarding the state of the art in the field of cooling electronic display equipment prior to March 3, 2008. I

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have been asked to provide my opinion concerning the question of whether the devices described in claims 1, 4-5, and 8-23 of the '287 patent were novel and 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 '287 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 person of ordinary skill in the art at the time of the '287 patent's priority date. As explained below, I am familiar with the level of skill of a person of ordinary skill in the art regarding the technology at issue as of that time frame.

5. I make this Declaration based upon my own personal knowledge, information, and belief, and I would and could competently testify to the matters set forth in this Declaration if called upon to do so. I do not have any personal or financial stake or interest in the outcome of the present proceeding, and the compensation is not dependent on the outcome of this IPR and in no way affects the substance of my statements in this declaration.

B. Qualifications and Experience

6. My background includes roughly 35 years of professional experience in the field of illuminated products including liquid crystal displays ("LCD") and

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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.

7. I received a B.A. in Physics in 1981 from the State University of New York, 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 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 material 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 1989. Sperry was purchased by Honeywell Inc., and I continued at Honeywell's Air Transport Systems Division. 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 continue at Honeywell through

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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 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 process 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,

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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).

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 2012 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,

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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 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.”

17. I am the author or co-author of 16 scientific and engineering publications, including articles, conference presentations, technical and 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

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LCD and other areas.

18. 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.

C. Materials Considered

19. 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 '287 patent (Ex. 1001) and its prosecution history (Ex. 1014). The '287 patent states on its face that it issued from U.S. Application Ser. No. 15/180,968, which was filed on June 13, 2016 and is a continuation of U.S. Application Ser. No. 14/803,848, filed on July 20, 2015, which was a continuation of U.S. Application Ser. No. 14/508,767, filed on October 7, 2014, which was a continuation of U.S. Application Ser. No. 13/937,777, filed on July 9, 2013, which was a continuation of U.S. Application Ser. No. 13/605,530, filed on September 6, 2012, which was a continuation of U.S. Application Ser. No. 12/620,330, filed on November 17, 2009, which was a continuation-in-part of U.S. Application Ser. No. 12/234,307 filed on September 19, 2008, which was a Continuation-in-Part of U.S. Application Ser. No. 12/237,365, filed on September 24, 2008, which was a Continuation-in-Part of U.S. Application Ser. No.

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12/411,925, filed on March 26, 2009, which was a Continuation-in-Part of U.S. Application Ser. No. 12/235,200, filed on September 22, 2008, which was a Continuation-in-Part of U.S. Application Ser. No. 12/556,029, filed on September 9, 2009. The '287 patent also claims priority to seven (7) different provisional applications as part of its priority chain, the earliest of which is Provisional Application No. 61/033,064, filed on March 3, 2008. (*See* Ex. 1001, 1:9-54).¹ For the purposes of this Declaration, I have assumed March 3, 2008 as the effective filing date for the '287 patent. I have cited to the following documents in my analysis below:

Exhibit No.	Description
Ex. 1001	U.S. Patent No. 9,629,287 (“the '287 Patent”)
Ex. 1003	Curriculum Vitae of Robert Smith-Gillespie
Ex. 1004	Certified translation of Japanese Patent No. 3118907 to Ohta (“Ohta”)
Ex. 1005	Certified translation of Japanese Unexamined Patent Application Publication No. H8-152604 to Marumoto (“Marumoto”)
Ex. 1006	International PCT Publication WO 2007/116116 to Karppanen, et al. (“Karppanen”)
Ex. 1007	U.S. Patent No. 6,798,655 to Nagashima, et al. (“Nagashima”)

¹ For purposes of this Declaration, citations to patents and patent applications, including the '287 patent, are in the form a:bb – c:dd, where “a” and “c” are column numbers, and “bb” and “dd” are line numbers.

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Exhibit No.	Description
Ex. 1008	“Exhibit 22: Infringement Claim Chart for Samsung OH-Series Outdoor Display Products,” produced by Manufacturing Resources International, Inc. in <i>In re Certain Outdoor and Semi-Outdoor Electronic Displays, Products Containing Same, and Components Thereof</i> , Investigation No. 337-TA-1331
Ex. 1009	Japanese Patent No. 3118907 to Ohta (“Ohta”)
Ex. 1010	Japanese Unexamined Patent Application Publication No. H8-152604 to Marumoto (“Marumoto”)
Ex. 1011	Claim Construction Order (D.I. 153) dated October 3, 2018 in <i>Manufacturing Resources Int’l, Inc. v. Civiq Smartscapes, LLC, et al.</i> , Civil Action No. 17-269-RGA (D. Del.)
Ex. 1012	Memorandum Opinion (D.I. 150) dated September 27, 2018 in <i>Manufacturing Resources Int’l, Inc. v. Civiq Smartscapes, LLC, et al.</i> , Civil Action No. 17-269-RGA (D. Del.)
Ex. 1013	United Kingdom Patent Application No. 2402205A to Yare (“Yare”)
Ex. 1014	File History for U.S. Patent Application No. 15/180,968
Ex. 1015	Japanese Patent Application No. 2001-209126 A to Fujimori (“Fujimori”)
Ex. 1016	Japanese Unexamined Patent Application Publication No. H8-54834 to Kitamura (“Kitamura”)
Ex. 1017	Certified translation of Japanese Unexamined Patent Application Publication No. H8-54834 to Kitamura (“Kitamura”)
Ex. 1018	U.S. Patent No. 5,748,269 to Harris, et al. (“Harris”)
Ex. 1019	U.S. Patent No. 5,991,153 to Heady, et al. (“Heady”)
Ex. 1020	Excerpts from the File History of U.S. Application No. 14,508,767

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Exhibit No.	Description
Ex. 1021	U.S. Patent No. 6,825,828 (“Burke”)
Ex. 1022	E. Fred Schubert & Jong Kyu Kim, <i>Solid-State Light Sources Getting Smart</i> , 308 <i>Science</i> 1274 (2005) (“Schubert”)
Ex. 1023	Military Handbook: Reliability Prediction of Electronic Equipment, DEPARTMENT OF DEFENSE, MIL-HDBK-217F (1991) (“MIL-HDBK-217F”)
Ex. 1024	Calculating useful lifetimes
Ex. 1025	LIAN-TUU YEH & RICHARD C. CHU, THERMAL MANAGEMENT OF MICROELECTRONIC EQUIPMENT: HEAT TRANSFER THEORY, ANALYSIS METHODS, AND DESIGN PRACTICES (Dereje Agonafer ed., 2002) (“Yeh & Chu”)
Ex. 1026	ALLAN W. SCOTT, COOLING OF ELECTRONIC EQUIPMENT (John Wiley & Sons, 1974) (“Scott”)
Ex. 1027	DAVE S. STEINBERG, COOLING TECHNIQUES FOR ELECTRONIC EQUIPMENT (John Wiley & Sons, 1980) (“Steinberg”)
Ex. 1028	U.S. Patent No. 6,504,713 (issued January 7, 2003) (“Pandolfi”)
Ex. 1029	U.S. Patent No. 4,327,803 issued in 1982 (“Mullejeans”)
Ex. 1030	U.S. Patent No. 5,002,118 (“Olmstead”)
Ex. 1031	U.S. Patent No. 6,244,333 (“Bergh”)
Ex. 1032	Memorandum Opinion (D.I. 181) dated March, 5, 2019 in <i>Manufacturing Resources Int’l, Inc. v. Civiq Smartscapes, LLC, et al.</i> , Civil Action No. 17-269-RGA (D. Del.)

II. LEGAL PRINCIPLES

20. I am not an attorney. For purposes of this declaration, I have been

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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.

A. Prior Art

21. I understand that the prior art to the '287 patent includes patents and printed publications in the relevant art that predate the '287 patent's priority date. As I explained previously, I have been instructed to assume for purposes of my analysis that March 3, 2008 is the relevant date for determining what is "prior art." In other words, I should consider 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.

B. Claim Construction

22. 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.

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23. 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.

24. 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 claims can also be a useful guide in understanding the meaning of particular claim terms.

25. 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.

26. 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.

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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.

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

28. 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

29. I understand that a patent claim is anticipated if a single prior art document describes every element of the claim such that a POSITA could practice the claimed method without undue experimentation.

30. 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

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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

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

32. To ascertain the scope and content of the prior art, it is necessary to first

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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.

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

34. 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

35. I understand that an assessment of claims of the '287 patent should be undertaken from the perspective of a person of ordinary skill in the art as of the earliest claimed priority date, which, as I explained above, I assumed to be March 3, 2008.

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36. 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 inventor.

37. Applying these factors, as to the '287 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

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aspects with which the other person may have expertise, experience, and/or knowledge that was obtained through her own education, industrial or academic experience.

38. 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, CCFL and 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 '287 PATENT

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

40. The technology at issue in the challenged claims of the '287 patent relates to the cooling of an electronic display assembly within a housing where the display is cooled by a combination of airflows, in which a closed loop of isolated gas may be used with an open loop of ambient air which passes through the housing in order to cool the display.

41. Some features of the electronic display assembly claimed in claims 1, 12, 18 and 21 of the '287 patent include:

- i. a housing for the electronic display;

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- ii. a gas-containing closed loop gas cooling chamber located within the electronic display housing, or positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display;
- iii. an electronic or LCD display (which may have a front surface which faces an intended viewer and a rear surface which opposes the front surface, and which may have a backlight) that may be positioned within the electronic display housing but outside of the closed loop gas cooling chamber; and
- iv. the ability of the electronic display to be coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air flow through the open loop ambient air pathway in the electronic display housing, including along the backlight.

42. 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.

43. A typical LCD display is comprised of three main components: an LCD panel, an electronic driver circuit, and a backlight. The LCD display panel

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

44. In the early- to mid-2000s, as LCD panel areas grew, their use in a variety of indoor and outdoor environments outside the home also grew. (*See, e.g.*, U.S. Patent No. 6,825,828 (“Burke”) at 1:15-30 (Ex. 1021); *Solid-State Light Sources Getting Smart*, E. Fred Schubert & Jong Kyu Kim, *Science* **308**, 1274-78 (2005) (Ex. 1022).) 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 ATMs, information kiosks, bus shelters, billboards, and street level advertising.

45. 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

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thermal stress. Thermal stress is a general term for both short- and long-term performance reduction of electronic components subject to operation at elevated temperature. The phenomenon of thermal stress is well known for at least the last 50 years,² with initial research and requirements developed by and for military equipment electronics.

46. 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.³ 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

² MIL-HDBK-217A Reliability Prediction of Electronic Equipment, Rev. was issued in 1965 to address failures in monolithic ICs and other components. In 1994, MIL-HDBK-217F (1991) (Ex. 1023) 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.

³ For a background on failure modes and component reliability, *see Calculating Useful Lifetimes of Embedded Processors*. SPRABX4, Texas Instruments Incorporated, Nov. 2014. (Ex. 1024.)

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radiative heating of the immediate environment by other equipment's heat dissipation or by external sources such as solar radiation. The latter of which is a significant factor for displays used in outdoor environments where the sun may impinge directly on the display.

47. 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 '297 patent filing. Thus, some cooling mechanism must be used to ensure the continued reliability of electronics, and ultimately, to prevent failure. (See Ex. 1025 (Yeh, Lian-Tuu and Chu, Richard C., *Thermal Management of Microelectronic Equipment*, 2002 ("Yeh & Chu")) at page 10 of 58 ("[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.") (endnote omitted).)

48. 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. 1026 (Scott, A.W., *Cooling of Electronic Equipment* (1974)

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(“Scott”)) at page 6 of 54 (“All electronic equipment needs cooling.”); Ex. 1027 (Steinberg, D.S., *Cooling Techniques for Electronic Equipment*, John Wiley & Sons (Steinberg”)) at page 15 of 225.) Cooling is accomplished by heat transfer, the movement of thermal energy from one body to another. The three primary modes of heat transfer used to cool electronic equipment are conduction, radiation, and convection. (Ex. 1027 (Steinberg) at page 16 of 225.)

49. 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.* at page 17 of 225.) 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 ’287 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.

50. 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

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system which constrains air flows to and from various regions of a building. Here, the air is moved under the influence of a fan. The air intake system on a modern automobile utilizes a plenum formed by a series of connected tubes and housings. In this case, the air is moved by a combination of negative pressure at the intake manifold, and positive pressure upstream of the incoming air filter. In electronics cooling applications, the walls of the plenum may be formed of a thermally conductive material on at least the side in contact with the heat source. This encourages conductive heat transfer through the plenum wall and into the moving airstream. (*See, e.g.*, Ex. 1018 (U.S. Patent No. 5,748,269 issued in 1998) (“Harris”) at 5:18–23.)

51. 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. 1023), an example of which is shown below), the thermal design of displays is always a key consideration.

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6.3 TRANSISTORS, LOW FREQUENCY, BIPOLAR

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

Base Failure Rate - λ_b

Type	λ_b
NPN and PNP	.00074

Temperature Factor - π_T

$T_J (^{\circ}\text{C})$	π_T	$T_J (^{\circ}\text{C})$	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 ($^{\circ}\text{C}$)

(*Id.*, § 6.3.)

52. 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 '287 filing wherein thermal considerations and countermeasures were taken by the inventors.

53. *Convective cooling of electronic displays.* Both conductive and convective cooling of electronic displays were well-known at the time of the '287 patent filing. (Ex. 1001, 1:63-2:17 (describing such cooling techniques as known background).) Even sealed display systems using convective approaches aimed at

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removing heat from display systems had been known and used years before the '287 patent application. For example, Harris (Ex. 1018), disclosed a forced convective cooling system for removing heat from “an environmentally-sealed enclosure having a removable cover, and housing a liquid crystal display screen.” (*Id.*, Abstract).

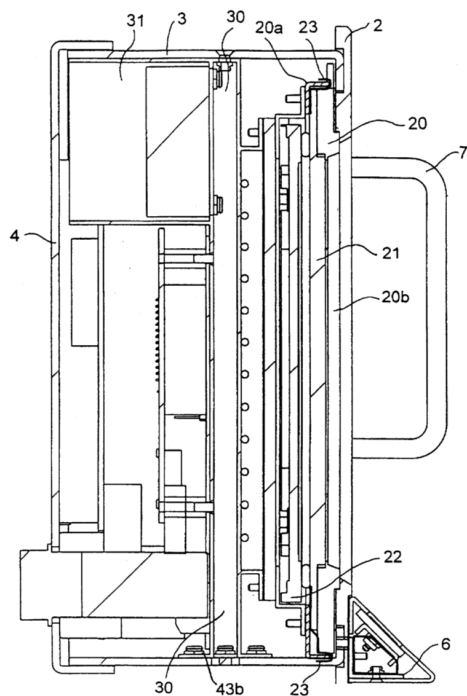


FIG.2

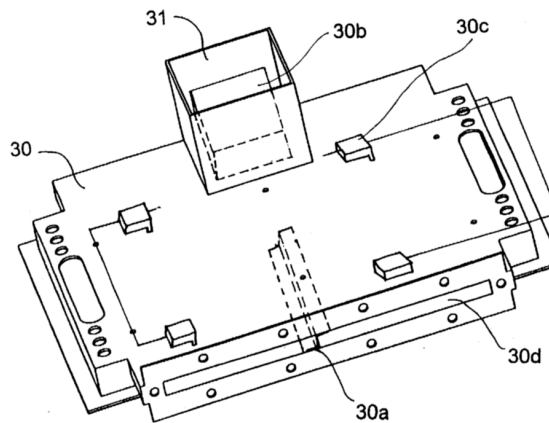


FIG.3

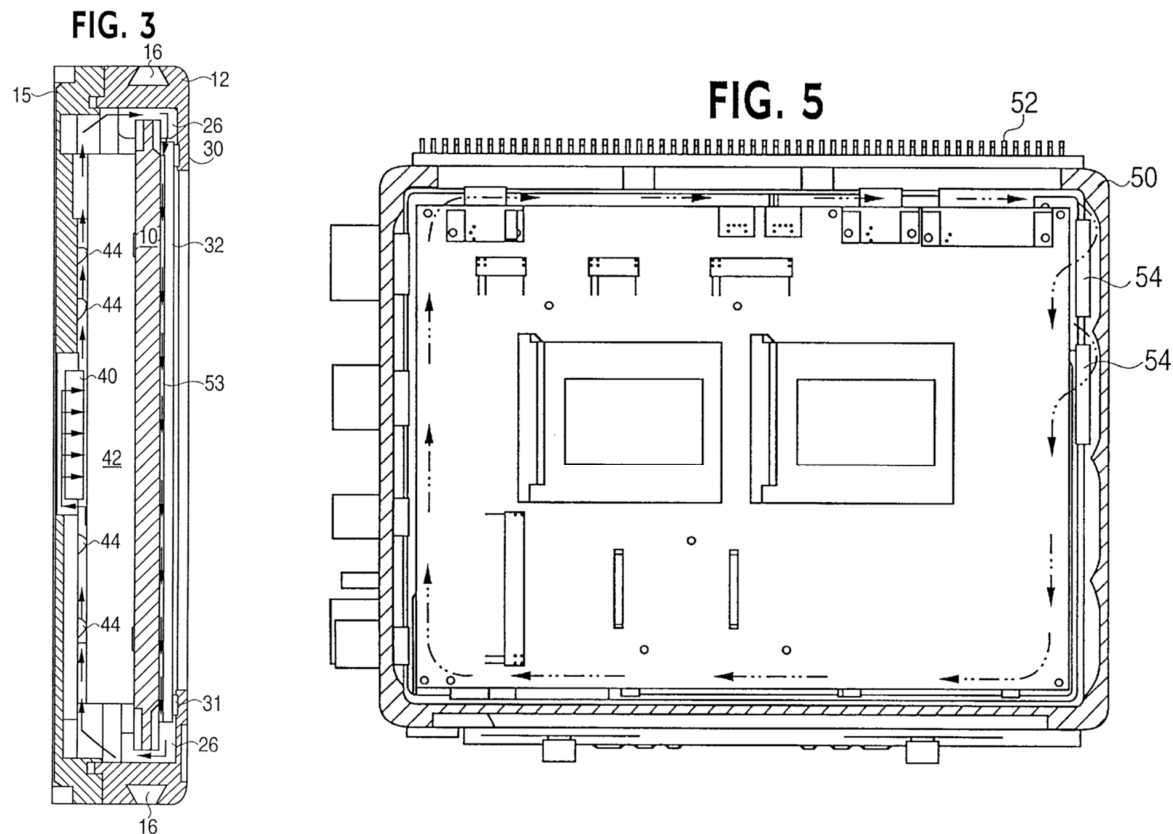
(*Id.*, FIGS. 2 and 3 (plenum **30** and fan **30b**, air intake passage **30d**, and exhaust port **31** provide cooling by convection).)

54. 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

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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.)

55. *Closed loop cooling of electronic displays.* While Harris suggests the use of an open loop cooling system, closed loop cooling of electronic displays was also well-known. For example, (Ex. 1028) U.S. Patent 6,504,713 (issued January 7, 2003) (“Pandolfi”) discloses sealed, closed loop, forced air cooling system for cooling a display module. (*Id.*, Abstract.) Pandolfi discloses “a path for the flow of a circulating cooling fluid, such as air, to circulate through the air gap **53** driven by convection currents or by one or more fans **40** located in the display housing and which may be, but need not be, vented to the outside atmosphere,” and “[t]he air is driven by the fan in a circular flow pattern so as to increase the laminar flow of air between the front surface of the display panel **28** and the touch responsive screen **32**.” (*Id.*, 2:55-67.) Pandolfi’s closed loop system through air gap **53** is reflected by Figures 3 and 5, and the arrows showing the circular air flow pattern:



(*Id.*, FIGS. 3 & 5.)

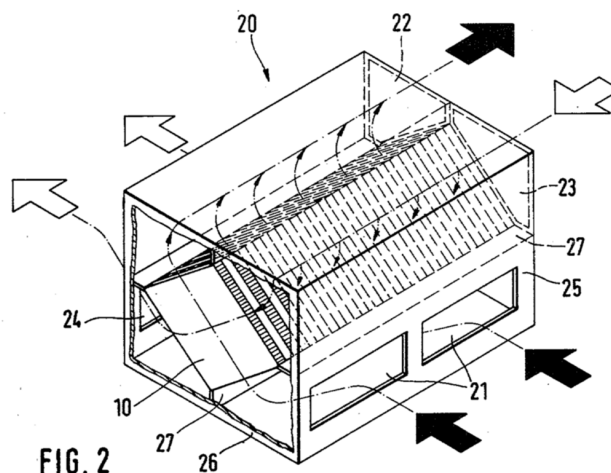
56. Pandolfi suggests case cooling of the airstream from the single closed loop wherein “[i]nternal fans **54** circulate air through the CPU housing **50** and heat is conducted by the housing to the ambient atmosphere, particularly through the cooling fins **52**.” (*Id.* 3:25-33.) Note that Pandolfi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

57. *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. U.S. Patent Nos. 4,327,803 issued in 1982 (“Muellejans”) (Ex. 1029) (disclosing a cross-flow heat exchanger); 5,002,118 issued in 1991 (“Olmstead”) (Ex. 1030) (also disclosing a cross-flow heat exchanger); and 6,244,333 issued in 2001 (“Bergh”) (Ex. 1031) (disclosing a folded plate heat exchanger), provide examples of a few types of air-to-air heat exchangers.

58. 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 Muellejans shows a pair of opposing air flow pathways through a preferred embodiment.



(Ex. 1029, FIG. 2.)

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59. WO Patent WO 2007/116116 A1, which published internationally on October 18, 2007 (“Karppanen”) (Ex. 1006)), and which is discussed at greater lengths in the discussion, *infra*, of the validity of the claims of the ’287 patent, 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, all contained within a common housing. Karppanen also discloses an air-to-air heat exchange comprising heat sinks **62** placed in cooling channels **70** shown in its 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. (*Id.*, FIGs. 1 & 4.)

V. THE ’287 PATENT

A. Overview of the ’287 Patent

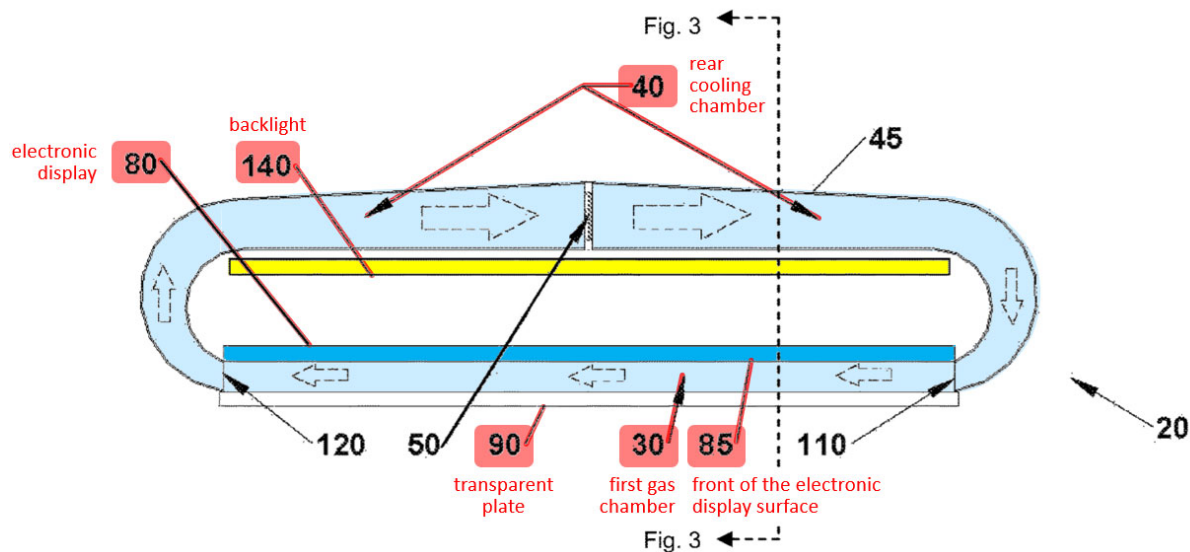
60. The ’287 patent, which is titled “System for Using Constricted Convection with Closed Loop Cooling System as the Convection Plate,” issued from U.S. Application Ser. No. 15/280,968 (the ’968 Application”) filed on January 13, 2016. (Ex. 1001, face page.) The ’968 Application was itself a continuation of U.S. Application Ser. No. 14/803,848, filed on July 20, 2015, which was a continuation of U.S. Application Ser. No. 14/508,767, filed on October 7, 2014, which was a continuation of U.S. Application Ser. No. 13/937,777, filed on July 9, 2013, which

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was a continuation of U.S. Application Ser. No. 13/605,530, filed on September 6, 2012, which was a continuation of U.S. Application Ser. No. 12/620,330, filed on November 17, 2009, which was a continuation-in-part of U.S. Application Ser. No. 12/234,307 filed on September 19, 2008, which was a Continuation-in-Part of U.S. Application Ser. No. 12/237,365, filed on September 24, 2008, which was a Continuation-in-Part of U.S. Application Ser. No. 12/411,925, filed on March 26, 2009, which was a Continuation-in-Part of U.S. Application Ser. No. 12/235,200, filed on September 22, 2008, which was a Continuation-in-Part of U.S. Application Ser. No. 12/556,029, filed on September 9, 2009. (*Id.* & p.2.) The '968 Application (and hence the '287 patent) also claims priority to seven provisional patent applications, the earliest of which (No. 61/033,064) was filed on March 3, 2008. (*Id.* p.2.)

61. The '287 patent relates to “an isolated gas cooling system and a method for cooling an electronic display. An exemplary embodiment includes an isolated gas cooling chamber. The gas cooling chamber is preferably a closed loop which includes a first gas chamber ... and a second gas chamber” (Ex. 1001, 2:37-43.)

62. As shown in Figure 2 (annotated below), “the isolated gas cooling chamber **20** comprises a closed loop which includes a first gas chamber **30** and a rear cooling chamber **40**”:



(Ex. 1001, 4:4-7, FIG. 2 (annotated).) “The first gas chamber **30** is positioned in front of the display image” and “includes a transparent plate **90**.” (*Id.*, 4:7-8, 4:12-13.) The rear “gas chamber [**40**] comprises a cooling plenum **45**.” (*Id.*, 4:8-9.)

63. I note that many challenged claims explicitly require that the electronic display be “outside of,” “isolated from” or “behind” the closed loop cooling chamber (as depicted in the annotated figure above). (*Id.*, claims 1, 14, 18, 21.)

64. The front surface of the electronic display **85** is behind the first gas chamber **30**: “[T]he backlight **140** is placed in close proximity to the posterior rear cooling chamber **40**.” (*Id.*, 4:46-48.) Here, “[t]he first gas chamber **30** includes at least one transparent plate **90** mounted in front of an electronic display surface **85**.” (*Id.*, 4:28-30.)

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B. Prosecution History

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” (Ex. 1014). I am aware the Patent and Trademark Office entered several office actions during prosecution and rejected claims 1, 4-5, and 8-11 as being anticipated and/or obvious in light of the prior art, while allowing claims 12-20 in an office action dated September 22, 2016. (*See* File History for U.S. Application No. 15/180,968, Ex. 1014, (9/22/2016 Non-Final Rejection) at 47-52). I am further aware that the Examiner relied solely on Japanese Patent Application 2001-209126 A (“Fujimori”) (Ex. 1015). I also am aware that in response, the Patent Owner made several amendments to overcome the prior art rejections, and the ’287 patent eventually issued on April 18, 2017.

C. The Challenged Claims

65. This Declaration addresses claims 1, 4-5, and 18-23 of the ’287 patent. Claims 1, 12, 18, and 21 are the independent claims. The following chart lists the claims from the ’287 patent that I analyze herein:

1[pre]. An electronic display assembly comprising: [a] an electronic display housing; [b] a gas-containing closed loop gas cooling chamber	12[pre]. An electronic display assembly comprising: [a] a housing; [b] a liquid crystal display (LCD) positioned within the housing and having a backlight;
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[c] an electronic display positioned within the electronic display housing but outside of the closed loop gas cooling chamber, and [d] an open loop ambient air pathway through the electronic display housing; [e] wherein the electronic display is coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air flow through the open loop ambient air pathway in the electronic display housing. 4. The electronic display assembly of claim 1 wherein: the gas within the closed loop gas cooling chamber is isolated from the open loop of ambient air. 5. The electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber and the ambient air pathway are configured such that gas circulation within the gas cooling chamber will occur in a direction that is substantially perpendicular to the direction that ambient air will flow through the electronic display housing. 8. The electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber is partially defined by a sealed rear plenum that prevents ambient air from entering the plenum.	[c] wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight. 13. The electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD. 14. The electronic display assembly of claim 12 further comprising: [a] a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas; and [b] wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber. 15. The electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber. 16. The electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber.
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9. The electronic display assembly of claim 8 further comprising: one or more electronic devices for operating the electronic display positioned within the sealed plenum. 10. The electronic display assembly of claim 1 wherein: the electronic display is selected from the group consisting of a liquid crystal display, a light emitting diode display, an organic light emitting diode display, a field emitting display, a cathode ray tube display, and a plasma display. 11. The electronic display assembly of claim 1 further comprising: [a] a gas-circulating fan for circulating the gas within the closed loop gas cooling chamber, and [b] a fan for producing a flow of ambient air through the open loop ambient air pathway in the electronic display housing.	17. The electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow.
18[pre]. An electronic display assembly comprising: [a] a housing [b] an electronic display positioned within the housing: [c] a rear cooling chamber positioned behind the electronic display and containing an electrical component	21[pre]. An electronic display assembly comprising: [a] an electronic display housing: [b] a closed loop of cooling gas adapted for circulation within the electronic display housing;

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which is electrically connected to the electronic display; [d] a front surface on the electronic display which faces an intended viewer and a rear surface on the electronic display which opposes the front surface; [e] wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air. 19. The electronic display assembly of claim 18 wherein: the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas when it passes through the housing. 20. The electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber.	[c] an open loop ambient air pathway through the electronic display housing; and [d] an electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop ambient air pathway; [e] wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing. 22. The electronic display assembly of claim 21 wherein: [a] the closed loop of cooling gas is isolated within a continuous loop gas cooling chamber, and [b] the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling chamber when it flows through the electronic display housing. 23. The electronic display assembly of claim 22 further comprising: [a] a fan located within the electronic display housing,
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	[b] the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display.
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66. 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

67. I understand that Patent Owner previously asserted the '287 patent against a third party, Civiq Smartscapes LLC, in patent litigation in the United States District Court for the District of Delaware captioned *Manufacturing Resources, Inc. v. Civiq Smartscapes, LLC*, No. 1:17-cv-00269 (D. Del.) (“the MRI-Civiq Litigation”). (See Ex. 1012.) I further understand that in that litigation, the District Court on October 3, 2018 issued a Claim Construction Order (Ex. 1011) where it construed two terms used in the challenged claims of the '287 patent, but elected not construe others. I discuss my understanding of the Delaware District Court’s constructions herein.

1. Terms Requiring No Construction

68. In particular, I understand that the Defendants in the MRI-Civiq Litigation contended that the phrase “**the front surface of the electronic display is coolable by a closed loop of isolated gas**” as used in claim 18 is indefinite because

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it is a functional limitation and there are no quantitative metrics or formula in the specification to determine how “coolable” the display needs to be to infringe. (Ex. 1012, at 15-16.) I further understand that the District Court disagreed, and held that **“any front display surface that is capable of being cooled-however minutely-is included within the scope of the invention.”** (*Id.*, at 16 (emphasis added); *see also* Ex. 1011, at 2.) I therefore have applied that understanding of the term to my analysis of the prior art.

69. I understand that the District Court also determined that the phrases **“open loop”** as used in claims 1, 4, 11-12, 14, and 16-22, and **“rear surface of the electronic display”** as used in claims 18, 20 and 23, should be given their plain and ordinary meaning. (Ex. 1011, at 1; Ex. 1012, at 9.) For instance, as to the phrase **“open loop,”** I understand that the District Court determined that it is not limited to a “gas pathway within a display housing that is open to or accessible to external air,” and therefore **no construction for the term was required.** (Ex. 1011, at 1; Ex. 1012, at 9.) These are the constructions I have applied in my analysis of the prior art.

70. I further understand that as for **“rear surface of the electronic display,”** the District Court reasoned that the phrase is not limited to only the rear surface of the backlight or the rear surface of the an LCD stack or backlight (in an LCD or LED) or posterior surface of an OLEO, FED, CRT, plasma or other display

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when there is no backlight. (Ex. 1012, 2-3.) I understand the District Court reached this conclusion because “the patentee used the term ‘rear surface of an electronic display’ broadly.” (*Id.*, at 2.) Again, this is the same understanding I have applied in my analysis of the prior art.

71. In my opinion, and solely for purposes of this Petition, I believe the Board should apply the Delaware District Court’s constructions and reasonings as to the scope of the terms at issue in the MRI-Civiq Litigation.

72. Although there are written description and indefinite problems in some of the claims^{4,5}, I believe the Board need construe only three other terms. The first

⁴ Claim 15 requires that “**one or more electronic components for driving the LCD positioned within the rear cooling chamber.**” In my opinion, there is no written description support for this limitation in the specification. However, I believe that solely for purposes of this Petition, the Board may give the phrase “electronic components for driving the LCD” its plain and ordinary meaning.

⁵ In my opinion, there is also no antecedent basis for the phrase “**the rear cooling chamber**” used in claim 15, which is dependent upon independent claim 12 and which makes no reference to such a “rear cooling chamber.” Again, though, solely

term is one which is recited in three nearly identical ways – namely, “**closed loop gas cooling chamber**”/“**closed loop of isolated gas**”/“**closed loop of cooling gas**” as used in each of independent claims 1, 12, 18 and 21. The second term is “**along the backlight**,” which appears in independent claim 12.

2. “**closed loop gas cooling chamber**”/ “**closed loop of isolated gas**”/ “**closed loop of cooling gas**” (Claims 1, 12, 18, 21)

73. I understand that the District Court construed the term “closed loop” as that term appears in the claims of the ’287 patent to mean “**gas pathway within a display housing containing gas that is essentially isolated from external air.**” (Ex. 1011, at 2; Ex. 1012, at 8.) This is the construction I therefore have applied to that term when evaluating the prior art.

3. “**between**” (Claims 20, 23)

74. I understand that the District Court construed the term “between” as that term appears in the claims of U.S. Patent No. 9,173,322 to mean “**in the space that separates**” and specifically noted that air that passed “between” two structures need not come into contact with said structures. (Ex. 1011, at 1; Ex. 1012, at 9-10.) This is the construction I therefore have applied to that term when evaluating the

for purposes of this petition, I believe the Board should treat the “rear cooling chamber” in claim 15 as any cooling chamber that is rear to the electronic display.

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prior art.

4. **“open loop of ambient air which passes through the housing and along the backlight” (Claim 12)**

75. In my opinion, the phrase **“open loop of ambient air which passes through the housing and along the backlight”** does not require that air actually contact the backlight. Rather, in my opinion, a POSITA reading the specification of the '287 patent would construe the limitation to mean **“open loop of ambient air which passes through the housing and is in thermal communication with, the backlight.”**

76. In that regard, I note that during prosecution of U.S. Patent No. 9,089,079 (“the '079 patent, of which the '287 patent is a continuation), the examiner rejected a pending claim covering ambient air moving “along the backlight” based on U.S. Patent No. 5,991,153 (“Heady”) (Ex. 1019) (pasted below) where the ambient air flows through a heat exchanger mounted to the side of the display:

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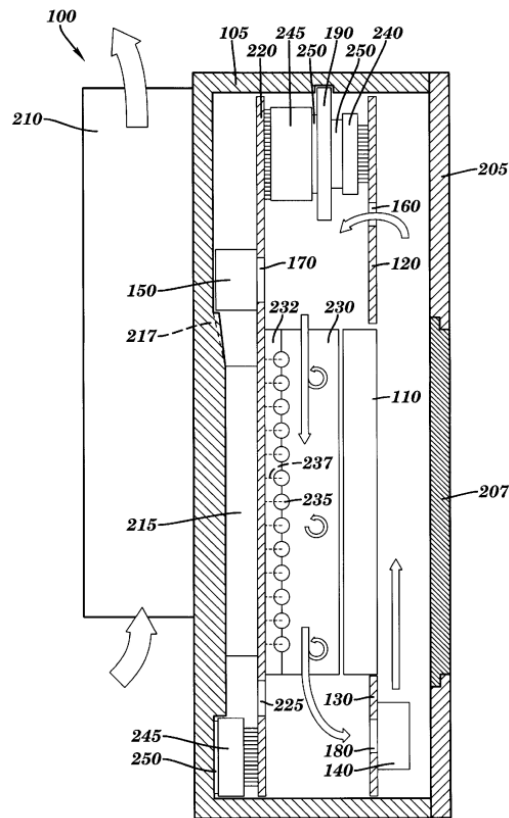


FIG. 3

(Ex. 1019, FIG. 3; *see also* Ex. 1020, at p.201 (Jan. 30, 2015 Office Action.) I understand that, in response, rather than traversing the characterization of Heady as disclosing covering ambient air moving “along the backlight,” MRI instead amended the claim to say “**contacting the . . . backlight.**” (Ex. 1020, p.223.) I note that in Heady, the open loop fan cools the fins mounted to the rear of the display. Yet I also note that the examiner nonetheless considered this to be “**along the backlight,**” and I believe that should be how it is interpreted for purposes of the ’287 patent too:

77. Otherwise, in my analysis of the validity of claims 1, 4-5, and 8-23 of

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the '287 patent, I have applied my understanding of what would be the plain and ordinary meaning to a POSITA of all other claim terms appearing in those claims.

VI. APPLICATION OF THE PRIOR ART TO ASSERTED CLAIMS

78. I have reviewed and analyzed the prior art references and materials listed in Section I.C above. In my opinion, the claims of the '287 patent are rendered unpatentable based on the following prior art:

Ground	References	Claim(s)
1	Obvious over Karppanen (Ex. 1006)	12-23
2	Obvious over Nagashima (Ex. 1007) and Karppanen (Ex. 1006)	1, 4-5, 8-12, 14-17, 21-23
3	Obvious over Ohta (Ex. 1004) and Marumoto (Ex. 1005)	1, 4-5, 8-23
4	Obvious over Ohta (Ex. 1004), Marumoto (Ex. 1005) and Yare (Ex. 1013)	1, 4-5, 8-23
5	Obvious over Kitamura (Ex. 1017) and Harris (Ex. 1018)	12-20

79. 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 '287 patent. I reserve the right to respond in the future to any arguments or positions that the Patent Owner may raise,

taking account of new information as it becomes available to me.

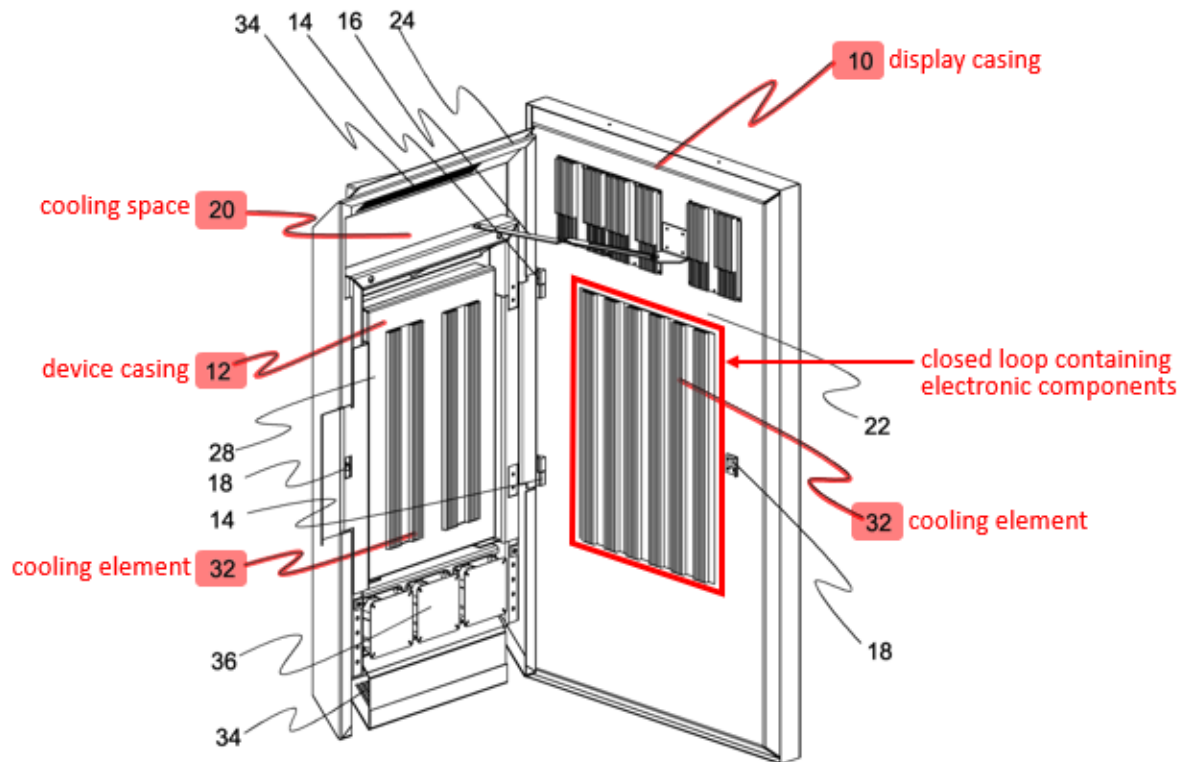
A. Brief Summary of Prior Art

1. Karppanen [Ex. 1006]

80. International Patent Application No. PCT/FI2006/050145 with Publication No. WO2007116116A1 (“Karppanen”) (Ex. 1006), entitled “Electronic Information Board” was filed on April 11, 2006 and published on October 18, 2007. I understand that Karppanen qualifies as prior art pursuant to at least pre-AIA 35 U.S.C. §§ 102(a) and 102(e), because it published in English and was filed before the earliest claimed priority date of March 3, 2008 for the ’287 patent.

81. Karppanen teaches “an electronic information board comprising ... a weatherproof display casing (10) ... and a weatherproof device casing (12) for the electronic equipment needed for controlling the display element. (Ex. 1006, Abstract.) As reflected by annotated Figure 1 below, “[b]etween the casings, there is a common cooling space (20) for cooling the devices in the display casing and the device casing,” where both the display and device casing have cooling elements for transferring heat to the cooling space:

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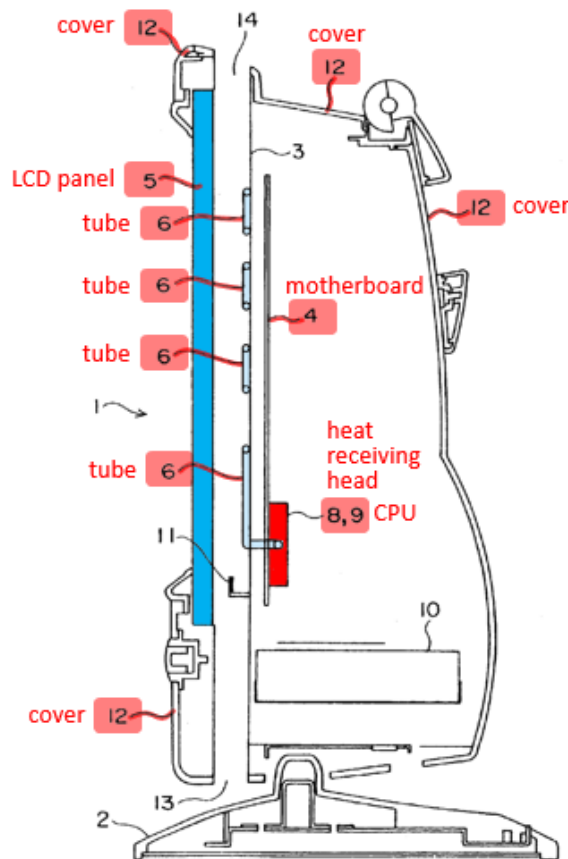
(*Id.*, FIG. 1 (annotated).) The display element can be “supported at its edges to the edge part of the display casing by support elements so as to form a gap enabling the circulation of air between the walls of the display casing and the outer surface of the display element.” (*Id.*, 4:29-32.) Fans may be placed inside the display casing “for circulating air in the space between the walls of the display element and the display casing, and ducting has been arranged between the walls of the casing and the display element for directing the circulation of air around the display element.” (*Id.*, 4:32-36.)

2. Nagashima [Ex. 1007]

82. U.S. Patent No. 6,798,655 (“Nagashima”) (Ex. 1007), entitled “Liquid Cooling System for All-in-One Computer,” issued on September 28, 2004 from Application No. 10/347,365, filed January 21, 2004. I understand that Nagashima is prior art to the ’287 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b).

83. Nagashima is directed to “liquid cooling technology for a heat generating elements” in a desktop-type computer integrated “with a liquid crystal display.” (Ex. 1007, 1:8-12.) The “liquid crystal display” is cooled by an open loop of air flowing along the rear surface of the display. (*Id.*, 5:13-22, 5:61-6:3.) Meanwhile, aa “heat receiving head” **8** is placed “in contact with [other] heat generating elements” including the CPU **9**, power source circuits, and hard disk drive **10**. (Ex. 1007, 4:4-11.) As reflected by annotated Figure 1 below, the heat receiving head **8** is “filled with a cooling medium liquid” and is pumped (7) through tube **6** which is affixed to main chassis **3** so that heat inside the tube can be radiated by the open loop of ambient air:

FIG. 1



(*Id.*, 4:14-22, 4:36-49, 5:13-22, FIG. 1 (annotated).) Nagashima further discloses that “[a] portion of the cover **12** ... is formed with an air inlet **13** for air-cooling the heat radiating portion that comprises the heat transporting tube and the main chassis. (*Id.*, 5:14-18.)

84. The heat receiving head **8** can include a “heat radiating fin” to facilitate additional radiation of heat and a “fan ... provided on the heat radiating fin on the

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heat receiving head ... [which] realizes the effective and rapid radiation of heat from
the heat radiating fin,” as shown in Figures 6A and 6B:

FIG. 6A

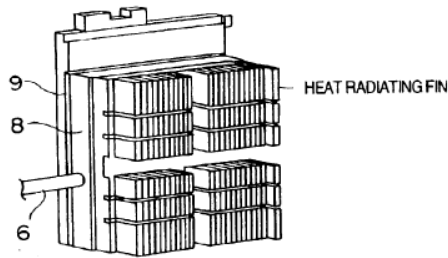
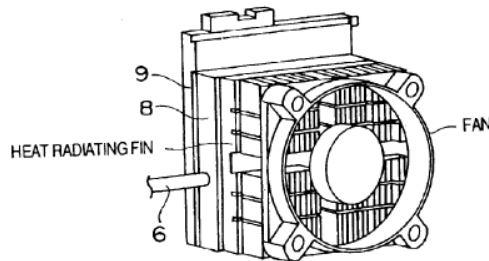


FIG. 6B



(*Id.* 7:9-19, FIGs.6A, 6B.)

3. Ohta [Exs. 1004, 1009]

85. Japanese Patent No. 3118907 (“Ohta”) (Exs. 1004, 1009),⁶ titled “Cooling Device for Plasma Display Panel,” published on October 13, 2000 from Japanese Patent Application H3-279363, filed October 25, 1991. I understand that

⁶ Unless otherwise noted, citations herein are to the certified translation of Ohta (Ex. 1004).

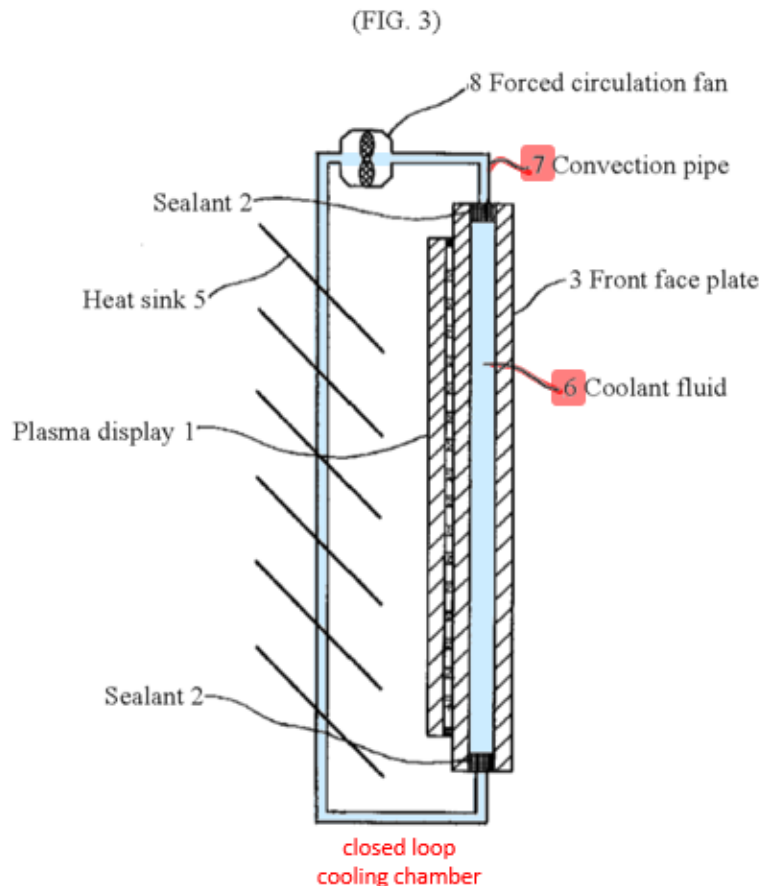
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Ohta is prior art to the '287 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b).

86. Ohta discloses a “cooling device for plasma display panel” that includes a “container that is directly mounted at an appropriate space from the plasma display panel so as to form an airtight container between itself and the plasma display panel, and coolant that either flows in/out of this airtight container.” (Ex. 1004, ¶[0006].)

87. As reflected by annotated Figure 1, Ohta's discloses that its cooling device includes a front face plate **3** “with sufficient permeability to visible light is integrated with a plasma display panel **1** by interposing sealant **2** also serving as spacer therebetween along the edges, so as to form an airtight container between the same and the display face of the plasma display panel **1**”:

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(*Id.*, ¶[0019]; FIG. 3 (annotated).) The top and bottom ends of the “interior of the airtight container formed between the front face plate **3** and the display face of the plasma display panel **1**” are connected by a convection tube **7**, and “heat sinks **5** and a forced circulation fan **8** are formed along the length of the convection tube **7**.” (*Id.*, ¶[0019].) The forced circulation fan **8** is furnished with a temperature detection device such as a thermostat or the like to detect the temperature of the plasma display panel **1** and “an external power supply (which may be shared with the drive circuit

of the plasma display panel)” to drive the fan (which is not shown in Figure 3). (*Id.*)

88. Ohta discloses that the heat from the panel “causes the coolant fluid 6 to warm up, producing convection within the airtight container formed between the front face plate 3 and the display face of the plasma display panel 1,” wherein “the heat ... is discharged to the exterior from the heat sink 5.” (*Id.*, ¶[0012].) Ohta teaches a ventilation fan that “send[s] outside air through the ventilation pipe 9 into the space between the plasma display panel 1 and the front face plate 3.” (*Id.*, ¶[0028].)

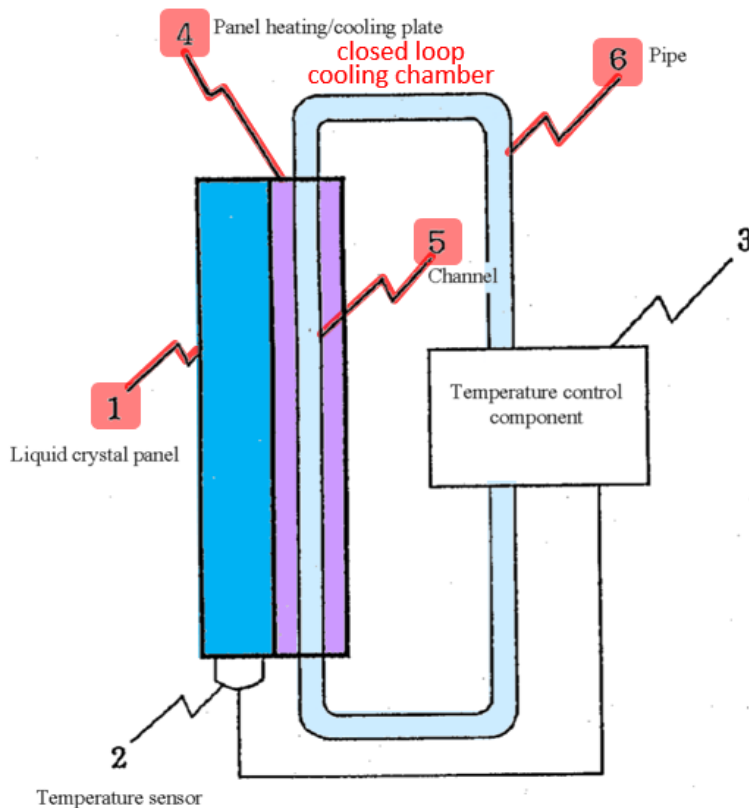
4. Marumoto [Exs. 1005, 1010]

89. Japanese Unexamined Patent Publication H8-152604 (“Marumoto”) (Exs. 1005, 1010),⁷ titled “Heating/Cooling System for Liquid Crystal Panel,” was published on June 11, 1996 from Japanese Patent Application H6-319212, filed November 29, 1994. I understand that Marumoto is prior art to the ’278 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b).

90. Marumoto discloses a “heating/cooling plate 4 [] adjoiningly provided on the back face of a liquid crystal panel 1, and a temperature control component 3 performs control according to the temperature reported by a temperature sensor 2,

⁷ Unless otherwise noted, citations herein are to the certified translation of Marumoto (Ex. 1005).

raising or lowering the temperature of the heating/cooling material passed through a channel **5** so as to heat or cool the panel heating/cooling plate.” (Ex. 1005, Abstract.)



(*Id.*, FIG. 1 (annotated).) Marumoto discloses that the “heating/cooling material may be a gas or a fluid.” (*Id.*, ¶[0007].)

5. Yare [Ex. 1013]

91. United Kingdom Patent Application No. GB 2402205A by Yare (“Yare”) (Ex. 1013), entitled “A Display System Cabinet and Display System Including Heat Removal Means,” published on December 1, 2004. I understand that Yare qualifies as prior art to the ’287 patent pursuant to at least pre-AIA 35 U.S.C.

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§ 102(b) because it was published more than one year the earliest claimed priority date of March 3, 2008 for the '287 patent.

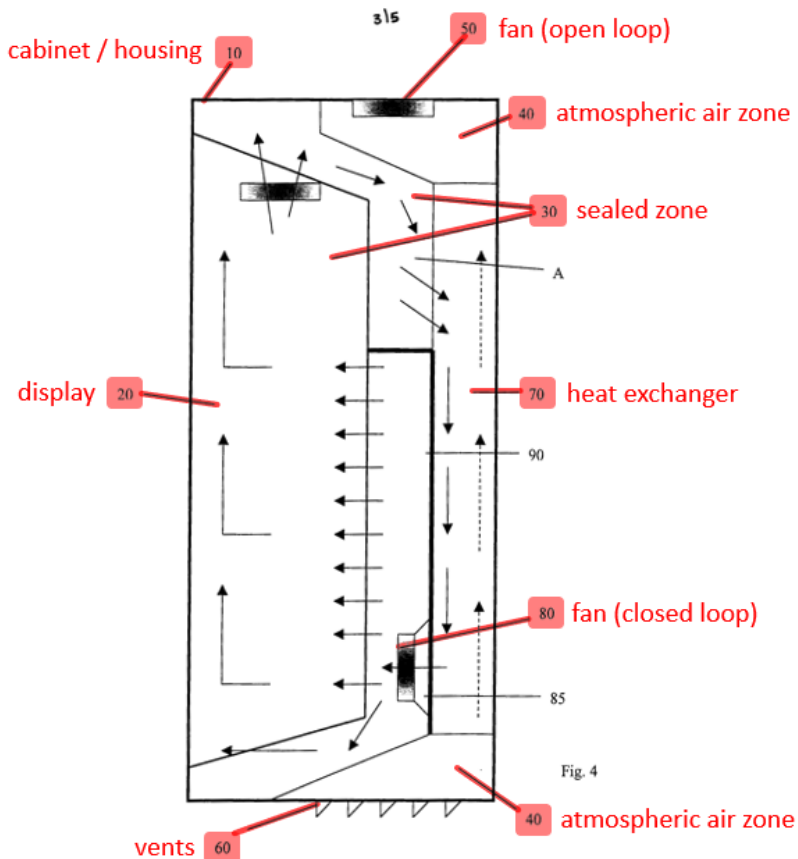
92. Yare discloses “a cabinet for mounting a display system” where the cabinet has “improved cooling facilities” and is “particularly suitable for” providing “displays in public places.” (Ex. 1013, 1:4-6.) A display according to Yare can be a “plasma, LCD or rear projection” display. (*Id.*, 1:14-15.) 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.)

93. To address these problems, Yare discloses a cabinet **10** having a sealed zone **30** that is sealed from the external environment, and contains a display **20**. (*Id.*, 4:1-7, FIG. 1; *see id.*, 2:8-9.) The sealed zone also includes an internal cooling system having fans **80**. (*Id.*, 4:31-33, FIGs. 1 & 4; *see id.*, 2:9-10.) In addition, the cabinet **10** includes an atmospheric air zone **40** and a heat exchanger **70** for transferring heat from the sealed zone **30** to the atmospheric air zone **40**. (*Id.*, 4:11-22, FIGs. 1 & 4; *see id.*, 2:19-29.) 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.)

94. 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**

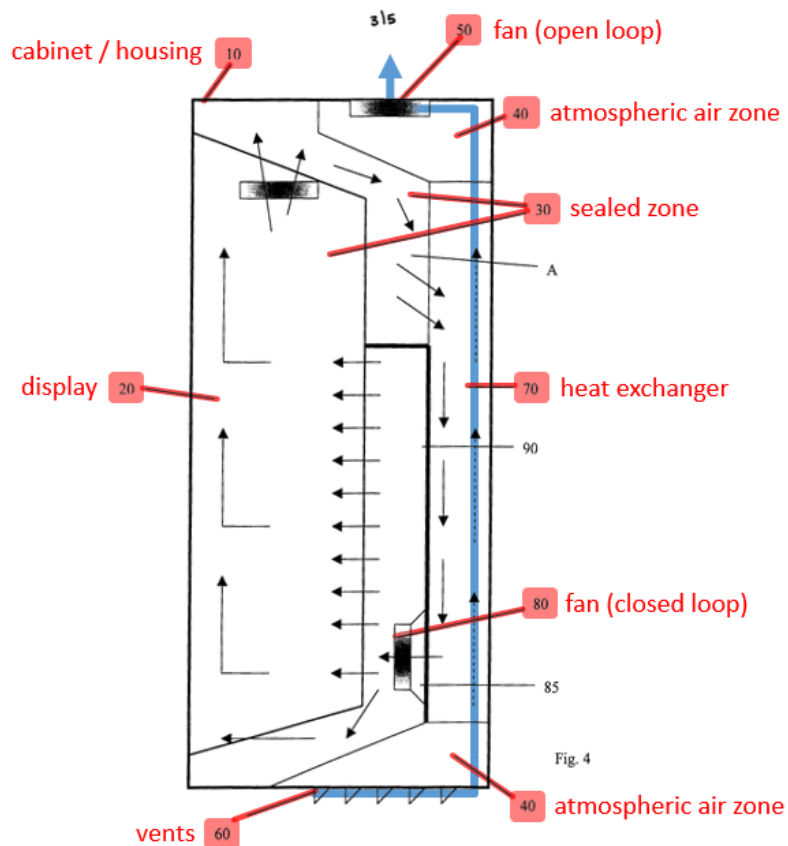
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via the heat exchanger **70**. (*Id.*, 5:2-10, FIGs. 1 & 4; *see id.*, 2:8-9.) The heated ambient air may then be released outside the cabinet **10** by the fan/exhaust **50**. (*Id.*, 5:2-10, FIGs. 1-4.) This configuration is shown below in annotated Figure 4:



(*Id.*, FIG. 4 (annotated).) Ambient air cools one side of the heat exchanger in Yare as depicted by the blue arrow below:

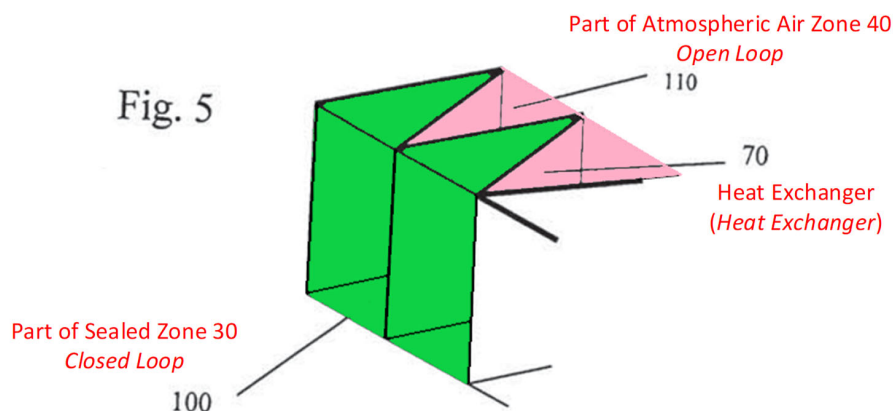
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(*Id.*, FIG. 4 (annotated).)

95. The heat exchanger 70 is further illustrated in Figure 5, reflecting that it is “sealed at the top and the bottom on the inner side to prevent atmospheric air

110 within the sealed zone from mixing”:



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

6. Kitamura [Ex. 1016, 1017]

96. Japanese Unexamined Patent Publication H8-54934 (“Kitamura”) (Exs. 1016-1017),⁸ titled “LED Display Device,” was published on February 27, 1996 from Japanese Patent Application No. H6-188257, filed August 10, 1994. Kitamura is prior art to the ’287 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b). Kitamura discloses an “LED display device” suitable for installation inside the “wall of a building.” (Ex. 1017, ¶[0004].)

97. Kitamura discloses an “LED display device” suitable for installation

⁸ Unless otherwise stated, all citations are to the Certified Translation of Kitamura (Ex. 1017).

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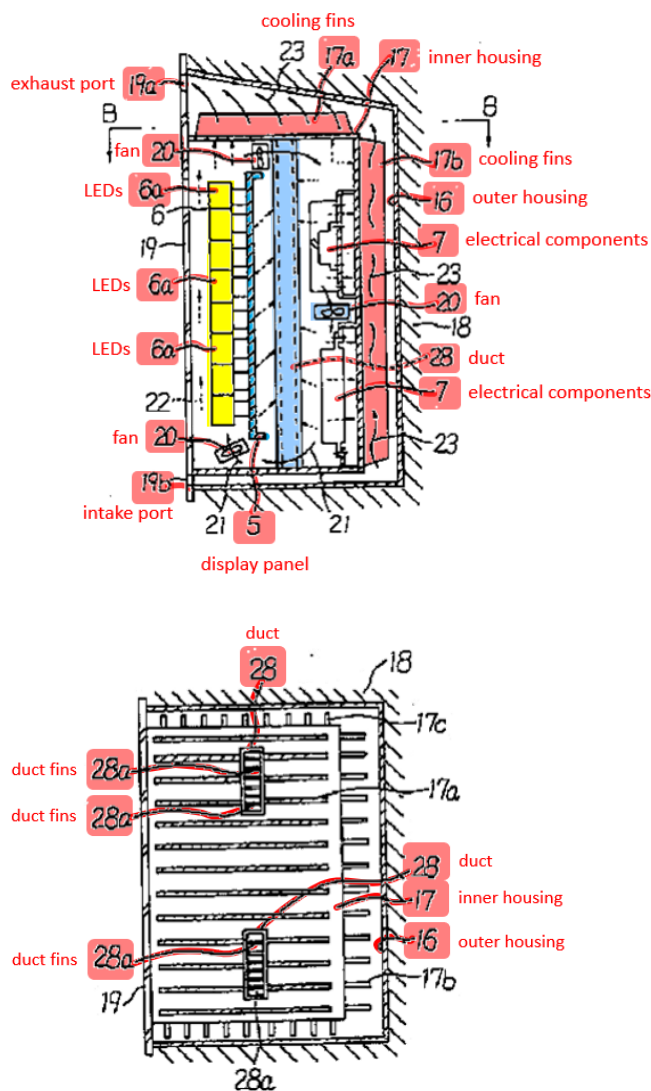
inside the “wall **18** . . . of a building.” (Ex. 1017, Title, ¶[0011].) “[A] display panel **5** is arranged within the inner housing **17** in a position parallel to the screen **19**, and an LED module **6** with rows of LED **6a**, **6a**, etc. is attached to the front-facing side of the display panel **5**.” (*Id.*, ¶[0014].) “Electrical parts for control **7**, **7** are attached to the rear side of the inner housing **17** in the interior thereof.” (*Id.*) Kitamura recognizes that there is a need for a cooling apparatus because both the “LED module **6**” and “electrical parts for control **7**” operate above the “operating temperature range” during ordinary use in the LED display. (*Id.*, ¶¶[0004], [0014].) Embodiment **3** includes two rectangular tube-shaped ducts **28** which traverse through the chamber where the top and bottom ends open into the space between the inner housing **17** and outer housing **16**. (*Id.* ¶[0021]; FIGs. 4-5.) The inside of the duct **28** is lined with fins and the upper and lower ends “communicate with the space between the outer housing **16** and the inner housing **17**.” (*Id.*, ¶[0021].)

98. The wall and an inner housing **17** houses the LED display. (*Id.*, ¶[0011], FIG. 4.)

99. During operation “heat circulating fans **20**, etc. activate, after which the LED module **6** illuminates,” and both the LED module **6** and the “electrical parts for control **7**, **7** produce heat.” (*Id.*, ¶[0022].) As reflected by annotated Figures 4 and 5 below, the “warmed air is then forcibly circulated in the direction of the arrow **21**

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within the inner housing **17** by the heat circulating fans **20**, etc., uniformly dispersing
the warmed air throughout the inner housing **17**”:



(*Id.*, ¶[0022]; FIGs. 4-5 (annotated).) Heat is then conductively transferred to the
fins inside duct **28** and cooling fins **17a** and **17b** attached to the outer surface of
inner housing **17**. (*Id.*, ¶[0023].) Heat transferred to the cooling fins **17a** and **17b**

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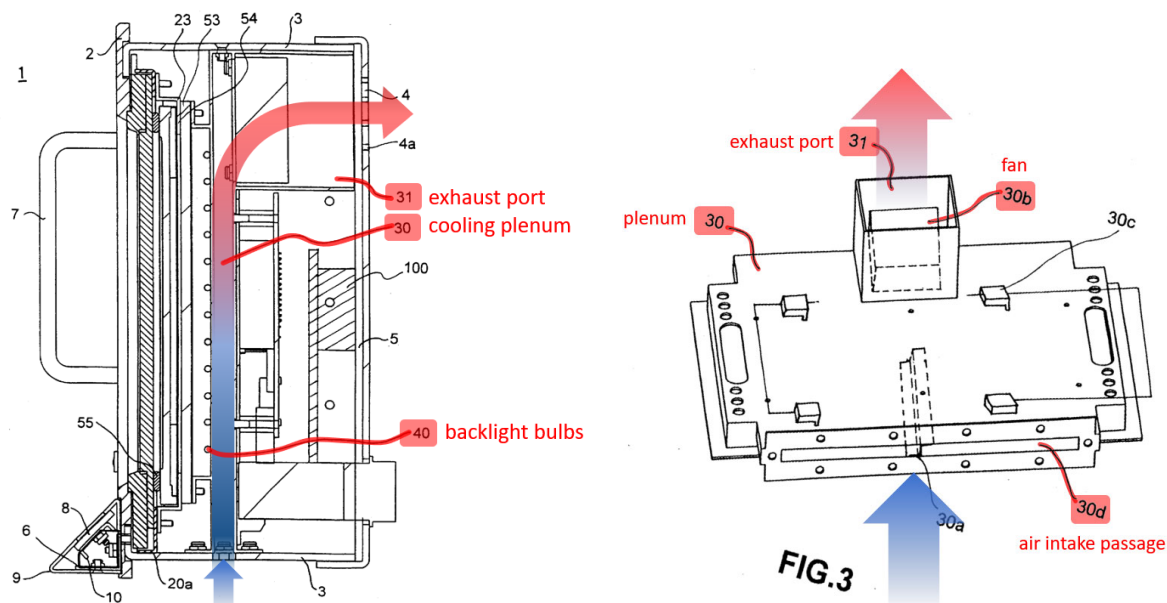
and duct **28** is radiated to the space between the inner housing **17** and outer housing **16** before being discharged through exhaust port **19a** by natural convection processes. (*Id.*)

7. Harris [Ex. 1018]

100. U.S. Patent No. 5,748,269 (“Harris”) (Ex. 1018), entitled “Environmentally-Sealed, Convectively-Cooled Active Matrix Liquid Crystal Display,” issued on May 5, 1998 from U.S. Patent Application No. 754,324, filed November 21, 1996. Harris is prior art to the ’287 patent pursuant to at least pre-AIA 35 U.S.C. § 102(b).

101. Harris discloses a housing used to “permanently mount[]” a liquid crystal display that includes a “backlighting unit” and a “cooling plenum [] for conductively and convectively cooling the backlighting unit which is mounted directly to a surface of the plenum.” (Ex. 1018, 2:8-26.) Cooling of the backlight is achieved because the plenum **30** “includes a hollow channel” for ambient air flow generated by a fan. (*Id.*, 5:18-23.) As reflected by annotated Figures 1 and 3, “air enters the plenum **30** through the intake passage/ orifice **30d** along the bottom of the display enclosure **3**, and exits at the air exhaust port **31** of the top of the rear cover **4**”:

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(*Id.*, 6:26-31, FIGs. 1, 3 (annotated).)

VII. GROUND 1 – CLAIMS 12-23 ARE OBVIOUS OVER KARPPANEN

A. Claim 12

102. In my opinion, Karppanen renders obvious claim 12 of the ‘287 patent.

1. 12[pre]

12[pre]	An electronic display assembly comprising:
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103. In my opinion, to the extent the preamble of claim 12 is limiting, Karppanen discloses or renders obvious “[a]n electronic display assembly.”

104. Karppanen’s system includes a display element 26, which can be a flat screen “TFT LCD display” or “some other suitable, flat electronic display element, such as plasma display, a LED display or an organic LED display.” (Ex. 1006,

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Abstract, 6:21-24, 8:8-11.) In March 2008, a POSITA would have known that a flat screen LCD display is an “electronic display assembly.”

105. Accordingly, Karppanen discloses or renders obvious “[a]n **electronic display assembly.**”

2. 12[a]

12[a]	a housing;
-------	------------

106. In my opinion, Karppanen discloses or renders obvious the limitation of claim 12 requiring “**a housing.**”

107. Karppanen teaches “an electronic information board comprising a frame (40), a flat display element (26) ... a weatherproof display casing (10) ... and a weatherproof device casing (12) for the electronic equipment needed for controlling the display element.” (Ex. 1006, Abstract.) Between the casings, “there is a common cooling space (20) for cooling the devices in the display casing and the device casing.” (*Id.*)

108. Karppanen discloses that an information board shown in Figure 2 “has been placed inside the display casing, and the electronic equipment needed in the control of the display element have been placed inside the device casing.” (*Id.* 6:21-24.) As shown below in referenced to annotated Figure 1, Karppanen teaches “[i]n normal use, the display casing [10] and the device casing [12] are turned against

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each other to a closed position”:

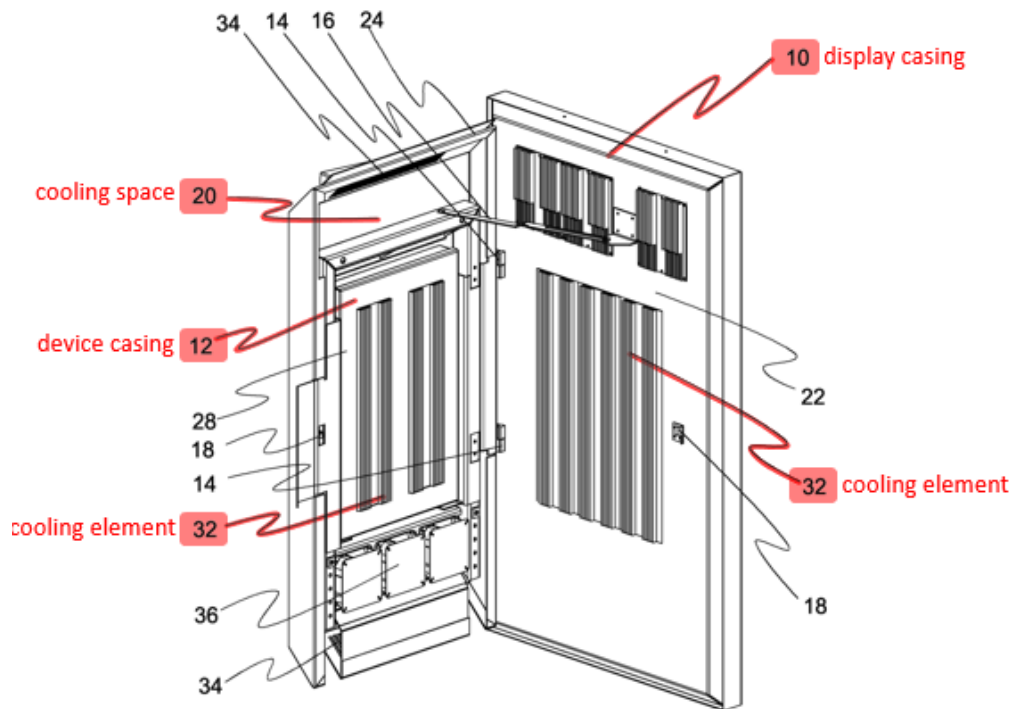


Fig.1

(*Id.*, 7:7-11, FIG. 1 (annotated).) Accordingly, Karppanen discloses or renders obvious “a housing.”

3. 12[b]

12[b]	a liquid crystal display (LCD) positioned within the housing and having a backlight;
-------	--

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109. In my opinion, Karppanen discloses or renders obvious the limitation of claim 12 requiring “a liquid crystal display (LCD) positioned within the housing and having a backlight.”

110. The “electronic information display” disclosed in Karppanen includes “a flat display element **26**, such as a TFT LCD display or plasma display for displaying information.” (Ex. 1006, Abstract; 3:21-23.)

111. Karppanen discloses that “[t]he display element **26** of the information board (Fig. 2) has been placed inside the display casing, and the electronic equipment needed in the control of the display element have been placed inside the device casing.” (*Id.*, 6:21-24, FIG. 2.) Accordingly, since the device casing is part of Karppanen’s housing, flat display element **26** is positioned within the housing.

112. In my opinion, the LCD display in Karppanen also discloses or suggests use of a backlight. For example, Karppanen states that device casing **12** contains “electronic equipment needed in the control of the display element,” including “the power supplies of the background light of the display.” (*Id.*, 6:21-26; *see also id.* 3:32-34, claim 5, FIG. 1.) A POSITA would understand the reference to “background light” to mean a “backlight in an LCD display **26** because a plasma display does not require any “background light.” Thus, in my opinion, Karppanen

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discloses or at least suggests a backlight for the LCD display **26**.

113. Moreover, the display casing includes “cooling elements **32** [e.g., heat sinks] which have a first heat transfer part **60** extending to the inside of the display casing.” (*Id.*, 8:13-14.) Karppanen discloses that “[t]he first heat transfer part ... is placed so that it touches the heat source.” (*Id.*, 8:29-32.) And as shown in annotated Figure 2 below, the first heat transfer part **60** touches the rear surface of the LCD display:

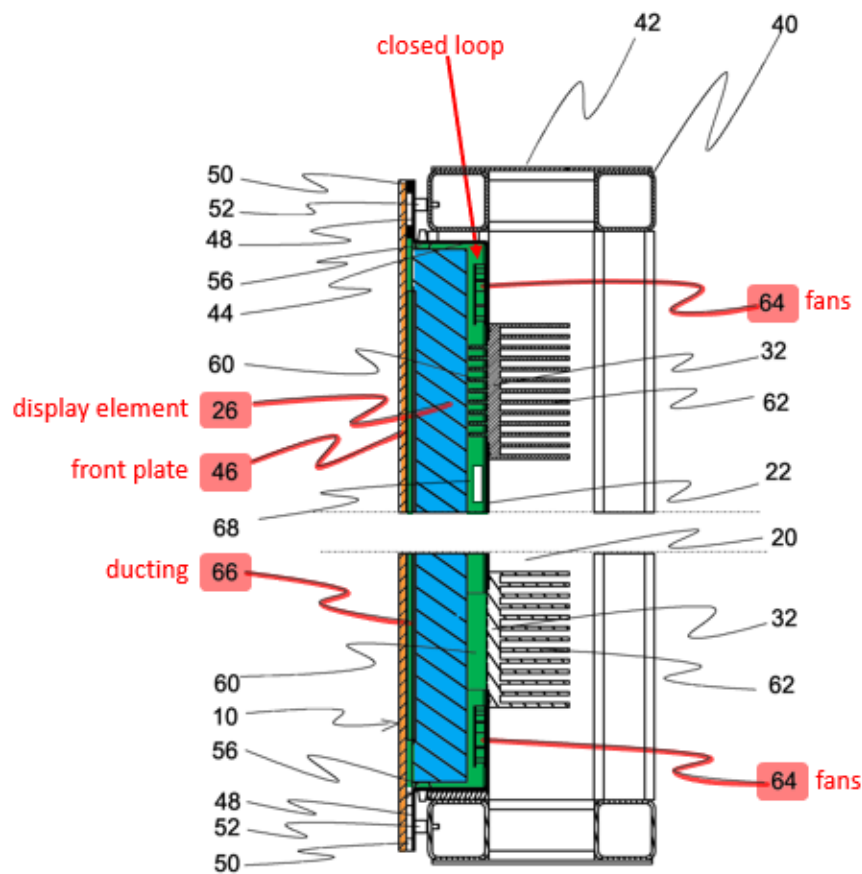


Fig. 2

(*Id.* FIG. 2 (annotated).) A POSITA in March 2008 would have understood that the referenced “heat source” referenced in Karppanen (i.e., *id.*, 8:29-32) is a backlight and, therefore, that Figure 2 depicts an LCD display with a backlight.

114. Further, in my opinion, a POSITA also would have understood Karppanen’s references to a “background light” (*e.g.*, *id.* 3:32-34, 6:21-26, claim 5) to be referring to a “backlight” in an LCD display 26 because a plasma display, for instance, does not require any “background light.” Moreover, a POSITA would have

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understood that an LCD display necessarily includes a backlight in order to form an image on screen and because, an LCD stack, alone lacks any light source.

115. Accordingly, Karppanen discloses or renders obvious the limitation of claim 12 requiring “a liquid crystal display (LCD) positioned within the housing and having a backlight.”

4. 12[c]

12[c]	wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.
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116. In my opinion, Karppanen discloses or renders obvious the limitation of claim 12 requiring “wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.”

117. In my opinion, Karppanen discloses an electronic display that is capable of being cooled by both a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.

118. The electronic display in Karppanen is placed into a sealed display

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casing. (Ex. 1006, 7:27-38 (discussing components which create a “closed display casing”). Karppanen discloses that “[i]nside the display casing on the back wall **22** there are fans **64**, which circulate air [an ‘isolated gas’] in the space between the display element and the walls of the display casing,” such that the display casing is encircled by a closed loop of isolated gas which circulates within the housing. (Ex. 1006, 9:3-8; *see also id.* 4:29-36.) The closed loop air flowing in the space between the display element and the walls of the display casing is essentially isolated from the external air in the housing of the display. (*Cf.* Ex. 1001, 4:9-11.) As shown below in annotated Figure 2 below, a front plate **46** and ducting **66** create a gap through which this isolated air is permitted to pass along the front side of the display (e.g., one half of the closed loop):

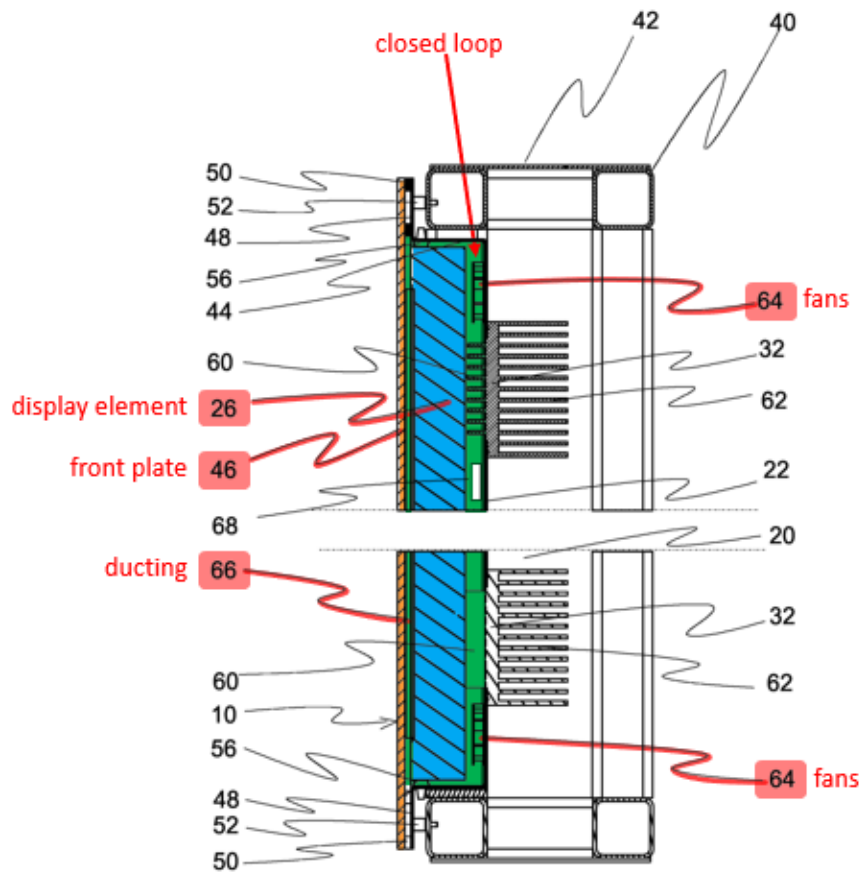


Fig. 2

(Ex. 1006, 9:5-8 & FIG. 2 (annotated).) The ducting **66** “direct[s] the circulation of air around the display element [26].” (*Id.*, 4:32-36.) The closed loop thus circulates isolated air within the housing, and is a “gas pathway within a display housing containing gas that is essentially isolated from external air,” so as to satisfy the Delaware District Court’s construction for “closed loop.” (Ex. 1011, at 2; Ex. 1012, at 8.) This closed loop of air also “transfer[s] heat from the display casing to the outside of the display casing.” (*Id.*, 3:28-32.) In my opinion, Karppanen therefore

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teaches a “closed loop” as defined by the District Court that is capable of cooling the electronic display.

119. In my opinion, Karppanen also teaches an open loop of ambient air which passes through the housing and along the backlight. Specifically, Karppanen discloses a “cooling space 20” between the display casing and the device casing, and located behind the electronic display as shown in annotated Figure 2 below:

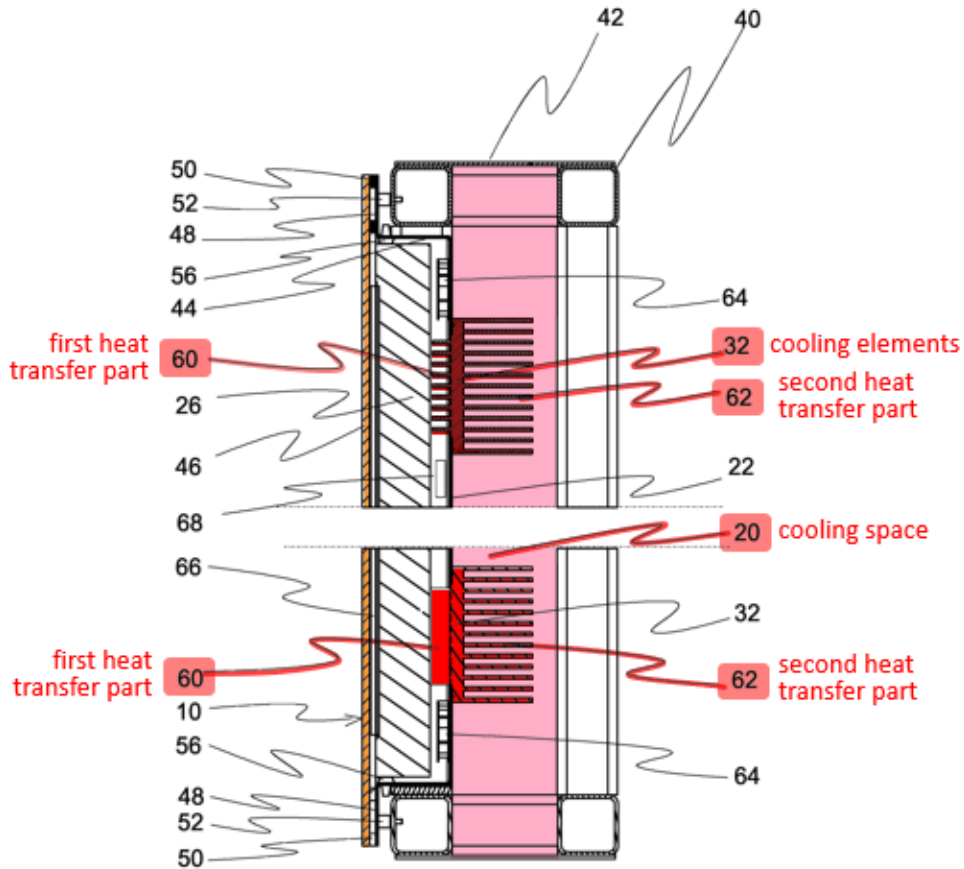


Fig. 2

(*Id.*, FIG. 2 (annotated); *see also id.*, 7:7-14, 8:13-16.) The closed loop in Karppanen

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is thermally connected to cooling space **20** through “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.” (*Id.*, 8:13-16.)

120. The second heat transfer part comprises a number of plate-like cooling fins placed side-by-side. (*Id.*, 8:16-17.) When the cooling air flows between the fins, “heat is transferred from the cooling fins to the air of the cooling space.” (*Id.*, 8:17-19.) “The task of the cooling elements is to transfer excess thermal energy from the display casing to the cooling space, from which it is further conducted by the air flow produced by the cooling fans **36** out from the entire device.” (*Id.*, 8:19-22.)

121. As illustrated in annotated Figure 3, “flow controllers **70** made of a shaped metal sheet have been fastened to the back wall **22** of the display casing **10**” to create “horizontal flow ducts **72**, inside which the second heat transfer parts **62** of the cooling elements **32** and the cooling fans **36** fastened to the back wall are placed”:

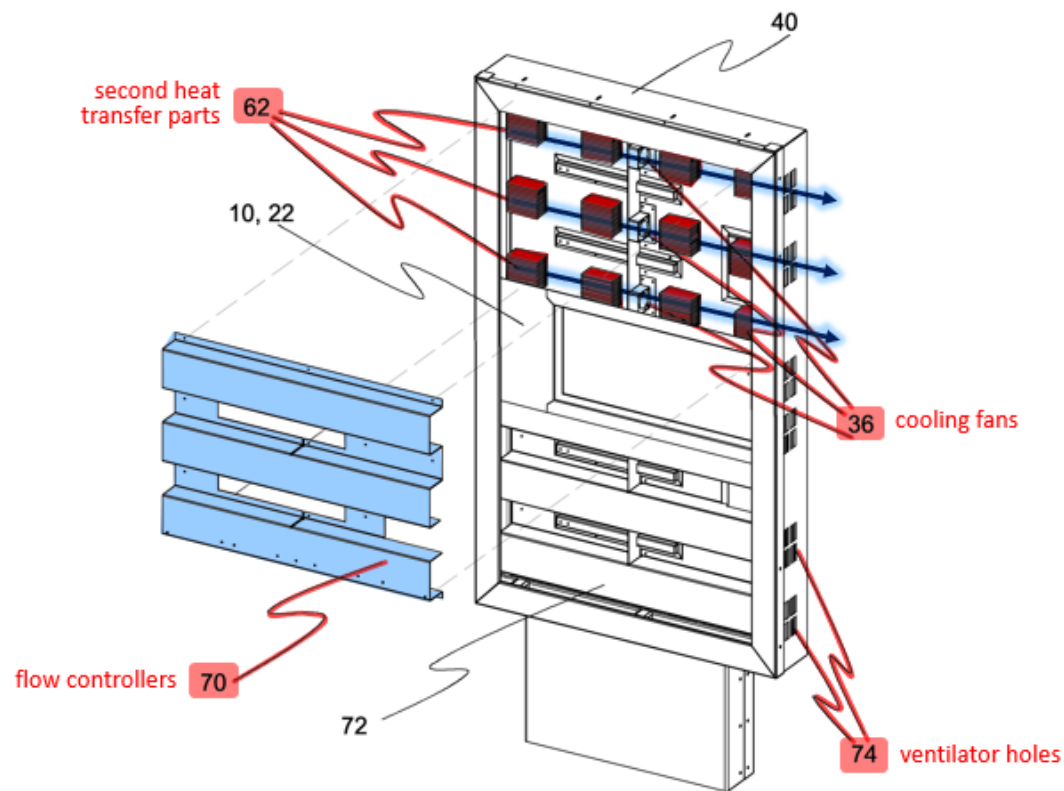


Fig. 3

(*Id.* 10:36-11:4; FIG. 3 (annotated).) Karppanen further discloses that “ventilator holes 74 [] enable the air flow produced by the cooling fans to pass along the flow duct through the cooling space 20.” (*Id.*, 11:6-8.) While the configurations in Figures 1 and 3 in Karppanen differ slightly in that Figure 3 is in a pedestal format as opposed the rectangular block format in Figure 1, a POSITA would understand that the cooling systems disclosed in Karppanen could be used in either configuration. Indeed, Karppanen suggests that the cooling concepts can be used

interchangeably across embodiments. (Ex. 1006, 3:21-34, 11:17-27.)

122. Karppanen further discloses that the thermal communication between the closed loop display case and the open loop portion cools the electronic display. (*Id.*, 8:16-22 (The second heat transfer part “comprises a number of plate-like cooling fins ... The task of the cooling elements is to transfer excess thermal energy from the display casing to the cooling space, from which it is further conducted by the air flow produced by the cooling fans **36** out from the entire device.”).) In my opinion, the electronic display is thus capable of being cooled by the open loop of ambient air which passes through the housing.

123. Moreover, in my opinion, Karppanen teaches an open loop of ambient air which passes through the housing and along a backlight because Karppanen’s open loop of ambient air passes through the housing and is in thermal communication with, the backlight. As noted above, Karppanen discloses or at least suggests a backlight for the LCD display. (*Supra*, §VII.A.3.) The horizontal flow of ambient air in the cooling space **20** is along the backlight and passes through the housing. (Ex. 1006, 7:7-14, 8:13-16; FIG. 2.) And as in the Heady reference (Ex. 1019) discussed during prosecution of the ’079 patent parent application, the air flowing through the heat exchanger “cooling elements” also is in thermal communication with the backlight, because first heat transfer parts **60** are placed in

direct contact with the backlight thereby conducting heat “along the backlight.”

124. Accordingly, Karppanen discloses or renders obvious the limitation “wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.”

B. Claim 13

13	The electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD.
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125. In my opinion, Karppanen renders obvious claim 13, which requires “[t]he electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD.”

126. As noted above (*supra*, §VII.A.4), the closed loop of isolated gas (i.e. air) which circulates within the housing in Karppanen cools a front surface of the LCD. (Ex. 1006, 9:7-8 (“The fans **64** force the air of the inner casing to flow past the front plate **46** of the device.”); *see also id.* 4:29-36, FIG. 2.) As Figure 2 reflects, the “front plate **46**” is positioned on the front of “display element **26**” and its associated LCD.

127. Accordingly, Karppanen renders obvious claim 13, which requires “[t]he electronic display assembly of claim 12 wherein: the isolated gas will cool a

front surface of the LCD.”

C. Claim 14

128. In my opinion, Karppanen renders obvious claim 14 of the '287 patent.

1. 14[a]

14[a]	The electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas;
-------	---

129. In my opinion, Karppanen discloses or renders obvious the limitation of claim 14 that requires “[t]he electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas.”

130. As shown in annotated Figure 2 below, the closed loop includes a first gas chamber located between the front surface of the electronic display element **26** and the front plate **46** and a rear cooling chamber located between the rear surface of the electronic display element **26** and the display case back wall **22**:

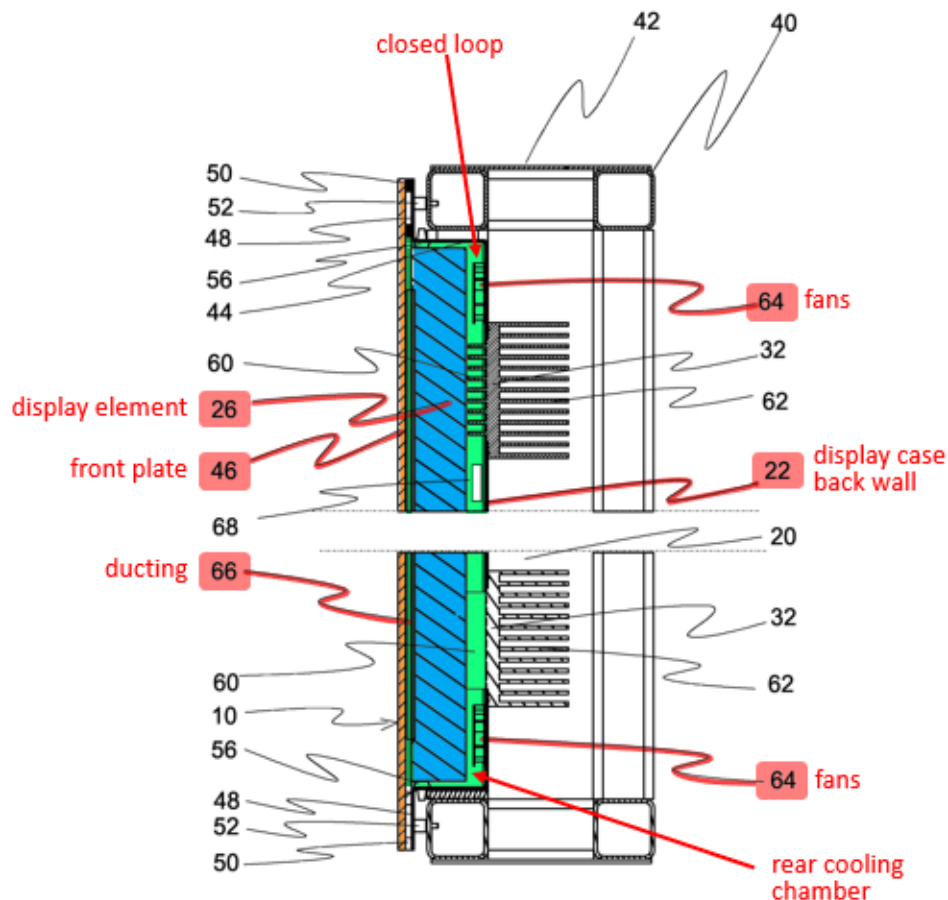


Fig. 2

(*Id.*, FIG. 2 (annotated).) Karppanen discloses that the “air flows past the front plate **46** of the device,” which as annotated Figure 2 reflects, means the closed loop necessarily is positioned behind the display element **26** and its associated LCD. (*Id.* 9:7-8, FIG. 2.)

131. Accordingly, Karppanen discloses or renders obvious “[t]he electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas.”

2. 14[b]

14[b]	and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber.
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132. In my opinion, Karppanen discloses or renders obvious the limitation of claim 14 requiring “and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber.”

133. As noted above, Karppanen teaches an open loop of ambient air which passes through “cooling space **20**” located behind the electronic display. (*Supra*, §VII.A.4.) In my opinion, that open loop ambient air contacts an exterior surface of the rear cooling chamber (e.g., exterior surface of display case back wall **22**). Yet, despite this contact, as reflected by Figure 2, the horizontal flow of ambient air in the open loop in cooling space **20** is sufficiently blocked by back wall **22** that it does not enter the rear cooling chamber. (Ex. 1006, FIG. 2.)

134. Accordingly, Karppanen discloses or renders obvious the limitation of claim 14 requiring “and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber.”

D. Claim 15

15	The electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber.
----	--

135. In my opinion, Karppanen discloses this element. Alternatively, in March 2008, it would have been obvious to a POSITA to modify Karppanen to include an electronic component for driving the LCD in the rear cooling chamber.

136. As noted above, Karppanen teaches or suggests an LCD containing a backlight. A POSITA would understand that a driver or other electrical component like cabling is needed to control the backlight in display element **26** and that the most obvious and conventional location to place such components in Karppanen is on the rear surface of the display element **26**. First, practically speaking, there is minimal space in the ducting on the front and side surfaces of the display in which the driver or cabling can be placed. (Ex. 1006, FIG. 2.) Second, placing a backlight driver or cabling on the front surface would impede the ability to view the images being displayed. Indeed, Karppanen discloses “the device casing contains at least the control unit of the information board, the power supply of the control unit and the power supply of the background light of the display.” (*Id.*, 3:32-34.) A POSITA would understand this disclosure to imply that the driver for the backlight is located

in the display casing. A driver located on the rear surface of the display element **26** would be in the rear cooling chamber. Further, a POSITA would understand that the most common placement of LCD drivers on an LCD module would be on the rear casing, as close to the LCD panel as practical to reduce electronic noise and signal degradation.

137. Accordingly, Karppanen renders obvious claim 15, which requires “[t]he electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber.”

E. Claim 16

16	The electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber.
----	---

138. In my opinion, Karppanen renders obvious claim 16, which requires “[t]he electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber.”

139. As noted above in conjunction with claim 14[b], the open loop of

ambient air in Karppanen contacts an exterior surface of the rear cooling chamber. (*Supra*, §VII.C.2.) Further, as noted in conjunction with the discussion of claim 14[a], the rear cooling chamber contains the closed loop of isolated gas. (*Supra*, §VII.C.1.) In my opinion, therefore, the closed loop of isolated gas contacts the interior surface of the rear cooling chamber (e.g., the interior surface of display case back wall **22**), just as the open loop of ambient air contacts the exterior surface of the rear cooling chamber (e.g., the exterior surface of display case back wall **22**).

140. Accordingly, Karppanen renders obvious claim 16, which requires “[t]he electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber.”

F. Claim 17

17	The electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow.
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141. In my opinion, Karppanen renders obvious claim 17, which requires “[t]he electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow.”

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142. As shown in annotated Figures 2 and 3 below, the closed loop isolated gas flow in Karppanen flows predominantly in a vertical direction along the front and back surfaces of display element **26**:

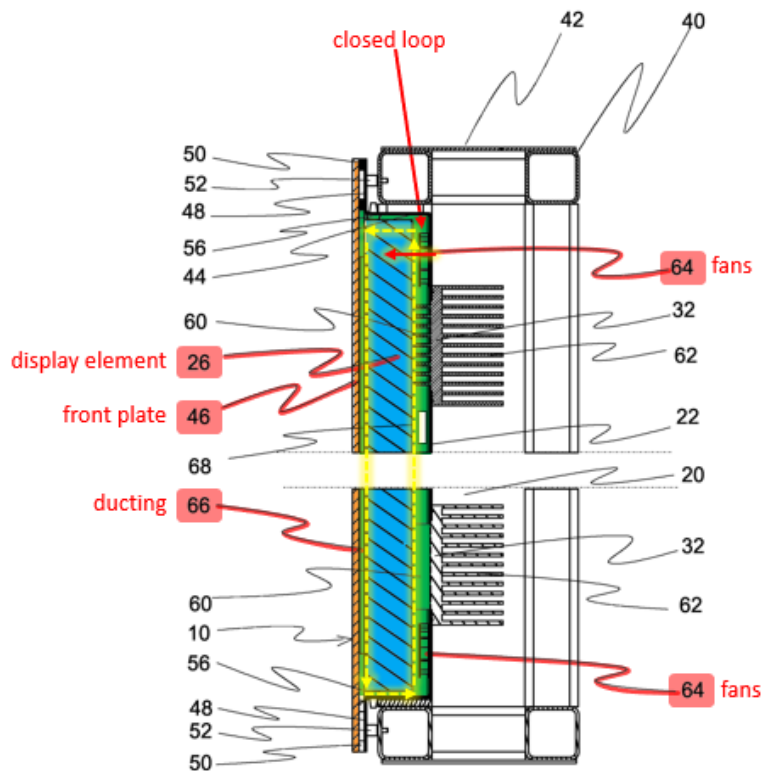


Fig. 2

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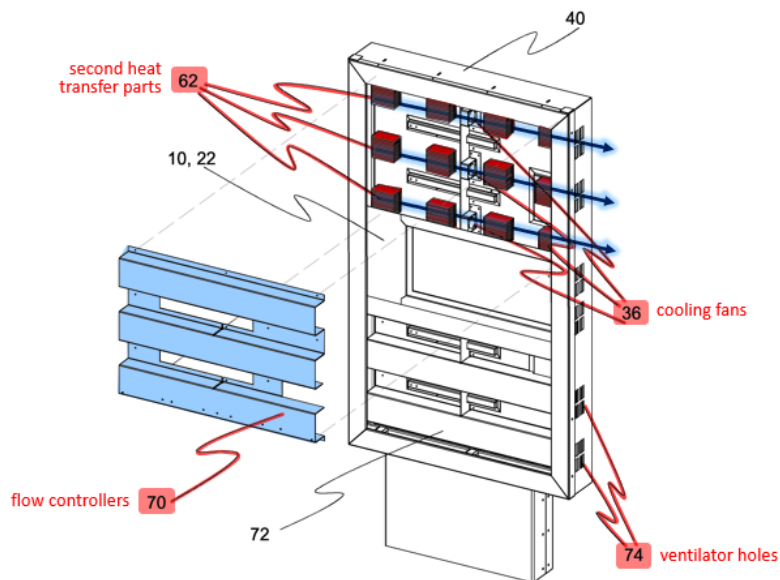


Fig. 3

(Ex. 1006, FIGs. 2 & 3 (annotated); *see also id.*, 4:32-36.) Meanwhile, as can also be seen from the annotated Figures, the open loop of ambient air flows in a horizontal direction along “horizontal flow ducts **72**” through ventilator holes **74** located on each side of the electronic information board, which is substantially perpendicular to the intended direction of open loop of ambient air flow. (*Id.*, 4:19-22, 11:1:4.) Underscoring that fact, Karppanen likewise discloses that while the open loop “flow ducts” have been depicted “in a horizontal position,” “it is also possible to form flow ducts ... in a vertical or oblique position.” (*Id.*, 11:13-15.)

143. Accordingly, Karppanen renders obvious claim 17, which requires “[t]he electronic display assembly of claim 12 wherein: the intended direction of

closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow.”

G. Claim 18

144. In my opinion, Karppanen renders obvious claim 18.

1. 18[pre]

18[pre]	An electronic display assembly comprising:
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145. In my opinion to the extent the preamble of claim 18 requiring “[a]n **electronic display assembly**” is limiting, Karppanen discloses or renders obvious this limitation for the same reasons Karppanen discloses or renders obvious the preamble requirement of claim 12 for the identically worded “an electronic display assembly.” (*See supra*, §VII.A.1.)

146. Accordingly, Karppanen discloses or renders obvious “[a]n **electronic display assembly**.”

2. 18[a]

18[a]	a housing:
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147. In my opinion, Karppanen discloses or renders obvious the limitation of claim 18 requiring “a **housing**” for the same reasons Karppanen discloses the identical limitation of “a housing” in claim 12[a]. (*See supra*, §VII.A.2.)

148. Accordingly, Karppanen discloses or renders obvious “**a housing.**”

3. 18[b]

18[b]	an electronic display positioned within the housing:
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149. In my opinion, Karppanen discloses or renders obvious the limitation of claim 18 requiring “**an electronic display positioned within the housing.**”

150. As noted above in conjunction with claim 12[b], Karppanen discloses “a flat display element **26**” which can be an LCD, that is located within a device casing, or housing. (*See supra*, §VII.A.3; *see also* Ex. 1006, Abstract, 3:21-23, 6:21-24, FIG. 2.) In March 2008, a POSITA would have understood that an LCD display is one type of “electronic display.”

151. Accordingly, Karppanen discloses or renders obvious the limitation of claim 18 requiring “**an electronic display positioned within the housing.**”

4. 18[c]

18[c]	a rear cooling chamber positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display;
-------	---

152. In my opinion, Karppanen discloses or renders obvious in multiple ways the limitation of claim 18 that requires “a rear cooling chamber positioned behind the electronic display and containing an electrical component which is

electrically connected to the electronic display.”

153. First, as discussed above in conjunction with claim 14[a], there is a rear cooling chamber positioned behind the LCD that is part of the display element **26** (i.e. the electronic display), and hence is located between the rear surface of the electronic display element **26** (and its associated LCD), and the display case back wall **22**. (*See supra*, §VII.C.1; *see also* Ex. 1006, FIG. 2.) In my opinion, as explained above in conjunction with claim 15, in March 2008 it would have been obvious to a POSITA to place an electrical component that is electrically connected to the electronic display in the closed loop in order to drive the LCD. (*See supra*, §VII.D.)

154. Second, Karppanen discloses that the “electronic equipment needed in the control” of the display element **26**, including a “programmable control unit with its power supply for controlling the display, and the power supplies of the background light of the display” have been “placed inside the device casing” of the cooling system, which as reflected by annotated Figure 2 (below) includes a second rear cooling chamber:

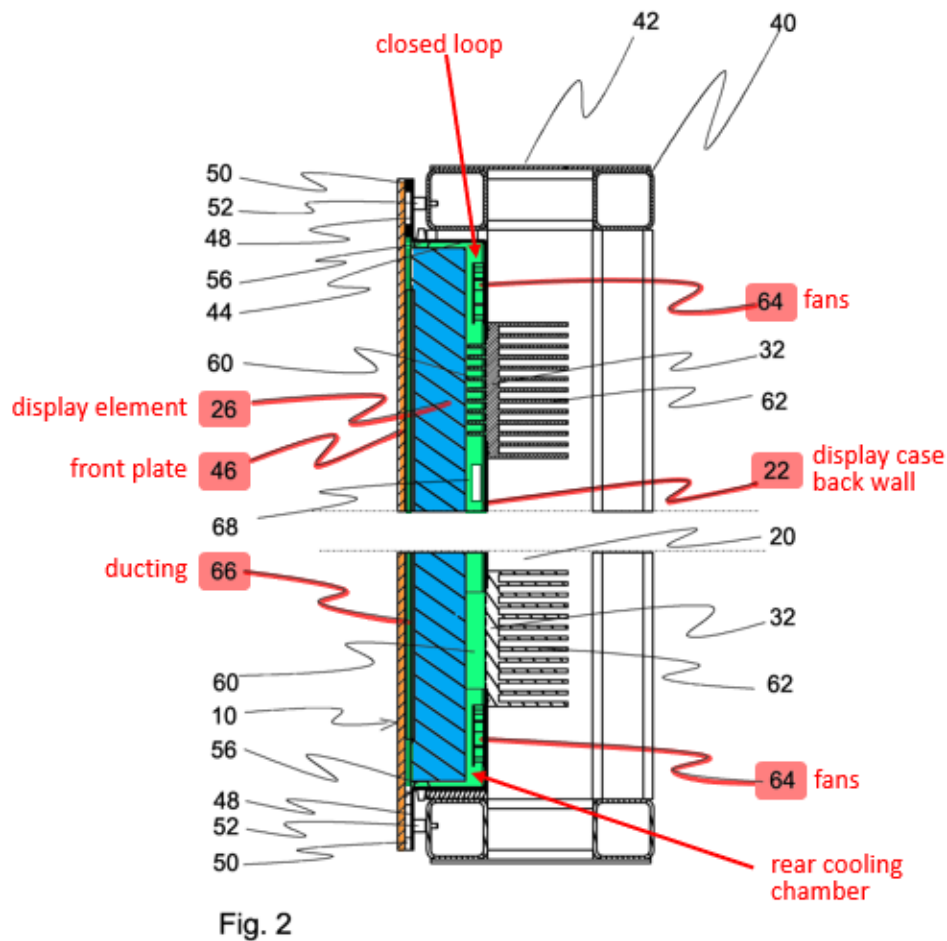
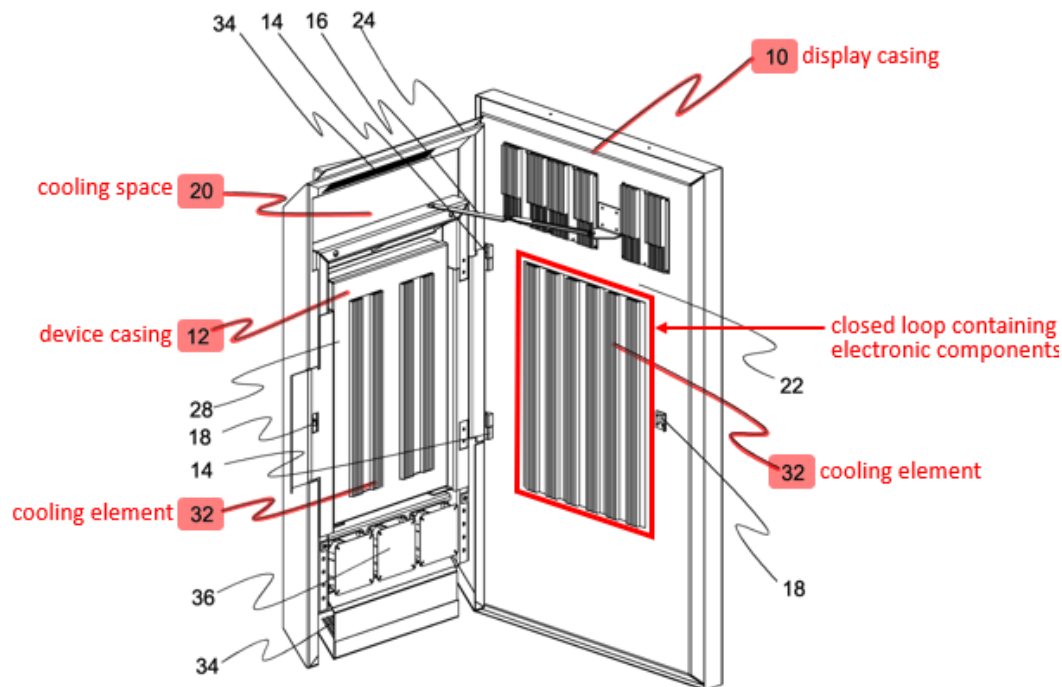


Fig. 2

(*Id.* 6:22-26, FIG. 2 (annotated)). In March 2008, a POSITA would have recognized that these components are electrically connected to the display.

155. Further, as shown in annotated Figure 1, the device casing **12** is positioned behind the electronic display element **26**:



(*Id.*, FIG. 1 (annotated).) And Karppanen’s device case includes its own cooling elements **32** and fans **36** which cool components located therein. (*Id.*, Abstract.) A POSITA in March 2008 also would have understood that the device casing **12** in Karppanen presents a second rear cooling chamber behind the display containing an electrical component (e.g., the control unit of the information board, the power supply of the control unit and the power supply of the background light of the display) which is electronically connected to the electronic display element **26**.

156. Accordingly, Karppanen discloses or renders obvious “a rear cooling chamber positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display.”

5. 18[d]

18[d]	a front surface on the electronic display which faces an intended viewer and a rear surface on the electronic display which opposes the front surface;
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157. In my opinion, Karppanen discloses or renders obvious the limitation of claim 18 requiring “a front surface on the electronic display which faces an intended viewer and a rear surface on the electronic display which opposes the front surface.”

158. Karppanen discloses a display element **26** having a front surface and a rear surface. (Ex. 1006, FIG. 2.) The display element is intended to have a “large viewing angle” relative to its viewing audience. (*Id.*, 1:17-22.) On the front surface of the display element **26** is a “transparent front plate” that “is preferably made of shock-resistant glass.” (*Id.*, 4:25-27.) Given this configuration, in my opinion, in March 2008 a POSITA would have understood that the front surface of the display element **26** in Karppanen faces an intended viewer. Likewise, in my opinion, in March 2008, a POSITA would have recognized that it is self-evident that that the rear surface on this electronic display opposes the front surface.

159. Accordingly, Karppanen discloses or renders obvious the limitation of claim 18 requiring “a front surface on the electronic display which faces an intended

viewer and a rear surface on the electronic display which opposes the front surface.”

6. 18[e]

18[e]	wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air.
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160. In my opinion, Karppanen discloses or renders obvious the limitation of claim 18 of “wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air” for the same reasons Karppanen discloses or renders obviously the limitations of claims 12[c], 13 and 14. (*See supra*, §§VII.A.4, VII.B, VII.C.)

161. In my opinion, in March 2008, a POSITA would have recognized that the rear surface of display element **26** is coolable by the open loop of ambient air because the open loop is in thermal communication with the rear surface of the electronic display via at least heat transfer parts **60**. And the closed loop air flowing in the space between the display element and the walls of the display casing is essentially isolated from the external air in the housing of the display, so as to be a “closed loop of isolated gas.” (*Cf.* Ex. 1001, 4:9-11.)

162. Accordingly, Karppanen discloses or renders obvious the limitation

“wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air.”

H. Claim 19

19	The electronic display assembly of claim 18 wherein: the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas when it passes through the housing.
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163. In my opinion, Karppanen renders obvious claim 19, which requires “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas when it passes through the housing.”

164. As noted above with respect to the discussion of claim 14[b], the open loop of ambient air is prohibited from entering the rear cooling chamber when the open loop of ambient air passes through the housing. (*Supra*, §VII.C.2.) Hence, in March 2008, it would be obvious to a POSITA that for the same reasons any ambient air also is prohibited from “mixing with” the closed loop of isolated gas when it passes through the housing.

165. Accordingly, Karppanen renders obvious claim 19, which requires “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air

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is prohibited from mixing with the closed loop of isolated gas when it passes through the housing.”

I. Claim 20

20	The electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber.
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166. In my opinion, Karppanen renders obvious claim 20, which requires “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber.”

167. As noted above in conjunction with the discussion of claim 18[c], Karppanen discloses a rear cooling chamber located in device casing **12**. (*Supra*, §VII.G.4.) In my opinion, in March 2008 a POSITA would have recognized that the open loop of ambient air in Karppanen necessarily passes in the space that separate (i.e. “between”) the rear surface of the electronic display element **26** and an exterior surface of the rear cooling chamber located in device casing **12**, as reflected by annotated Figure 2:

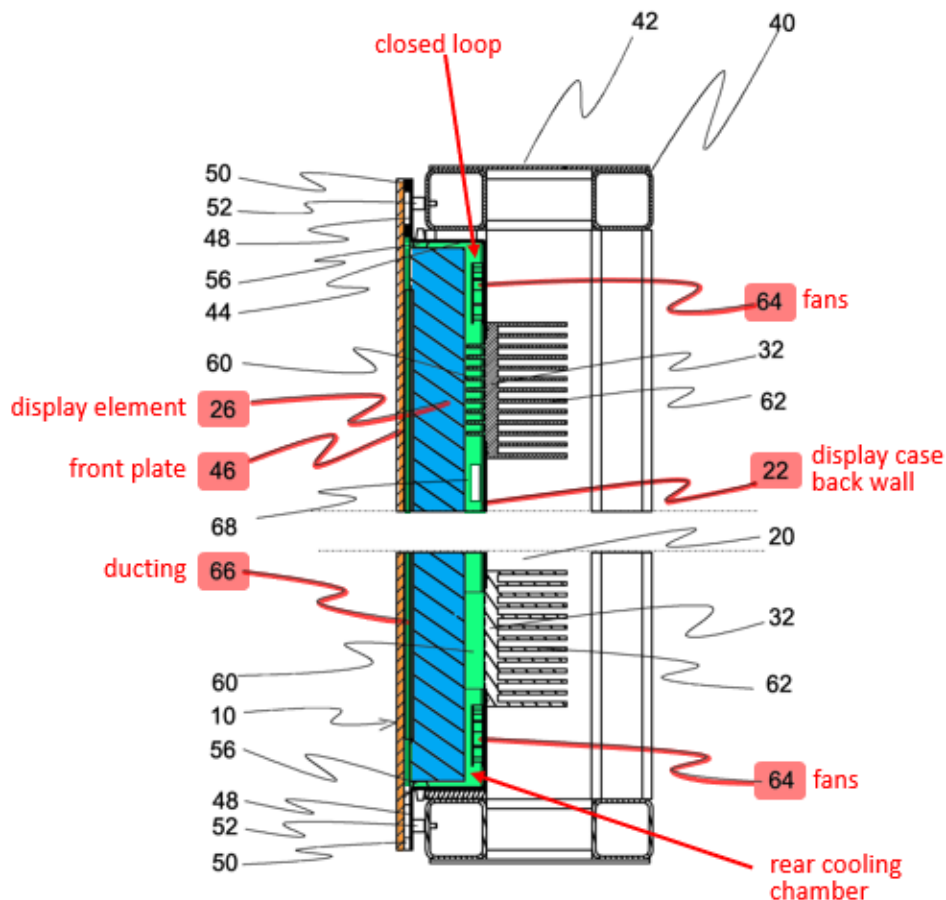


Fig. 2

(Ex. 1006, FIG. 2 (annotated).) The open loop of ambient air in Karppanen thus passes “in the space that separates” the rear surface of the electronic display element **26** and an exterior surface of the rear cooling chamber located in device casing **12**, so as to satisfy the Delaware District Court’s claim construction for “between.” (Ex. 1011, at 1; Ex. 1012, at 9-10.) Alternatively, if MRI argues that the ambient air must contact the display to satisfy this limitation, it is nonetheless disclosed in Karppanen by the first and second heat transfer parts (**60** and **62**) attached to the electronic

display and the open loop passes through cooling space **20** and contacts the second heat transfer part **62**.

168. Accordingly, Karppanen renders obvious claim 20, which requires “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber.”

J. Independent Claim 21

169. In my opinion, Karppanen renders obvious claim 21.

1. 21[pre]

21[pre]	An electronic display assembly comprising:
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170. In my opinion, to the extent the preamble of claim 21 is limiting, Karppanen discloses or renders obvious “[a]n **electronic display assembly**” for the same reasons Karppanen discloses or renders obvious the identical preamble of claim 12. (*See supra*, §VII.A.1.)

171. Accordingly, Karppanen discloses or renders obvious “[a]n **electronic display assembly**.”

2. 21[a]

21[a]	an electronic display housing:
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172. In my opinion, Karppanen discloses or renders obvious the limitation of claim 21 that requires “**an electronic display housing.**”

173. As noted above in the discussion of claim 12[a], Karppanen discloses a “housing” containing an electronic display. (*Supra*, §VII.A.2.)

174. Accordingly, Karppanen discloses or renders obvious “**an electronic display housing.**”

3. 21[b]

21[b]	a closed loop of cooling gas adapted for circulation within the electronic display housing:
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175. In my opinion, Karppanen discloses or renders obvious the limitation of claim 21 that requires “**a closed loop of cooling gas adapted for circulation within the electronic display housing.**”

176. In addition to the closed loop that surrounds the electronic display discussed above in conjunction with claim 12[c] (*see supra*, §VII.A.4), Karppanen also teaches that the same closed loop of air that surrounds the electronic display can be used to surround the electrical components located in the device casing. (Ex. 1006, 10:20-22.) Like the display casing, the device casing is also “closed.” (*Id.*, 6:20-21.) By using the same cooling systems in both the display casing **10** and device casing **12**, Karppanen teaches that the cooling “air flow circulates as forced

past all the components becoming warmed.” (*Id.*, 10:22-23.)

177. Further, as explained above in conjunction with claim 12[c] (*see supra*, §VII.A.4), Karppanen’s closed loop circulates isolated air within the housing, and is a “gas pathway within a display housing containing gas that is essentially isolated from external air,” so as to satisfy the Delaware District Court’s construction for “close loop.” (Ex. 1011, at 2; Ex. 1012, at 8.) Therefore, in my opinion, a POSITA in March 2008 would understand that Karppanen’s closed loop of cooling gas in the device casing **12** is adapted for circulation within the electronic display housing.

178. Accordingly, Karppanen discloses or renders obvious “a closed loop of cooling gas adapted for circulation within the electronic display housing.”

4. 21[c]

21[c]	an open loop ambient air pathway through the electronic display housing; and
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179. In my opinion, Karppanen discloses or renders obvious the limitation of claim 21 that requires “**an open loop ambient air pathway through the electronic display housing**” for the same reasons Karppanen discloses or renders obvious the requirement of claim 12[c] for “an open loop of ambient air which passes through the housing and along the backlight.” (*See supra*, §VII.A.4.)

180. As note above in conjunction with limitation 21[b] (*supra*, §VII.J.3),

Karppanen’s housing includes both the “display casing **10**” and “device casing **12**,” and contains the “display element **26**” with its associated LCD, so as to be an “electronic display housing.” (Ex. 1006 at Abstract.)

181. Accordingly, Karppanen discloses or renders obvious the limitation “an open loop ambient air pathway through the electronic display housing.”

5. 21[d]

21[d]	an electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop ambient air pathway;
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182. In my opinion, Karppanen discloses or renders obvious the limitation of claim 21 requiring “an electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop ambient air pathway.”

183. As noted above in conjunction with the discussion of limitation 21[b], the relevant closed loop of cooling gas is located in the device casing **12**. (*See supra*, §VII.J.3.) And as reflected by Figure 1, display element **26** is located in display case **10**. (Ex. 1006, FIG. 1.) And as more particularly explained above in conjunction

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with claim 19 (*see supra*, §VII.H) the ambient air flowing through the open loop ambient airway is in contact with the electronic display, but does not mix with the closed loop located in the device casing. (*Cf.* Ex. 1001, 4:9-11.) In my opinion, therefore, Karppanen teaches an electronic display positioned in the electric display housing that is isolated from the closed loop of cooling gas.

184. In my opinion, the electronic display is contactable by ambient air flowing through the open loop ambient air pathway. As noted above in conjunction with the discussion of limitation 12[c], an open loop of air passes through cooling space **20**. (*Supra*, §VII.A.4.) Ambient air passes along “plate-like cooling fins” on cooling elements **32**. (Ex. 1006, 8:16-17.) Karppanen discloses that “when the cooling air flows between the fins, heat is transferred from the cooling fins to the air of the cooling space.” (*Id.*, 8:18-19.) Karppanen also teaches that the cooling element is “preferably” “fastened to ... the surface of the display element.” (*Id.*, 8:32-36.)

185. As a result, in March 2008, a POSITA would have recognized that the cooling element **32** is part of the electronic display. Karppanen thus teaches an electronic display that is contactable by ambient air flowing through the open loop ambient air pathway.

186. Accordingly, Karppanen discloses or renders obvious the limitation “an

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electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop ambient air pathway.”

6. 21[e]

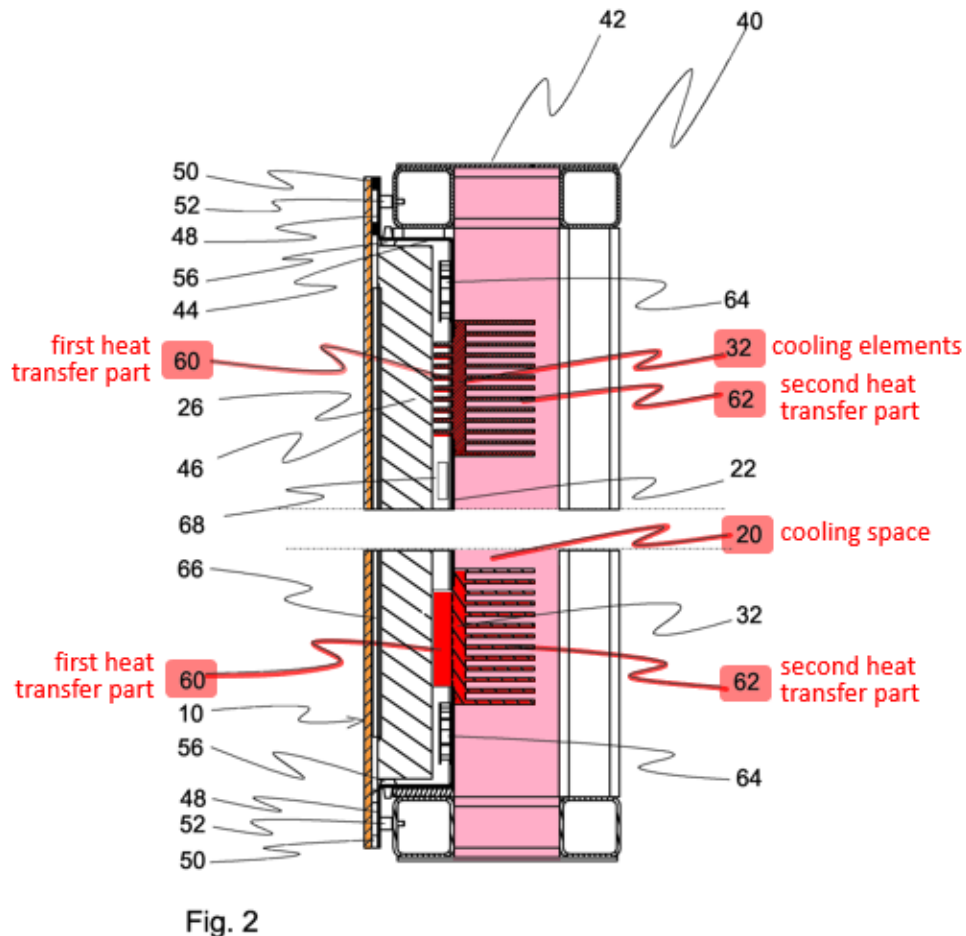
21[e]	wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing.
-------	---

187. In my opinion, Karppanen discloses or renders obvious the limitation of claim 21 that requires “wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing.”

188. As noted above in conjunction with the discussion of limitations 12[c], 18[e], and 21[b], Karppanen discloses two different closed loop isolated gas airflow pathways, and an open loop of ambient air which passes through the housing and along the backlight. (*Supra*, §§VII.A.4, VII.G.6, VII.J.3.) In my opinion, therefore, a POSITA in March 2008 would understand that this limitation 21[e] is disclosed by the closed loop which surrounds the display element **26** and open loop of ambient

air flowing through cooling space **20**, as reflected by the annotated versions of Figure 2 below:





(Ex. 1006, FIG. 2 (annotated).)

189. Accordingly, Karppanen discloses or renders obvious the limitation “wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing.”

K. Claim 22

190. In my opinion, Karppanen renders obvious claim 22.

1. 22[a]

22[a]	The electronic display assembly of claim 21 wherein: the closed loop of cooling gas is isolated within a continuous loop gas cooling chamber, and
-------	---

191. In my opinion, Karppanen discloses or renders obvious the limitation of claim 22 that requires “[t]he electronic display assembly of claim 21 wherein: the closed loop of cooling gas is isolated within a continuous loop gas cooling chamber.”

192. In my opinion, this limitation of claim 22 is satisfied by the closed loop that surrounds the electronic display for the same reasons Karppanen renders discloses or renders obvious limitation 12[c] and 14. (*Supra*, §§VII.A.4, VII.C.) In particular, a POSITA would have recognized in March 2008 that the rear chamber positioned behind the LCD and containing the closed loop of isolated gas discussed in conjunction with claim 14 is a “continuous loop gas cooling chamber,” in that the ambient air within the closed loop is continuously circulated within the rear chamber by the fans **64**. (Ex. 1006, 9:3-5, 9:25-27.)

193. Accordingly, Karppanen discloses or renders obvious the limitation “[t]he electronic display assembly of claim 21 wherein: the closed loop of cooling gas is isolated within a continuous loop gas cooling chamber.”

2. 22[b]

22[b]	the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling chamber when it flows through the electronic display housing.
-------	---

194. In my opinion, Karppanen discloses or renders the limitation of claim 22 that requires “the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling chamber when it flows through the electronic display housing.”

195. As noted above in conjunction with the discussion of claims 12[c] and 14[b], the open loop ambient air contacts and hence is directed over an exterior surface of display case **10**; specifically, display case back wall **22**. (*Supra*, §§VII.A.4, VII.C.2.) The fans **36** included within the cooling space constituting the open loop chamber “conduct[]” (i.e. “direct”) the ambient “air flow” over the exterior surface of the display case back wall **22** when it flows through the housing surrounding the cooling space and “out from the entire device.” (Ex. 1006, 8:19-22, 9:32-36, FIG. 2.)

196. Accordingly, Karppanen discloses or renders the limitation “the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling chamber when it flows through the electronic display

housing.”

L. Claim 23

197. In my opinion, Karppanen renders obvious claim 23.

1. 23[a]

23[a]	The electronic display assembly of claim 22 further comprising: a fan located within the electronic display housing,
-------	---

198. In my opinion, Karppanen discloses or renders obvious the limitation of claim 23 that requires “[t]he electronic display assembly of claim 22 further comprising: a fan located within the electronic display housing.”

199. As noted in conjunction with the discussion of claims 21[c] and 22[a], Karppanen an open loop ambient air pathway within cooling space **20** through the electronic display housing. (*Supra*, §§VII.J.4, VII.K.1.) Karppanen discloses fans **36** located within this cooling space, such that there is at least one fan within the electronic display housing. (Ex. 1006, 8:19-22, 9:32-36, FIGs. 2 & 4.)

200. Accordingly, Karppanen discloses or renders obvious the limitation “[t]he electronic display assembly of claim 22 further comprising: a fan located within the electronic display housing.”

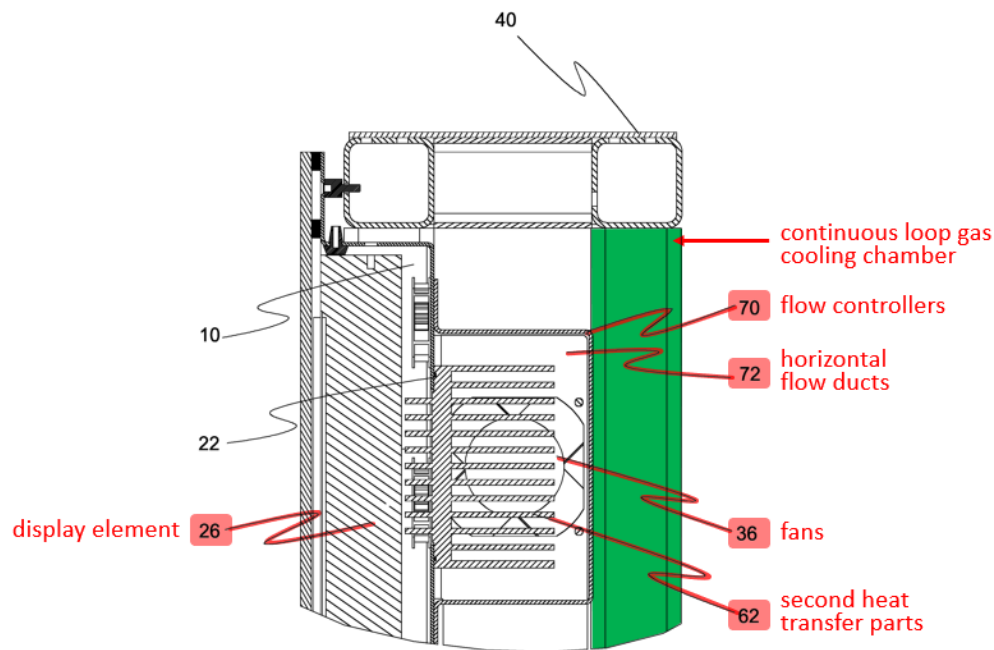
2. 23[b]

23[b]	the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display.
-------	---

201. In my opinion, Karppanen discloses or renders obvious the limitation of claim 23 that requires “the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display.”

202. Specifically, as shown in annotated Figure 4 below, and discussed above with respect to claims 21[d] and 22[b], open loop fans **36** move air located within the housing in the cooling space **20** in the space that separates the external surface of the closed loop in device case **12** and the cooling elements attached to the electric display, so as to satisfy the Delaware District Court’s definition of “between.”

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(Ex. 1006, FIG. 4 (annotated); Ex. 1011, at 1; Ex. 1012, at 9-10.) The fans **36** included within the cooling space are configured and oriented to “conduct[]” (i.e. “move”) the ambient air along the display case back wall **22** and through the housing surrounding the cooling space, and “out from the entire device.” (Ex. 1006, 8:19-22, 9:32-36).

203. Accordingly, Karppanen discloses or renders obvious the limitation “the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display.”

**VIII. GROUND 2 - CLAIMS 1, 4-5, 8-12, 14-17 AND 21-23 ARE OBVIOUS
OVER NAGASHIMA AND KARPPANEN**

A. Independent Claim 1

204. In my opinion, Nagashima in combination with Karppanen renders obvious claim 1.

**1. Element 1

```
[pre]
```**

| | |
|--------------------|--|
| 1 <pre>[pre]</pre> | An electronic display assembly comprising: |
|--------------------|--|

205. To the extent the preamble of claim 1 is limiting, in my opinion, Nagashima discloses “**[a]n electronic display assembly.**”

206. Nagashima discloses “a cooling technology” applied to “a desk-top type computer with an LCD unit” that itself includes an “LCD panel 5.” (Ex. 1007, 2:18-22, 3:53-58, FIGs. 1-3, 8). Nagashima’s “display unit integral type computer” comprises “a chassis, a plane-shaped display attached to the chassis, a mother board attached to the chassis, a variety of electronic devices and a CPU mounted on the mother board, and a memory device electrically connected to the mother board.” (*Id.*, 2:23-28; *see also id.*, 3:59-4:3.)

207. In my opinion, a POSITA in March 2008 would have recognized that a LCD unit with LCD panel in which the “plane-shaped display attached to the chassis, a mother board attached to the chassis, a variety of electronic devices and a CPU

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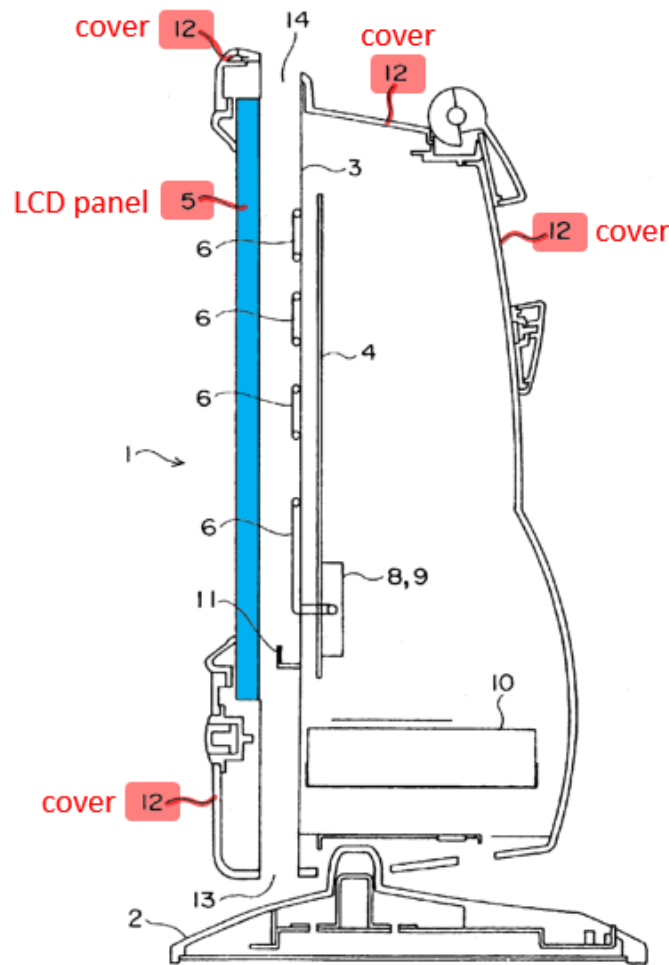
mounted on the mother board, and a memory device electrically connected to the mother board” is an “electronic display assembly.”

2. Element 1[a]

| | |
|------|--------------------------------|
| 1[a] | An electronic display housing; |
|------|--------------------------------|

208. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 1[a] requiring “**an electronic display housing.**”

209. As shown in annotated Figure 1, Nagashima discloses an LCD panel **5** which is bordered by a cover **12** which extends behind the electronic display:



Ex. 1007, FIG. 2 (annotated); *see also id.*, 5:13-23.) Cover **12** “cover[s] the whole of the computer body **1**.” (*Id.*, 5:13-14.) “A portion of the cover **12** that corresponds to the lower portion of the space between the LCD panel **5** and the main chassis **3**” includes “an air inlet **13** for air-cooling the heat radiating portion that comprises the heat transporting tube and the main chassis.” (*Id.*, 5:14-18.) The “upper portion of the cover **12**” also includes “an air outlet **14** for exhausting air.”

(*Id.*, 5:19-20.) Nagashima discloses “[a]n air flow-through path from the air inlet **13** to the air outlet **14** has a chimney effect for air to effect a further air-cooling on the heat generating portion, thus improving the cooling efficiency.” (*Id.*, 5:20-23.)

210. As reflected by Figure 2, the cover **12** also encompasses the “motherboard **4**” with its “CPU **9**, the power source circuits, a hard disk drive (HDD) **10**, etc, which generate heat, and a heat receiving head **8**....” (*Id.*, 3:59-4:10.) In my opinion, a POSITA in March 2008 would have recognized that cover **12** shown in Figure 2 that encompasses LCD panel **5** and all of its associated electronics, such as motherboard **4**, constitutes an electronic display housing.

211. Accordingly, Nagashima discloses or renders obvious “**an electronic display housing.**”

3. Element 1[b]

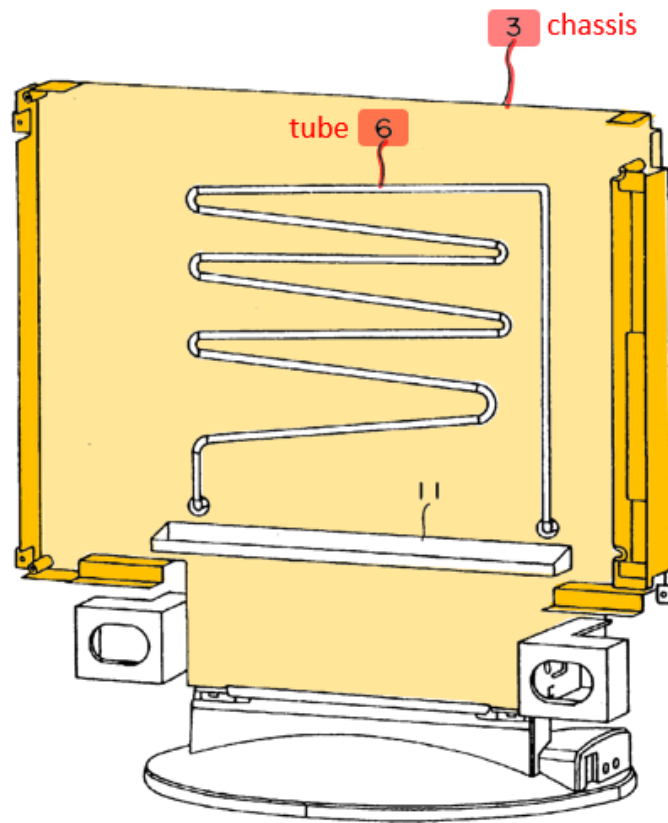
| | |
|------|---|
| 1[b] | a gas-containing closed loop gas cooling chamber located within the electronic display housing; |
|------|---|

212. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 1[b] that requires “**a gas-containing closed loop gas cooling chamber located within the electronic display housing.**”

213. In Nagashima, main chassis **3** is located behind LCD panel **5** and within

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the cover **12** that serves as an electronic display housing. (Ex. 1007, 5:14-18, FIGs. 1-2.) As reflected by annotated Figure 2 below, Nagashima discloses that main chassis **3** can be a unitary body containing no open holes or vents, and hence is a “gas-containing closed loop gas cooling chamber”:



(*Id.*, FIG. 2.) In particular, Nagashima’s Figure 2 depicts tube **6** entering and exiting the main chassis **3**. (*Id.*) In Figure 2, and every other figure, there is no space between tube **6** and main chassis **3**. (*See id.*, FIGs. 1, 4, 5, 10.)

214. In my opinion, a POSITA in March 2008 would thus have understood

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that Nagashima discloses a sealed main chassis **3** with no open holes or vents. To the extent this feature is not disclosed explicitly, it would have been obvious to seal any open holes to prevent dust and dirt in the ambient air from entering the rear cooling chamber which contains critical electrical components like the CPU **9** and power circuits. (Ex. 1007, 6:11-16.)

215. I understand that the Patent Owner alleges in pending litigation that a cooling fan directed to a heat generating electrical element in a closed environment creates a closed loop gas cooling chamber. (Ex. 1008, p.8 (alleging that fan directing air to circuit board creates closed loop).) Consistent with Patent Owner's allegations, Nagashima must also disclose a gas-containing closed loop gas cooling chamber located within the electronic display housing, because it is a gas pathway within a display housing containing gas (i.e. ambient air) that is essentially isolated from external air. With this understanding of Patent Owner's own contentions, in my opinion the closed loop Nagashima circulates isolated air within the housing, and is a "gas pathway within a display housing containing gas that is essentially isolated from external air," so as to satisfy the Delaware District Court's construction for "closed loop." (Ex. 1011, at 2; Ex. 1012, at 8.)

216. For example, Karppanen discloses a device casing **12** that contains "electronic equipment needed for control[ling] the display element" including "the

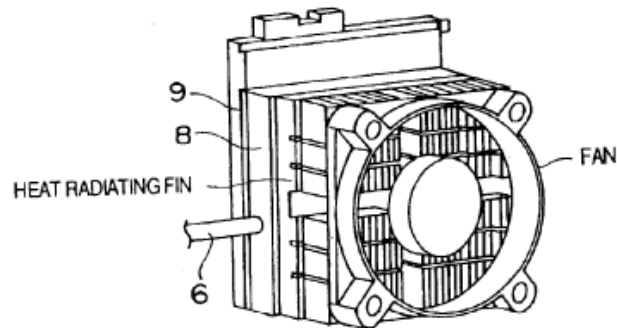
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control unit of the information board, the power supply of the control unit and the power supply of the background light of the display.” (Ex. 1006, 3:29-34.) Like the display casing **10**, the device casing **12** in Karppanen may contain a closed loop of air that “circulates as forced past all the components being warmed” as a result of their ordinary operation. (*Id.*, 10:20-24.) The device casing **12** in Karppanen is “closed” (*id.*, 6:20-21) and “weatherproof” (*id.*, 5:6-8). In view of these disclosures, a POSITA would understand that Karppanen discloses a rear cooling chamber containing electronic components that may be used to operate the display that are being cooled by a closed loop of air.

217. Likewise, as reflected by Figure 1, cover **12** can be a unitary body with no open holes or vents with the exception of a small vent located at the bottom of the space formed by main chassis **3** and cover **12**. (*Id.*, FIG. 1.)

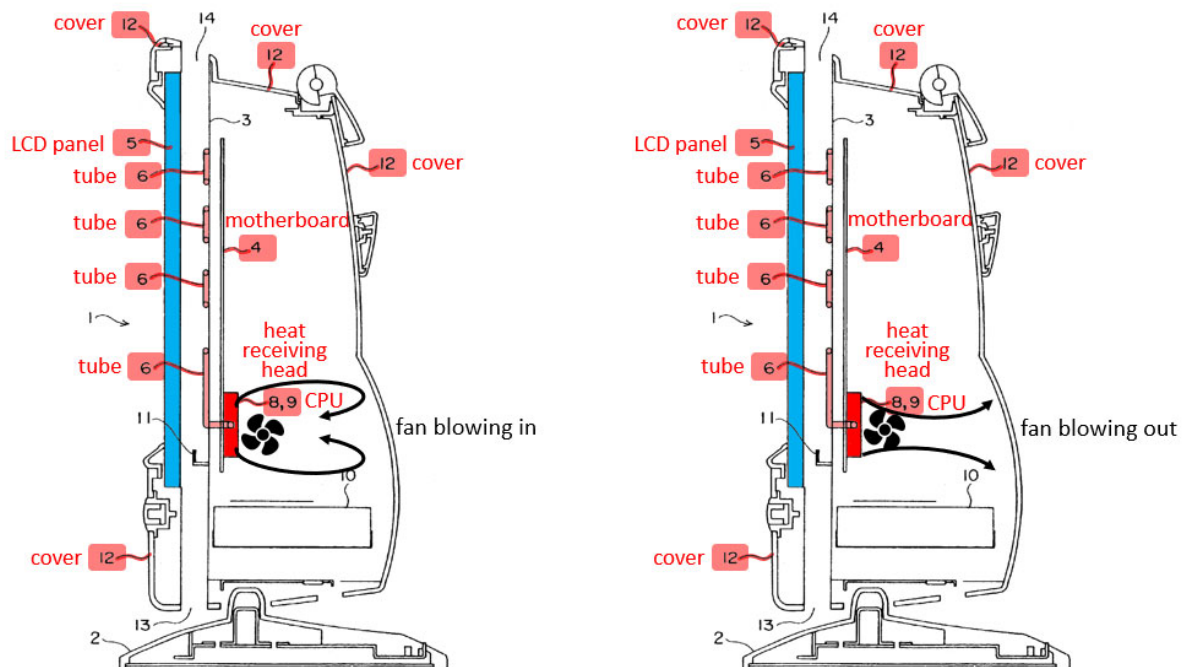
218. Nagashima discloses a tube **6** mounted on a chassis **3** containing a liquid cooling medium which goes through a “heat receiving head **8**.” (Ex. 1007, 4:36-42.) As shown in both Figures 1 and 2, the “heat receiving head **8**” is located within the electronic display housing (i.e. cover **12**). (*Id.*, FIGs. 1-2.) As reflected by Figure 6B, Nagashima discloses that a fan may be provided “on the heat radiating fin on the heat receiving head”:

FIG. 6B



(*Id.*, 7:16-17, FIG. 6B.) The fan displaces heat from the heat radiating fin, providing the “gas cooling” for the “gas-containing closed loop gas cooling chamber.” (*Id.*, 7:18-19.)

219. Air flow generated by the fan in Nagashima on the heat receiving head circulates within the chamber created by the cover **12** and rear surface of the chassis **3**. (*Id.*, FIG. 1.) While Nagashima does not disclose the direction in which air flows from the fan on heat receiving head **8**, air is circulated between motherboard **4** and cover **12** regardless of the direction of air flow as shown below in two annotated versions of Figure 1:



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

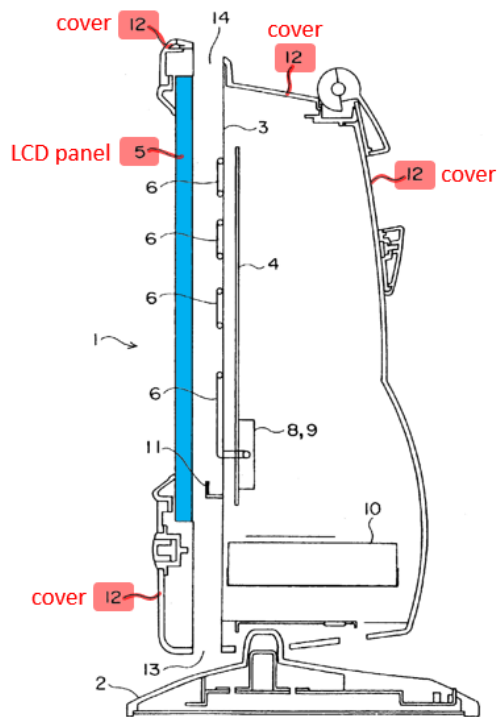
4. Element 1[c]

| | |
|------|--|
| 1[c] | an electronic display positioned within the electronic display housing but outside of the closed loop gas cooling chamber, and |
|------|--|

220. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 1[c] that requires “an electronic display positioned within the electronic display housing but outside of the closed loop gas cooling chamber.”

221. As shown below in two annotated versions of Figure 1, LCD panel 5 is located outside the closed loop gas cooling chamber that is located behind main

chassis 3:



(Ex. 1007, FIG. 1 (annotated).)

5. Element 1[d]

| | |
|------|--|
| 1[d] | an open loop ambient air pathway through the electronic display housing; |
|------|--|

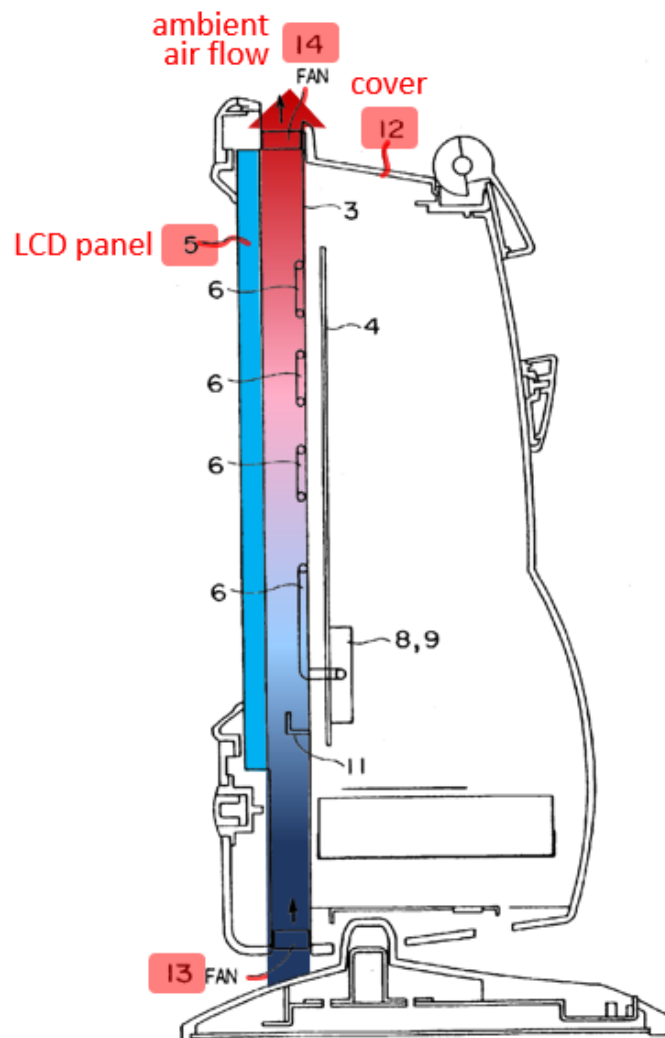
222. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 1[d] that requires “**an open loop ambient air pathway through the electronic display housing.**”

223. Nagashima discloses that “[a] portion of the cover 12 [i.e. the ‘housing’] that corresponds to the lower portion of the space between the LCD panel

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5 and the main chassis **3**” includes “an air inlet **13** for air-cooling” the space between heat transporting tube **6** and the main chassis **3**. (Ex. 1007, 5:14-19.) Air outlet **14** is formed in an “upper portion of the cover **12**” for “exhausting the air.” (*Id.*, 5:19-20.) Air flowing through this path creates a “chimney effect” that air-cools heat generating portions. (*Id.*, 5:20-23.)

224. Nagashima discloses that “the provision of the air inlet in the lower portion of air outlet and in in the upper portion of the cover, which covers the clearance between the LCD panel and the main chassis, form in combination an air flow-through path from the air inlet at the lower part to the air outlet at the upper portion, and an improvement of the heat radiating effect is expected due to the so-called chimney effect.” (*Id.*, 5:64-6:3.) An “air ventilation fan” can be added at the lower, upper or both lower and upper portions of cover **12** to “expedite the movement of air” “between the LCD panel [**5**] and the main chassis [**3**].” (*Id.*, 6:4-13.) Annotated Figure 10 below depicts an exemplary embodiment of the Nagashima “chimney” with “air ventilation fan:”



(*Id.*, FIG. 10 (annotated).) In my opinion, air inlet **13** and air outlet **14** constitute an open loop ambient air pathway through the electronic display housing.

6. Element 1[e]

| | |
|------|---|
| 1[e] | wherein the electronic display is coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air |
|------|---|

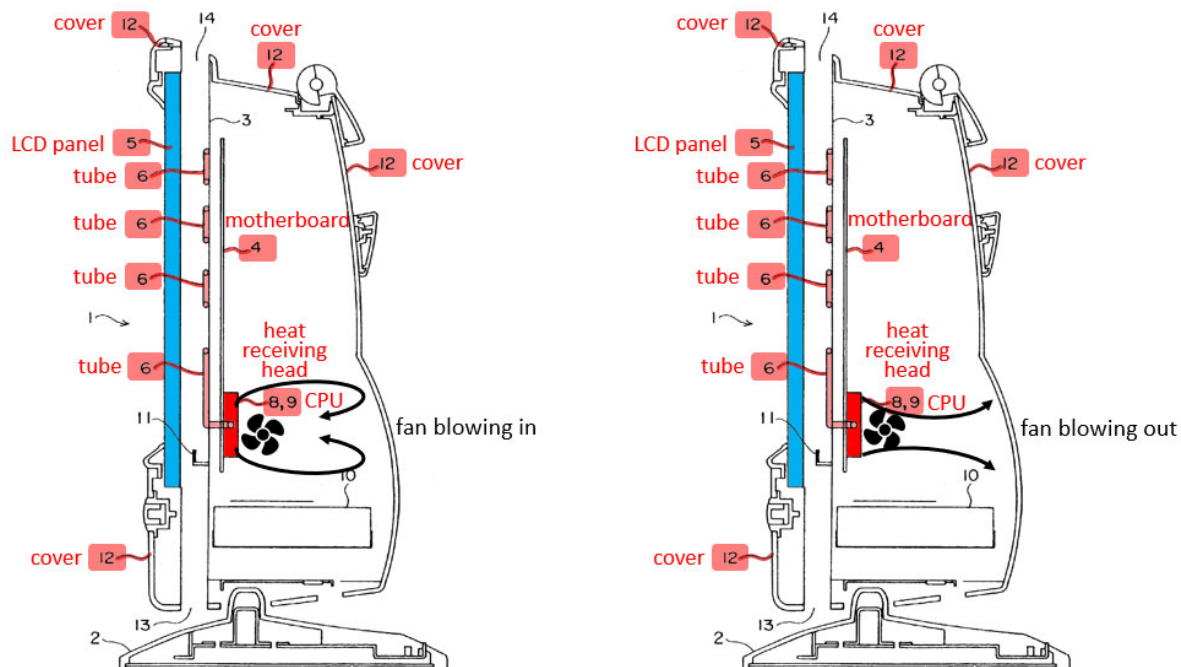
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| | |
|--|---|
| | flow through the open loop ambient air pathway in the electronic display housing. |
|--|---|

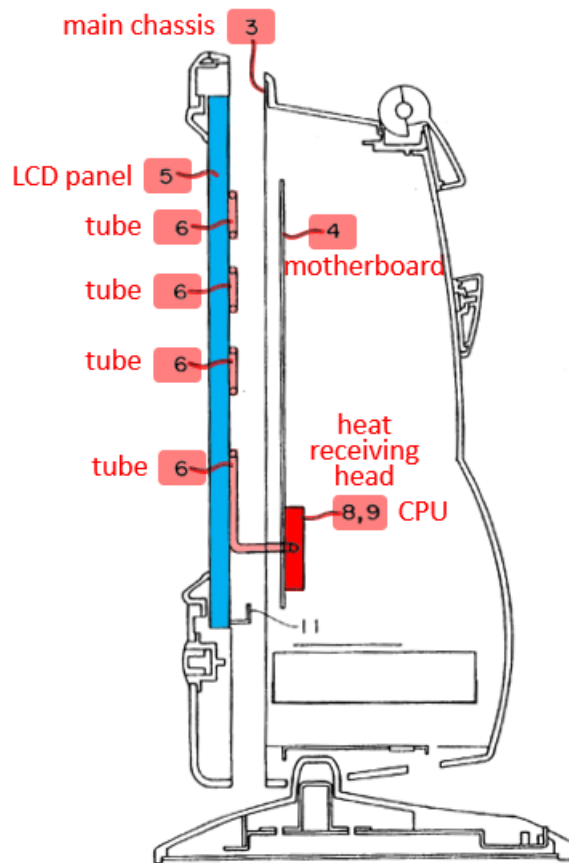
225. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 1[e] that requires “wherein the electronic display is coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air flow through the open loop ambient air pathway in the electronic display housing.”

226. As noted above in conjunction with the discussion of claim 1[b] (*supra*, §VIII.A.3), Nagashima discloses or renders obvious “a gas-containing closed loop gas cooling chamber located within the electronic display housing,” as reflected by the annotated versions of Figure 1:

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(*Id.*, FIG. 1 (annotated).) Meanwhile, in the embodiment shown in Figure 4, tube 6 is in conductive thermal communication with the rear cooling chamber formed by main chassis 3 and rear cover 12.



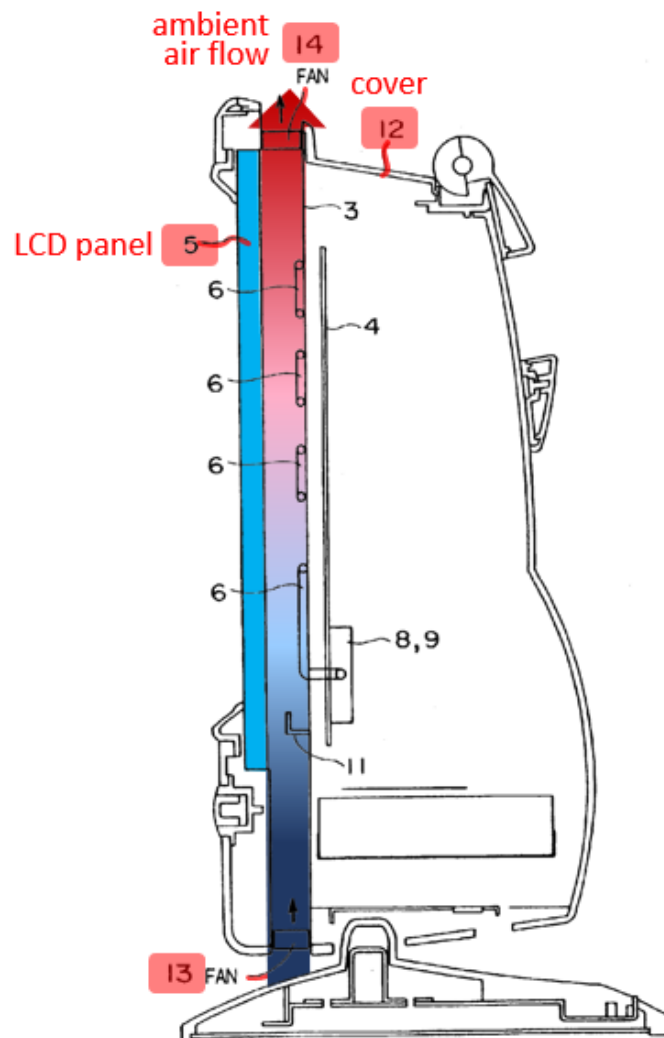
(Ex. 1007, Fig. 4 (annotated).) Specifically, the tube is attached to the display, thereby transferring heat from the display to the rear cooling chamber containing a closed loop generated by the heat receiving head and fan. The closed loop thus cools the display in this embodiment. A POSITA would understand that the teachings set forth amongst the various embodiments shown in at least Figures 1, 4, 5 and 10 in Nagashima can be used interchangeably and there is no disclosure in Nagashima to the contrary. For example, while air inlet **13** and air outlet **14** are not explicitly shown in Figure 4, a POSITA would understand, and would be

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motivated, to include the open loop fan in order to cool the rear of the LCD and tube **6**.

227. I am aware that the Patent Owner alleges in pending litigation that an electronic display is coolable by gas circulation within a closed loop gas cooling chamber that includes a fan directed to a heat generating element in a closed environment. (Ex. 1008, at 11 (“the cooling of the unit [is caused] by a combination of gas circulation within the closed loop gas cooling chamber and ambient airflow through the open loop ambient air pathway”).) Consistent with the Patent Owner’s allegations in that infringement contention, therefore, Nagashima and its own fan directed to a heat generating element in a closed environment discloses an electronic display that is coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air flow through the open loop ambient air pathway in the electronic display housing.

228. Likewise, Nagashima discloses that the electronic display is coolable by an open loop ambient air pathway in the electronic display housing. As noted above in the discussion of claim limitation 1[d] (*supra*, §VIII.A.5), ambient air flows through the “chimney” between the LCD panel **5** and main chassis **3** air-cools the display, as reflected by annotated Figure 10:



(Ex. 1007, FIG. 10 (annotated); *see also id.* 5:63-6:13, FIG. 10.)

229. Nagashima discloses that “the back side of the LCD panel has a large area of the [sic] metal surface, and heat dissipation can be carried out at high efficiency while utilizing this large area.” (*Id.*, 5:61-63.) And the “provision of [] fans [inside the chimney] enables the transportation of a large volume of cooling air” into the chimney. (*Id.*, 6:11-13.) Meanwhile, tube 6 is in conductive thermal

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communication with the rear cooling chamber formed by main chassis **3** and rear cover **12**.

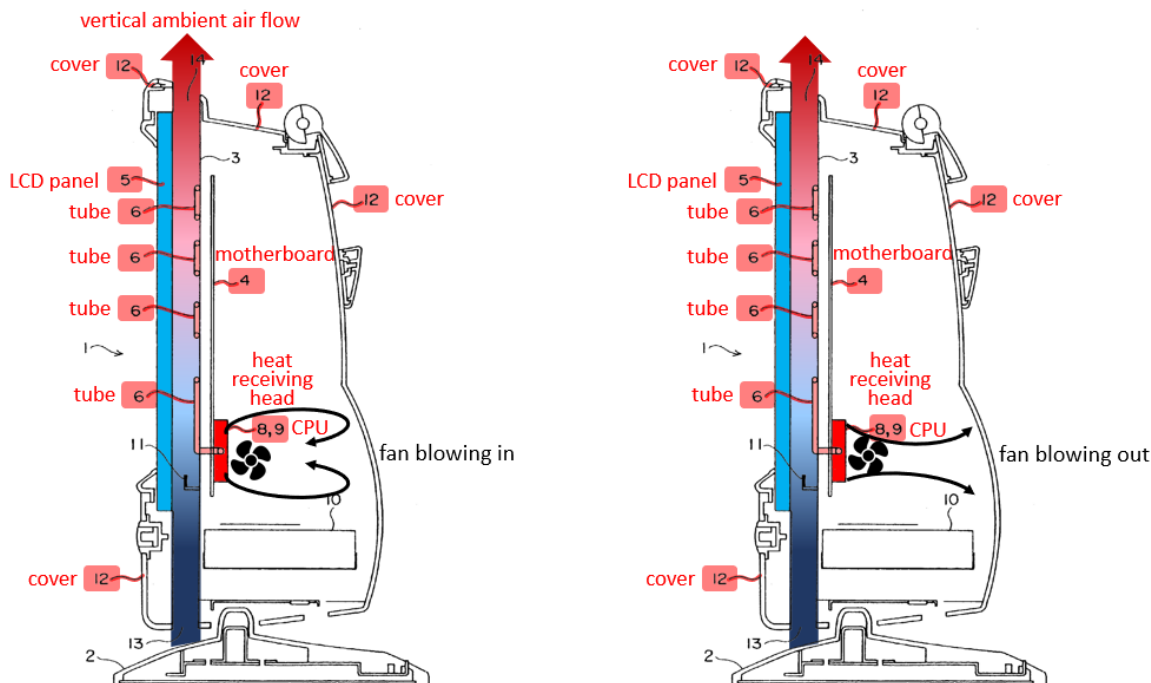
B. Claim 4

| | |
|---|--|
| 4 | The electronic display assembly of claim 1 wherein: the gas within the closed loop gas cooling chamber is isolated from the open loop of ambient air. |
|---|--|

230. In my opinion, Nagashima in combination with Karppanen renders obvious the requirement of claim 4 of “[t]he electronic display assembly of claim 1 wherein: the gas within the closed loop gas cooling chamber is isolated from the open loop of ambient air.”

As shown in annotated Figures 1 and 2 below, gas within the isolated and closed gas cooling chamber immediately behind LCD mother board **4** is essentially isolated by the main chassis **3** and motherboard **4** from the ambient air in the open loop of the housing of the electronic display assembly:

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(Ex. 1008, FIG. 1 (annotated).)

C. Claim 5

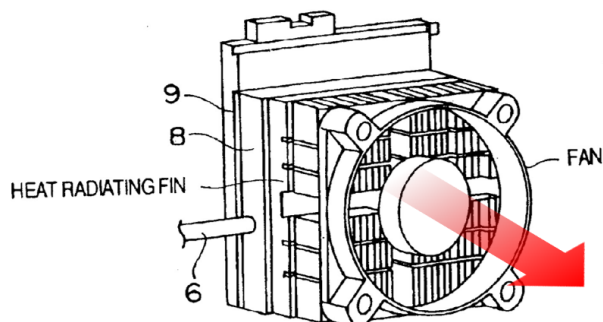
| | |
|---|---|
| 5 | The electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber and the ambient air pathway are configured such that gas circulation within the gas cooling chamber will occur in a direction that is substantially perpendicular to the direction that ambient air will flow through the electronic display housing. |
|---|---|

231. In my opinion, Nagashima in combination with Karppanen renders obvious the requirement of claim 5 of “[t]he electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber and the ambient air pathway are configured such that gas circulation within the gas cooling chamber will occur in a

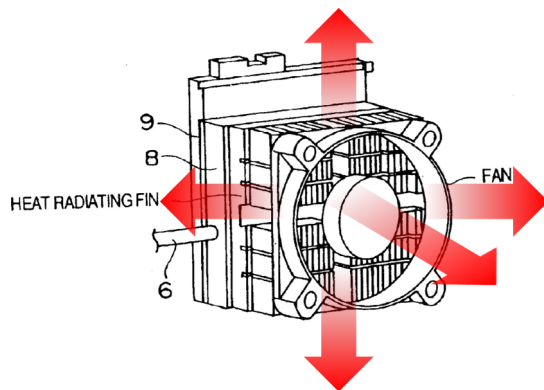
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direction that is substantially perpendicular to the direction that ambient air will flow through the electronic display housing.”

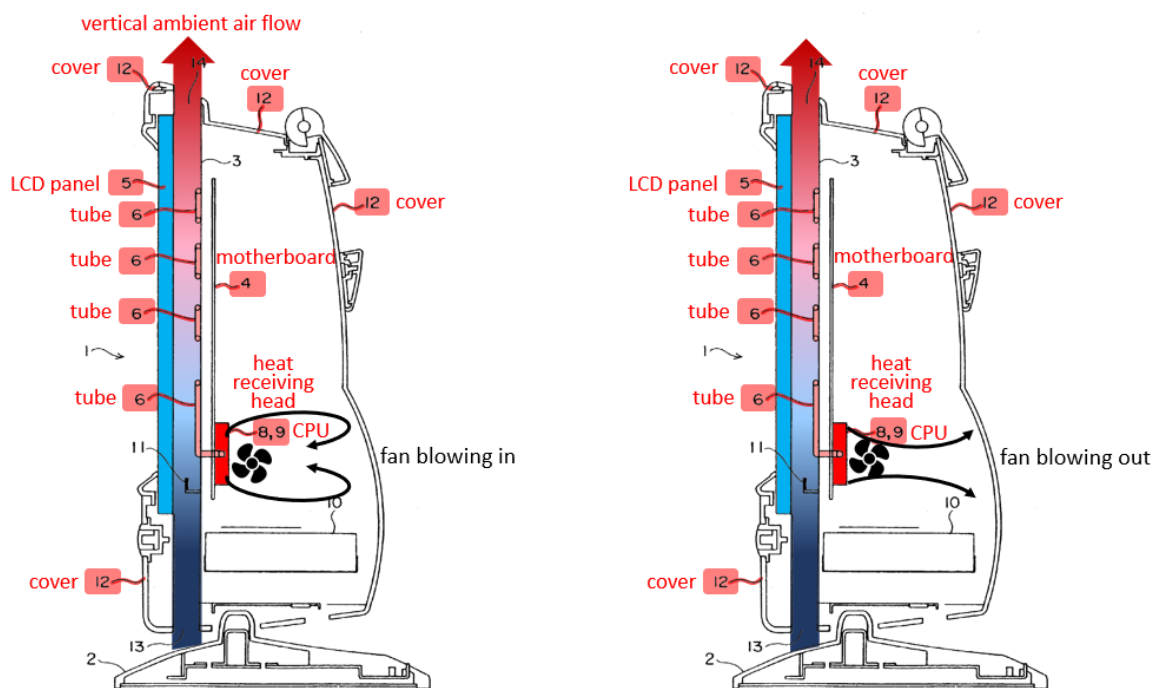
232. As shown in annotated Figure 1 below, and as explained with respect to claim limitation 1[b] (*see supra*, §VIII.A.3), ambient air flows in a vertical direction between air inlet **13** and air outlet **14**. Meanwhile, air within the gas cooling chamber moves substantially in a horizontal direction as a result of the fan “on the heat radiating fin on the heat receiving head” regardless whether the fan is forcing air into the fin or drawing it out of the fin. (Ex. 1007, 7:16-17.) For example, where the fan is forcing air away from the fin, air moves substantially horizontally before hitting cover **12** as shown in the annotated images below. But when the fan is forcing air into the fin, the air will be scattered in three different directions, two of which (horizontal and lateral) are perpendicular to the direction of the flow of ambient air.



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(Ex. 1007, Fig. 6B (annotated).)



(Ex. 1007, FIG. 1 (annotated.)) That is to say, air within the gas cooling chamber moves substantially in a horizontal direction as a result of the fan “on the heat radiating fin on the heat receiving head,” as reflected by the additional annotated versions of Figure 1 above, which again shows that the direction of the ambient air

through the housing in Nagashima's open loop is substantially perpendicular to the horizontal direction of the air in the closed loop cooling chamber. (*Id.*)

D. Claim 8

| | |
|---|--|
| 8 | The electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber is partially defined by a sealed rear plenum that prevents ambient air from entering the plenum. |
|---|--|

233. In my opinion, Nagashima in combination with Karppanen renders obvious the requirement of claim 8 of "[t]he electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber is partially defined by a sealed rear plenum that prevents ambient air from entering the plenum."

234. As noted above in conjunction with the discussions of claims 1[b] and 4, the closed loop gas cooling chamber formed behind main chassis **3** and motherboard **4** is at least partially defined by main chassis **3**, which is provided as a unitary piece of material with no holes or vents through which air can pass. (*See supra*, §§VIII.A.3, VIII.B.)

235. Alternatively, and as noted above, it would have been obvious to modify the rear cooling chamber in Nagashima to create a closed loop gas cooling chamber. (*Id.*) In either case, main chassis **3** acts as a sealed plenum. In my opinion, and as reflected by Figure 2, main chassis **3** is thus a sealed plenum on the

rear side of the display that prevents ambient air from entering the plenum.

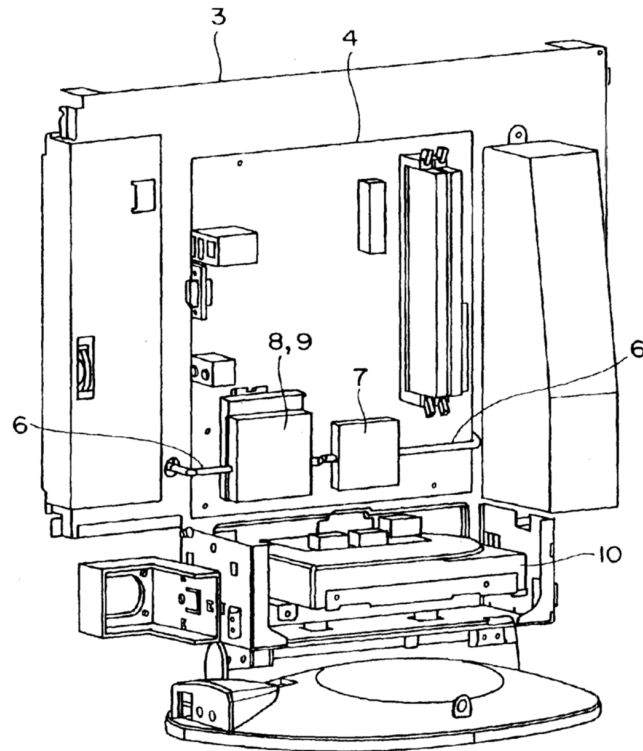
E. Claim 9

| | |
|---|--|
| 9 | The electronic display assembly of claim 8 further comprising: one or more electronic devices for operating the electronic display positioned within the sealed plenum. |
|---|--|

236. In my opinion, Nagashima in combination with Karppanen renders obvious the requirement of claim 9 of “[t]he electronic display assembly of claim 8 further comprising: one or more electronic devices for operating the electronic display positioned within the sealed plenum.”

237. Nagashima discloses that “[o]n the backside of the LCD panel **5**, i.e. its side facing the main chassis **3** are arranged a large number of connectors, and electric wiring lines, connected to the connectors, extend through an opening in the main chassis **3** and are connected to terminals of the mother board **4**.” (Ex. 1007, 3:63-4:1.) And as reflected by Figure 3, Nagashima further discloses on the backside of the motherboard **4** there are several electronic devices including “CPU **9**, the power source circuits, a hard disk drive (HDD) **10**, etc.” that are necessary to operate (via the electric wiring lines connecting the mother board **4** to the LCD panel **5**) the electronic display assembly positioned within the sealed plenum created by main chassis **3**:

FIG. 3



(*Id.*, 4:4-10, FIG. 3.) Further, the electrical connections are themselves “positioned within the sealed plenum.”

F. Claim 10

| | |
|----|--|
| 10 | The electronic display assembly of claim 1 wherein: the electronic display is selected from the group consisting of a liquid crystal display, a light emitting diode display, an organic light emitting diode display, a field emitting display, a cathode ray tube display, and a plasma display. |
|----|--|

238. In my opinion, Nagashima in combination with Karppanen renders

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obvious the requirement of claim 10 of “[t]he electronic display assembly of claim 1 wherein: the electronic display is selected from the group consisting of a liquid crystal display, a light emitting diode display, an organic light emitting diode display, a field emitting display, a cathode ray tube display, and a plasma display.”

239. As noted above in conjunction with the discussions of the preamble claim 1 and limitation 1[a], the electronic display assembly in Nagashima is an LCD display. (*Supra*, §§VIII.A.1-2; *see also* Ex. 1007, Abstract, 2:18-22.)

G. Claim 11:

240. In my opinion, Nagashima in combination with Karppanen discloses or renders obvious claim 11.

1. 11[a]

| | |
|-------|--|
| 11[a] | The electronic display assembly of claim 1 further comprising: a gas-circulating fan for circulating the gas within the closed loop gas cooling chamber, and |
|-------|--|

241. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 11[a] of “[t]he electronic display assembly of claim 1 further comprising: a gas-circulating fan for circulating the gas within the closed loop gas cooling chamber.”

242. As noted in conjunction with the discussion of claim 1[b], Nagashima

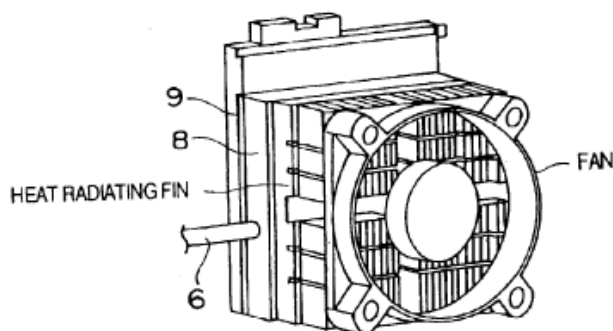
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discloses “a gas contained closed loop cooling chamber.” (*See supra*, §VIII.A.3.)

And as further noted in conjunction with the discussion of claim 1[d], Nagashima discloses the electronic display is coolable, in part, by “gas circulation within the closed loop gas cooling chamber. (*See supra*, §VIII.A.5.)

243. With respect to this closed loop cooling chamber, Nagashima discloses a tube **6** mounted on a chassis **3** containing a liquid cooling medium which goes through a “heat receiving head **8**.” (Ex. 1007, 4:36-42.) As shown in both Figures 1 and 2, the “heat receiving head **8**” is located within the electronic display housing (i.e. cover **12**). (*Id.*, FIGs. 1-2.) As reflected by Figure 6B, Nagashima discloses that a fan may be provided “on the heat radiating fin on the heat receiving head”:

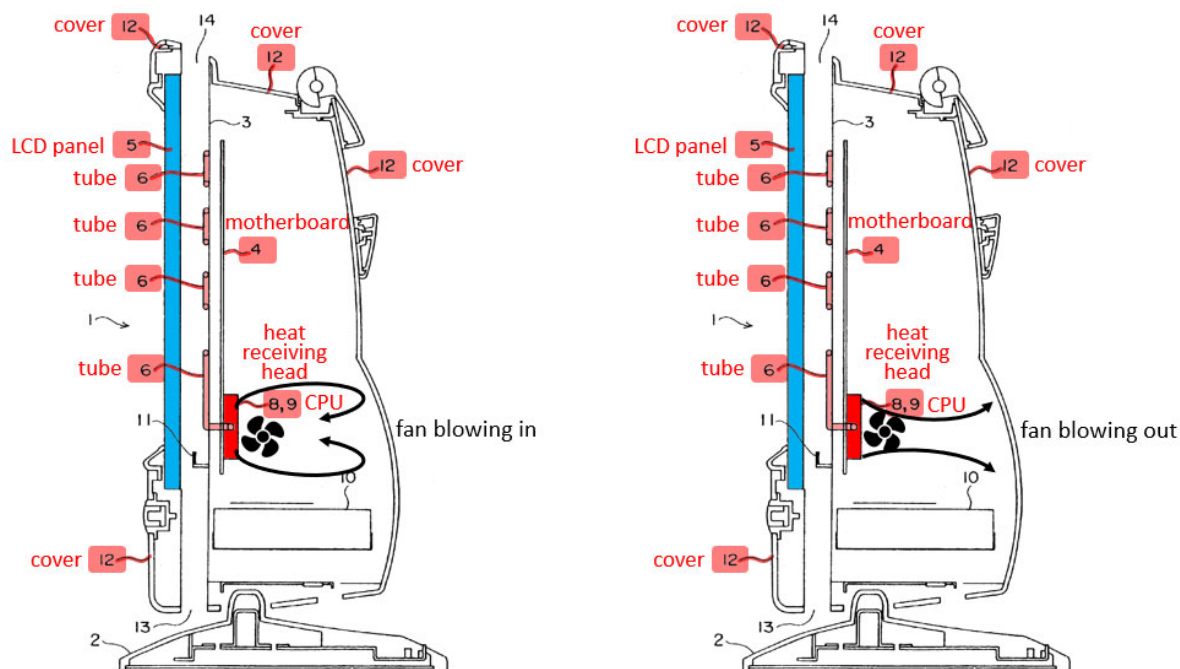
FIG. 6B



(*Id.*, 7:16-17, FIG. 6B.) The fan displaces heat from the heat radiating fin, providing the “gas cooling” for the “gas-containing closed loop gas cooling chamber.” (*Id.*, 7:18-19.)

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244. As noted with respect to claim limitation 1[b] (*supra*, §VIII.A.3) air flow generated by the fan in Nagashima on the heat receiving head circulates within the chamber created by the cover **12** and rear surface of the chassis **3**. (Ex. 1007, FIG. 1.) While Nagashima does not disclose the direction in which air flows from the fan on heat receiving head **8**, air is circulated between motherboard **4** and cover **12** regardless of the direction of air flow as shown below in two annotated versions of Figure 1:



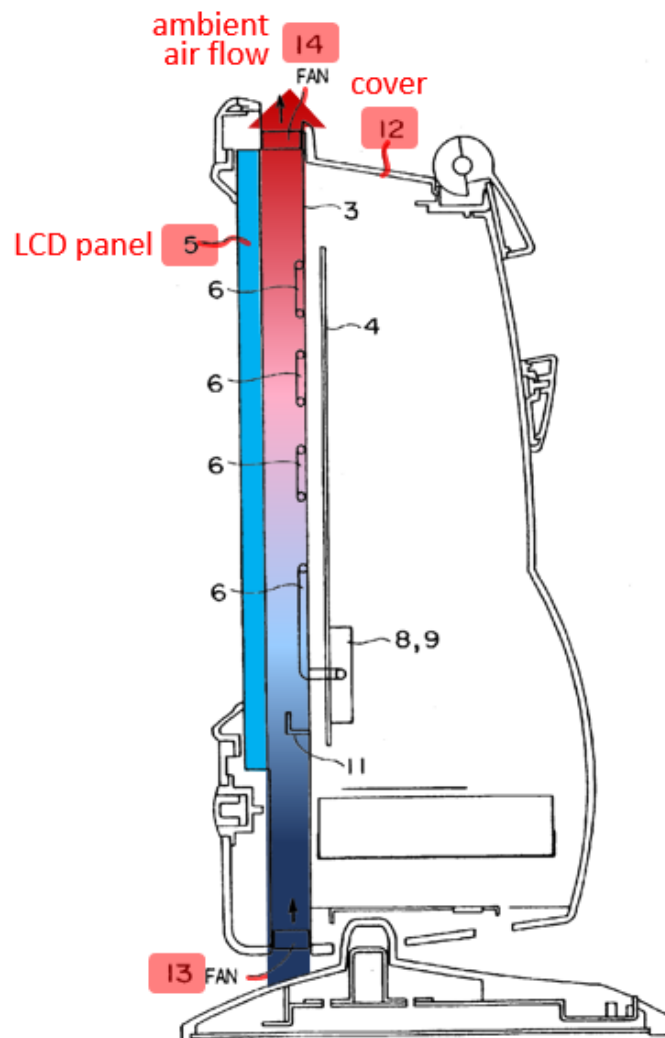
(*Id.*, FIG. 1 (annotated).)

2. 11[b]

| | |
|-------|--|
| 11[b] | a fan for producing a flow of ambient air through the open loop ambient air pathway in the electronic display housing. |
|-------|--|

245. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 11[b] of “a fan for producing a flow of ambient air through the open loop ambient air pathway in the electronic display housing.”

246. As noted with respect to claim limitation 1[d], in discussing an embodiment reflected by Figure 10, Nagashima also discloses an “air ventilation fan” can be added at the lower, upper or both lower and upper portions of cover **12** to “expedite the movement of air” “between the LCD panel **[5]** and the main chassis **[3]**.” (*Id.*, 6:4-13.) Annotated Figure 10 below depicts the exemplary embodiment of the Nagashima “chimney” with “air ventilation fans” positioned in the air inlet **13** and the air outlet **14** formed by this configuration, and which acts as an open loop ambient air pathway:



(*Id.*, FIG. 10 (annotated); *see also id.*, 3:22-24.)

H. Independent Claim 12:

247. In my opinion, Nagashima in combination with Karppanen renders obvious claim 12.

1. 12[pre]

| | |
|---------|--|
| 12[pre] | An electronic display assembly comprising: |
|---------|--|

248. In my opinion to the extent the preamble of claim 1 requiring “[a]n **electronic display assembly**” is limiting, Nagashima in combination with Karppanen renders obvious this limitation for the same reasons Nagashima in combination with Karppanen renders obvious the preamble requirement of claim 1 for the identically worded “an electronic display assembly.” (*See supra*, §VIII.A.1.)

2. 12[a]

| | |
|-------|------------|
| 12[a] | a housing; |
|-------|------------|

249. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 12[a] requiring “**a housing**” for the same reasons Nagashima discloses the limitation of “an electronic display housing” in claim 1[a]. (*See supra*, §VIII.A.2.)

250. Accordingly, Nagashima discloses or renders obvious “**a housing.**”

3. 12[b]

| | |
|-------|--|
| 12[b] | a liquid crystal display (LCD) positioned within the housing and having a backlight; |
|-------|--|

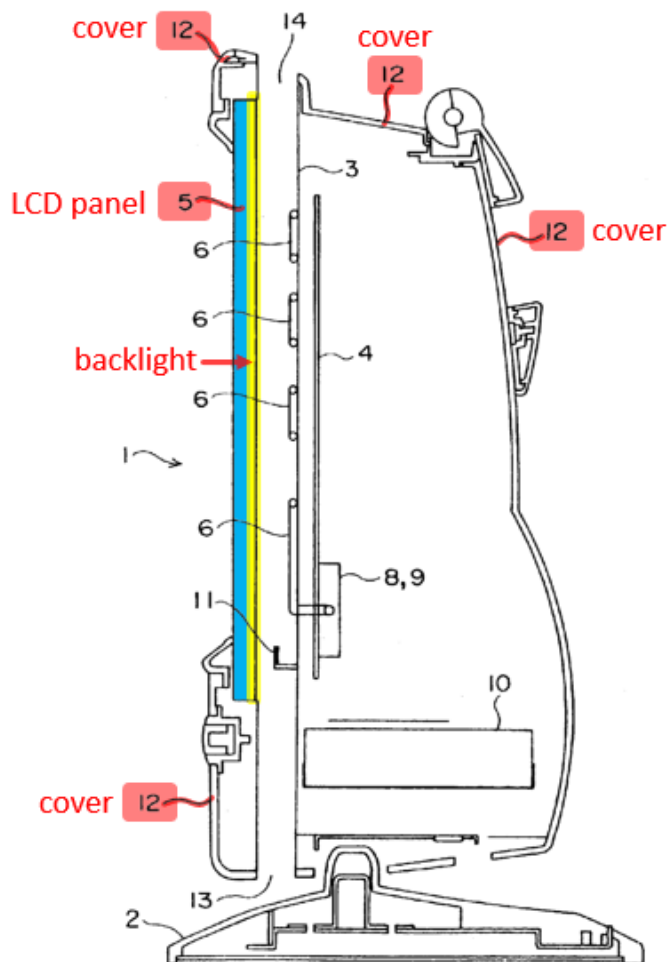
251. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 12[b] for “**a liquid crystal display (LCD) positioned within the housing and having a backlight.**”

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252. As noted above in conjunction with claim 1[c], Nagashima discloses an LCD display positioned within a housing. (*Supra*, §VIII.A.4.)

253. In my opinion, a POSITA in March 2008 would have understood that the LCD display in Nagashima has a backlight. For example, Nagashima discloses that “the LCD panel has a large area of the [sic] metal surface, and heat dissipation can be carried out at high efficiency while utilizing this large area.” (Ex. 1007, 5:61-63.) A POSITA in March of 2008 would have understood that the need for heat dissipation on the metal surface arises from the fact that a backlight is located on the back portion in LCD display 5. To the extent a backlight is not inherently disclosed in Nagashima, it would have been obvious to add a backlight into the LCD display to improve screen brightness.

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(Ex. 1007, Fig. 2 (annotated).)

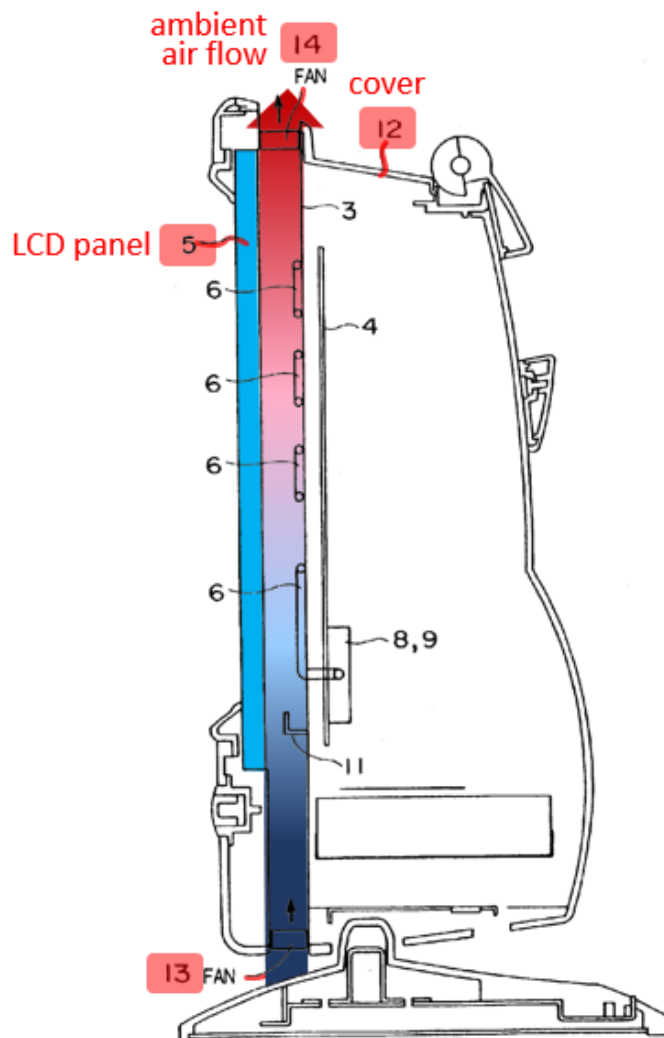
4. 12[c]

| | |
|-------|--|
| 12[c] | wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight. |
|-------|--|

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254. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 12[c] of “wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.”

255. As noted in the discussion of limitation 1[e], Nagashima discloses an electronic display that is coolable by a combination of a closed loop of isolated gas which circulates in the housing and an open loop of ambient air which passes through the housing. (*Supra*, §VIII.A.6.) And, as noted in conjunction with the discussion of claim 12[b] above (*supra*, §VIII.H.3), in addition to recognizing that the electronic display assembly with its LCD display panel **5** would include a backlight, a POSITA in March 2008 also would understand that the open loop ambient air that passes through the housing, as shown below in annotated Figure 10, also has to pass along the backlight located in the rear portion of the LCD panel **5**:



(Ex. 1007, FIG. 10 (annotated).)

I. Claim 14

256. In my opinion, Nagashima in combination with Karppanen renders obvious claim 14.

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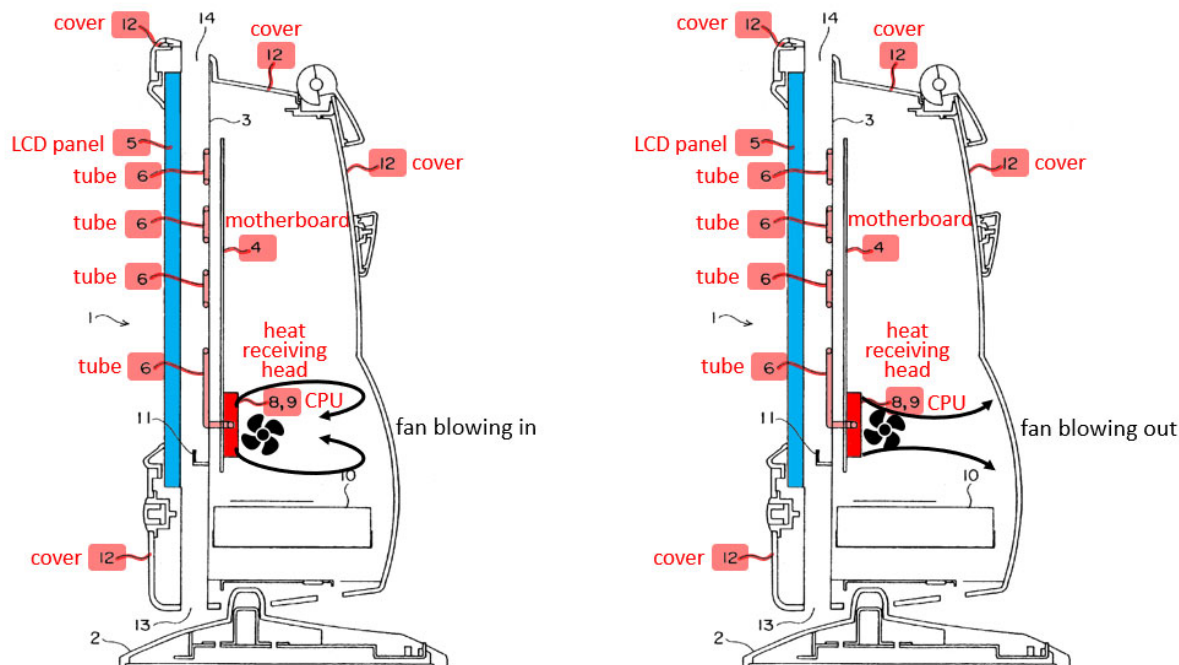
1. 14[a]

| | |
|-------|---|
| 14[a] | The electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas; |
|-------|---|

257. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 14[a] of “[t]he electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas.”

258. As noted above in conjunction with the discussion of claim 1[b] (*supra*, §VIII.A.3), the rear cooling chamber containing the “closed loop” of isolated gas is defined by main chassis **3** and cover **12** and is positioned behind the LCD panel **5**, as reflected by the annotated versions of Figure 1 below:

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(Ex. 1007, FIG. 1 (annotated).)

2. 14[b]

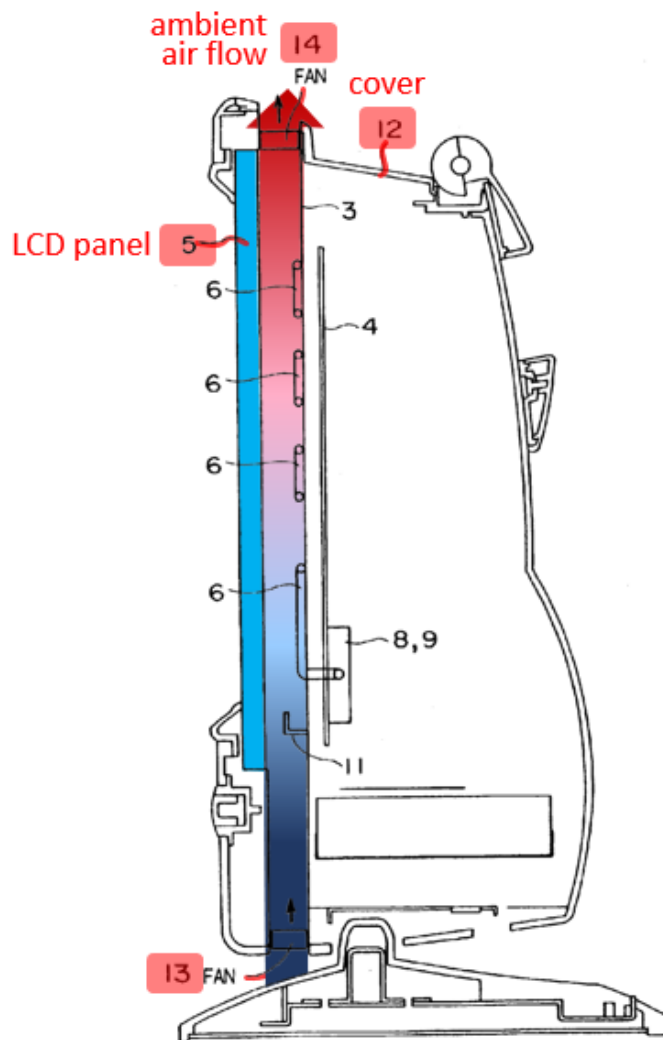
| | |
|-------|---|
| 14[b] | and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber. |
|-------|---|

259. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 14[b] of “wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber.”

260. For the same reasons that Nagashima teaches the requirements of claims 1[d] and 8 that “the closed loop gas cooling chamber is partially defined by a sealed rear plenum that prevents ambient air from entering the plenum” (*supra*,

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§§VIII.A.5, VIII.D), the open loop ambient air contacts the posterior (i.e. exterior) surface of main chassis **3**, but does not enter the rear cooling chamber, as reflected by the illustrated air path shown in annotated Figure 10 below:



(Ex. 1007, FIG. 10 (annotated).)

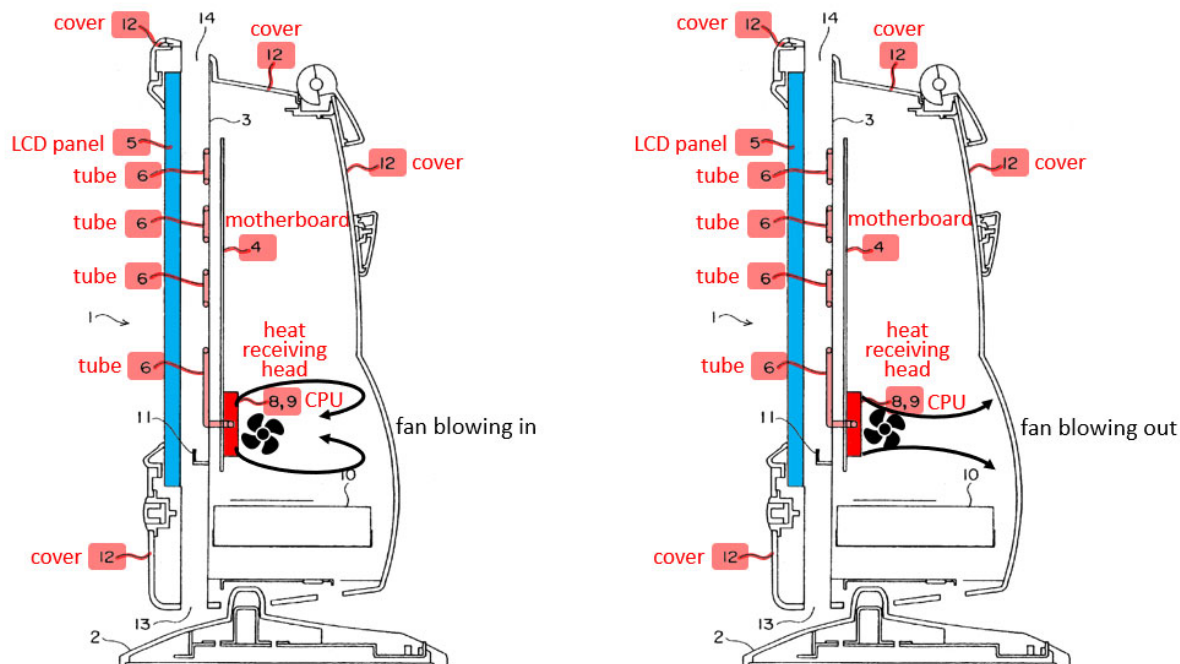
J. Claim 15

| | |
|----|--|
| 15 | The electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber. |
|----|--|

261. In my opinion, Nagashima in combination with Karppanen renders obvious the requirement of claim 15 of “[t]he electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber.”

262. Nagashima discloses that “[o]n the backside of the LCD panel **5**, i.e. its side facing the main chassis **3** are arranged a large number of connectors, and electric wiring lines, connected to the connectors, extend through an opening in the main chassis **3** and are connected to terminals of the mother board **4**.” (Ex. 1007, 3:63-4:1.) And as reflected by Figure 3, Nagashima further discloses on the backside of the motherboard **4** there are several electronic devices including “CPU **9**, the power source circuits, a hard disk drive (HDD) **10**, etc” that a POSITA in March 2008 would have understood are necessary to drive (via the electric wiring lines connecting the mother board **4** to the LCD panel **5**) the electronic display assembly positioned within the rear cooling chamber created by main chassis **3**. (*Id.* 4:4-10.) Further, the components on the backside of mother board **4** such as CPU **9** and HDD

10 that are necessary for driving the LCD are themselves “positioned within the rear cooling chamber,” as reflected by the annotated versions of Figure 1 below:



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

K. Claim 16

| | |
|----|--|
| 16 | The electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber. |
|----|--|

263. In my opinion, Nagashima in combination with Karppanen renders obvious the requirement of claim 16 of “[t]he electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear

cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber.”

264. As noted above in conjunction with the discussion of claim 14[a], the closed loop of isolated gas in Nagashima will contact an interior surface of the rear cooling chamber (i.e. the anterior surface of main chassis **3**). (*Supra*, §VIII.I.1.) And as also discussed in conjunction with claim 14[b], the open loop of ambient air will contact an exterior surface of the rear cooling chamber (i.e. the posterior surface of main chassis **3**). (*Supra*, §VIII.I.2.)

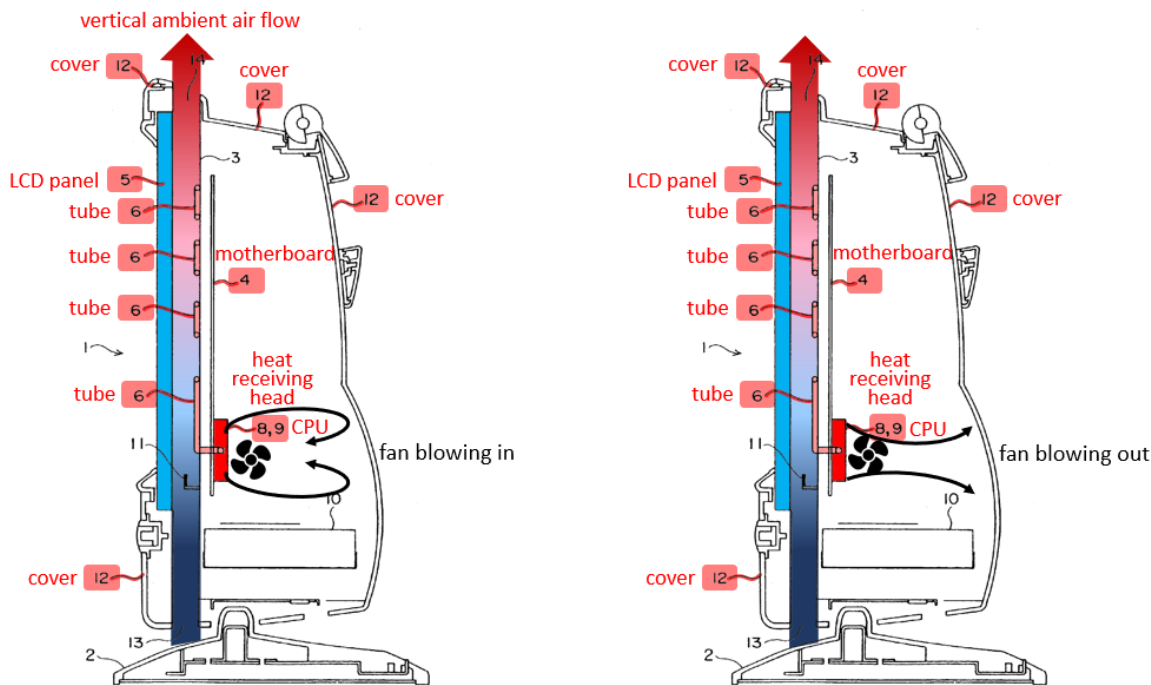
L. Claim 17

| | |
|----|--|
| 17 | The electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow. |
|----|--|

265. In my opinion, for the same reasons Nagashima in combination with Karppanen renders obvious claim 5 (*see supra*, §VIII.C), Nagashima also discloses or renders obvious claim 17.

266. In March 2008, a POSITA would have understood the positioning of the fans in Nagashima dictates the “intended direction” of the air flow. And as explained in conjunction with claim 5, Nagashima’s fans that produce both the open loop ambient air flow and the closed loop isolated gas flow are “intended

direction[s]” that are substantially perpendicular to one another, as reflected by the annotated versions of Figure 1 below:



(Ex. 1007, FIG. 1 (annotated).)

M. Independent Claim 21

267. In my opinion, Nagashima in combination with Karppanen renders obvious claim 21.

1. 21[pre]

| | |
|---------|--|
| 21[pre] | An electronic display assembly comprising: |
|---------|--|

268. In my opinion, to the extent the preamble of claim 21 requiring “**an electronic display assembly**” is limiting, Nagashima in combination with

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Karppanen renders obvious this limitation for the same reasons it renders obvious the identically worded preambles of claims 1 and 12. (*See supra*, §§VIII.A.1, VIII.H.1.)

2. 21[a]

| | |
|-------|--------------------------------|
| 21[a] | an electronic display housing: |
|-------|--------------------------------|

269. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 21[a] for “**an electronic display housing**” for the same reasons it discloses or renders obvious the identically worded claim 1[a]. (*See supra*, §VIII.A.2.)

3. 21[b]

| | |
|-------|---|
| 21[b] | a closed loop of cooling gas adapted for circulation within the electronic display housing: |
|-------|---|

270. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 21[b] of “**a closed loop of cooling gas adapted for circulation within the electronic display housing**” for the same reasons it discloses or renders obvious the limitation of claim 1[b] requiring “a gas-containing closed loop gas cooling chamber located with the electronic display housing.” (*See supra*, §VIII.A.3.)

271. A POSITA in March 2008 would understand that “a gas-containing closed loop gas cooling chamber” by design includes a closed loop of cooling gas adapted for circulation within the electronic display housing.

4. 21[c]

| | |
|-------|--|
| 21[c] | an open loop ambient air pathway through the electronic display housing; and |
|-------|--|

272. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 21[c] of “**an open loop ambient air pathway through the electronic display housing**” for the same reasons it discloses or renders obvious the identical limitation of claim 1[d].” (*See supra*, §VIII.A.5.)

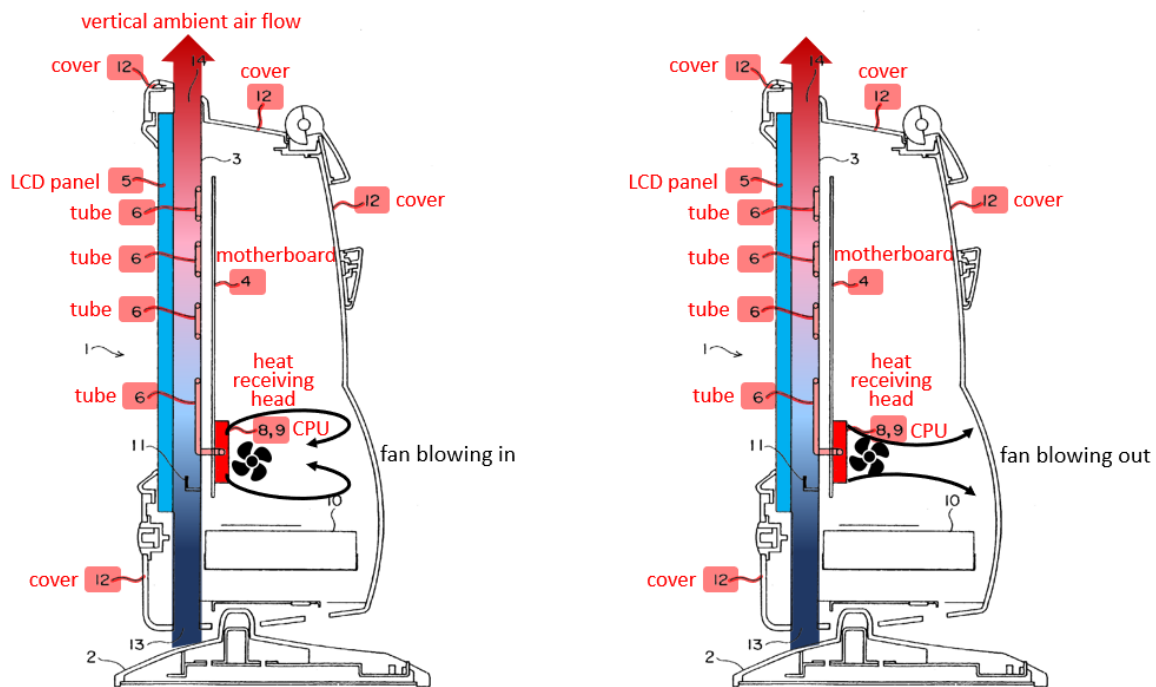
5. 21[d]

| | |
|-------|---|
| 21[d] | an electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop ambient air pathway; |
|-------|---|

273. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 21[d] of “an electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop

ambient air pathway” for the same reasons Nagashima discloses or renders obvious claims 12[c] and 14. (*See supra*, §§VIII.H.4, VIII.I.)

274. As noted above in conjunction with the discussion of claim 1[c], the LCD display **5** is isolated from the closed loop of cooling gas. (*See supra*, §VIII.A.4.) And as further discussed with respect to claim 1[e], the electronic display is contactable by ambient air flowing through the open loop pathway between LCD display **5** and main chassis **3**. (*See supra*, §VIII.A.6.) As reflected by the annotated versions of Figure 1 below, the ambient air flows through the open loop ambient pathway along LCD panel **5** and its backlight, not shown), but is isolated via main chassis **3** from the closed loop of cooling gas:



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(Ex. 1007, FIG. 1 (annotated).)

6. 21[e]

| | |
|-------|---|
| 21[e] | wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing. |
|-------|---|

275. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 21[e] of “wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing” for the same reasons that Nagashima discloses or renders obvious the nearly identical limitation of claims 1[e] and 12[c]. (*See supra*, §§VIII.A.6, VIII.H.4.)

N. Claim 22

276. In my opinion, Nagashima in combination with Karppanen renders obvious claim 22.

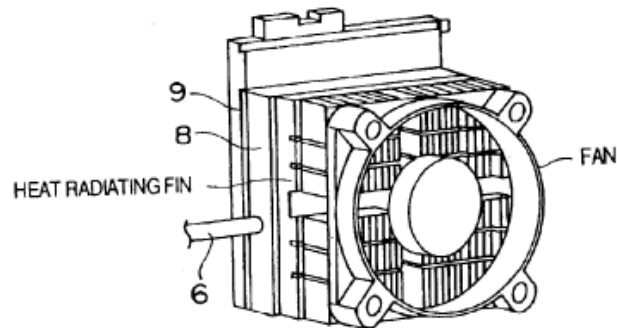
1. 22[a]

| | |
|-------|--|
| 22[a] | The electronic display assembly of claim 21 wherein: the closed loop of cooling gas is isolated within a continuous loop gas cooling chamber, and |
|-------|--|

277. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 22[a] requiring “[t]he electronic display assembly of claim 21 wherein: the closed loop of cooling gas is isolated within a continuous loop gas cooling chamber” for the same reasons that Nagashima discloses or renders obvious the nearly identical limitation of claim 4. (*See supra*, §VIII.B.)

278. Nagashima’s loop of cooling gas is a “continuous loop” of gas, in that it circulates continuously with the closed loop chamber (thereby forming a “continuous loop gas cooling chamber”). In particular, as reflected by Figure 1, Nagashima discloses a tube **6** mounted on a chassis **3** containing a liquid cooling medium which goes through a “heat receiving head **8**.” (Ex. 1007, 4:36-42.) That “heat receiving head **8**” is located within the electronic display housing (i.e. cover **12**). (*Id.*, FIGs. 1-2.) However, as reflected by Figure 6B, Nagashima discloses that a fan may be provided “on the heat radiating fin on the heat receiving head”:

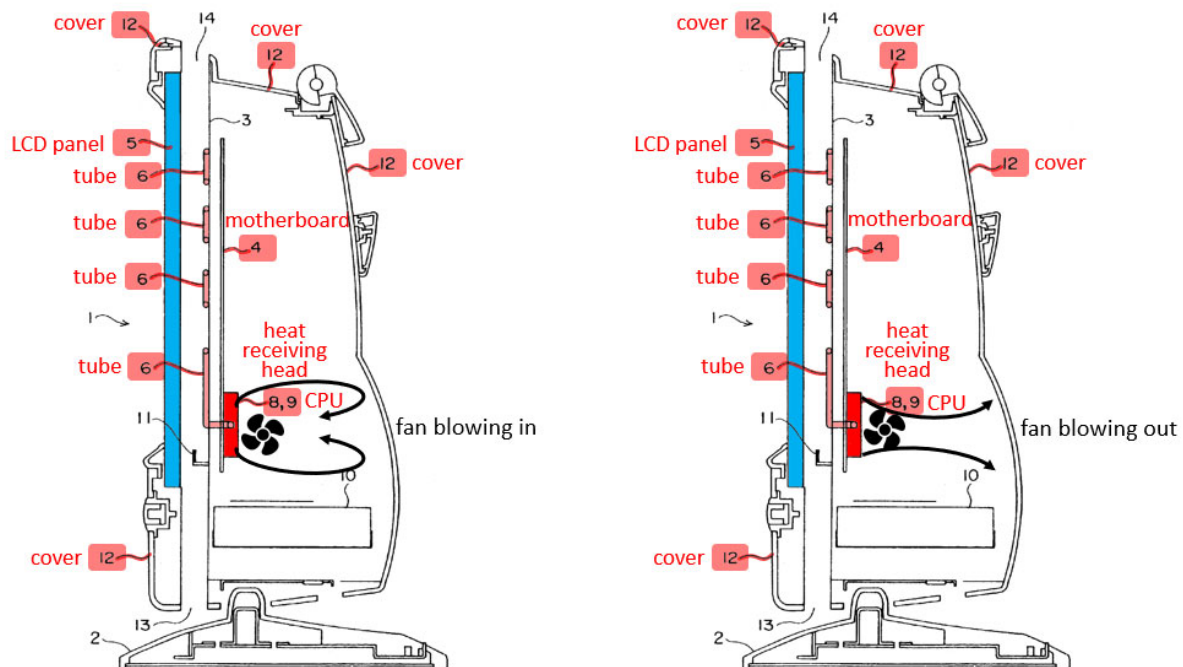
FIG. 6B



(*Id.*, 7:16-17, FIG. 6B.) The fan continuously displaces heat from the heat radiating fin, providing the “gas cooling” for the “gas-containing closed loop gas cooling chamber.” (*Id.*, 7:18-19.)

279. Air flow generated by the fan in Nagashima on the heat receiving head continuously circulates within the chamber created by the cover **12** and rear surface of the chassis **3**. (*Id.*, FIG. 1.) The air is continuously circulated between motherboard **4** and cover **12** regardless of the direction of air flow as shown below in two annotated versions of Figure 1:

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(*Id.*, FIG. 1 (annotated).) Further, the gas in the closed continuous loop gas cooling chamber is “isolated” from external air in the housing of the display. (*Cf.* Ex. 1001, 4:9-11.)

2. 22[b]

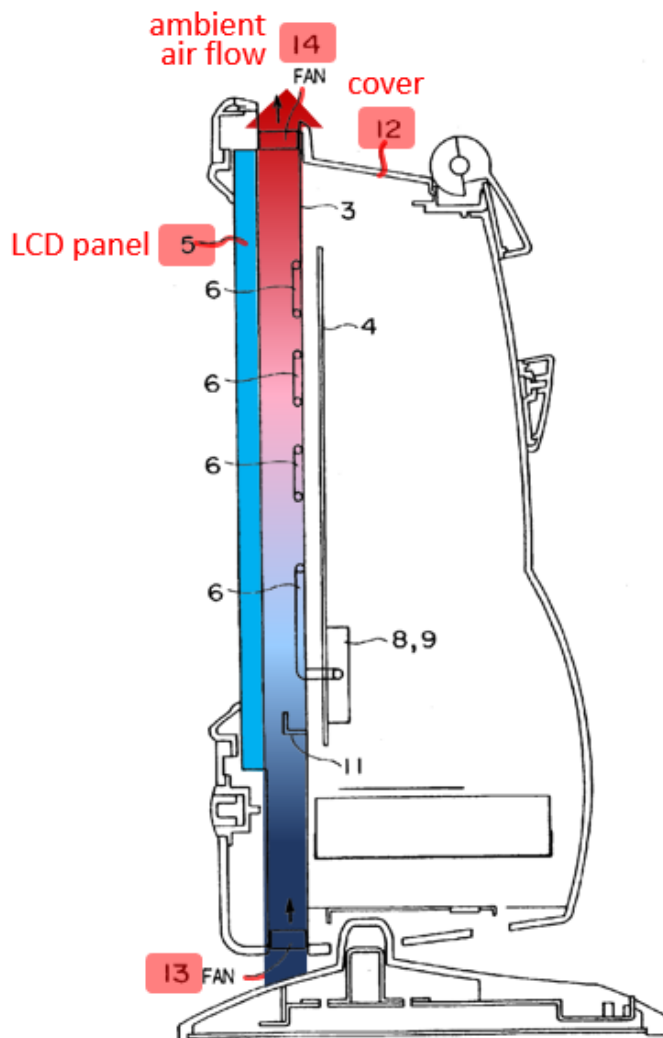
| | |
|-------|---|
| 22[b] | the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling chamber when it flows through the electronic display housing. |
|-------|---|

280. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 22[b] that “the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling

chamber when it flows through the electronic display housing” for the same reasons that Nagashima discloses or renders obvious claims 14[b] and 16. (*See supra*, §§VIII.I.2, VIII.K.)

281. Nagashima’s open loop ambient air directs the ambient air to flow over and contact the posterior (i.e. exterior) surface of main chassis **3** when it flows through the electronic housing, but as discussed with respect to claim 14[b] does not enter the rear cooling chamber. (*See supra*, §VIII.I.2.) This relationship between the open loop and the closed loop cooling chamber is reflected by the illustrated air path shown in annotated Figure 10 below:

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(Ex. 1007, FIG. 10 (annotated).)

O. Claim 23

282. In my opinion, Nagashima in combination with Karppanen discloses or renders obvious claim 23.

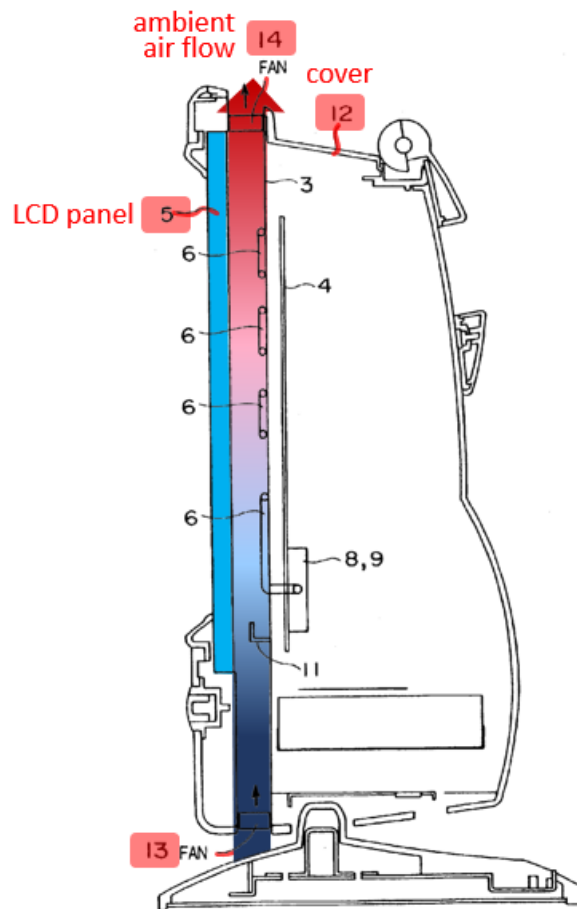
1. 23[a]

| | |
|-------|---|
| 23[a] | The electronic display assembly of claim 22 further comprising: a fan located within the electronic display housing, |
|-------|---|

283. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 23[a] of “[t]he **electronic display assembly of claim 22 further comprising: a fan located within the electronic display housing**” for the same reasons Nagashima discloses or renders obvious the portion of the limitation 11[b] requiring “a fan for producing a flow of ambient air through the open loop ambient air pathway in the electronic display housing.” (*See supra*, §VIII.G.2.)

284. As noted in the discussion of claim 11[b] (*supra*, §VIII.G.2.) Nagashima discloses an embodiment reflected by Figure 10, in which an “air ventilation fan” can be added at the lower, upper or both lower and upper portions of cover **12** to “expedite the movement of air” “between the LCD panel **[5]** and the main chassis **[3]**” as part of a “chimney-effect” air-flow path. (Ex. 1007, 5:63-6:13.) Annotated Figure 10 below depicts the exemplary embodiment of the Nagashima “chimney” with “air ventilation fans” positioned in the air inlet **13** and the air outlet **14** formed by this configuration, and which acts as an open loop ambient air pathway:

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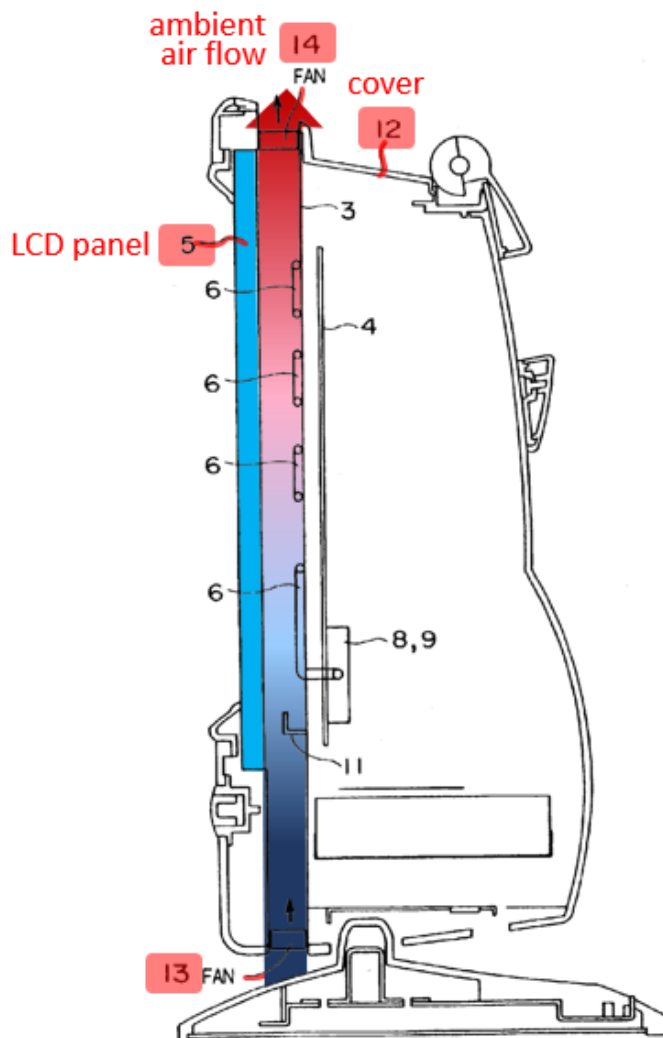
(*Id.* FIG. 10 (annotated); *see also id.* 3:22-24.) As can be seen, the fan which creates the open loop ambient air flow is located within the cover **12**, or is a part of it, and hence is located within the electronic display casing housing. (*Id.* Ex. 10 (annotated).)

2. 23[b]

| | |
|-------|--|
| 23[b] | the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display |
|-------|--|

285. In my opinion, Nagashima in combination with Karppanen renders obvious the limitation of claim 23[b] requiring “the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display.”

286. Specifically, as reflected above in conjunction with the discussion of claims 1[d] and 23[a] (*supra*, §§VIII.A.5, VIII.O.1) and as reflected by the illustration of the air ventilation fans shown in Figure 10, the open loop ventilation fan moves air between the surface of the continuous loop gas cooling chamber (main chassis **3**) and the rear surface of LCD panel **5**, and thus moves move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display:



(Ex. 1007, FIG. 10 (annotated); *see also id.* 3:22-24, 5:63-13.)

P. Motivation to Combine Nagashima and Karppanen

287. In my opinion, to the extent that Nagashima alone or in combination with the knowledge one skilled in the art does not disclose a rear cooling chamber that contains a closed loop (e.g., a “gas pathway within a display housing containing gas that is essentially isolated from external air”) because ambient air may be

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permitted to enter the rear chamber, it nonetheless would have been obvious in March 2008 to a POSITA to further modify Nagashima to seal the rear cooling chamber for at least the reasons disclosed in Karppanen (Ex. 1006).

288. Karppanen discloses a device casing **12** that contains electronic equipment needed in the control of the display element” including “the control unit of the information board, the power supply of the control unit and the power supply of the background light of the display.” (*Id.*, 3:32-34.) Like the display casing **10**, the device casing **12** in Karppanen may contain a closed loop of air that “circulates as forced past all the components being warmed” as a result of their ordinary operation. (*Id.*, 10:20-24.) The device casing **12** in Karppanen is “closed” (*Id.*, 6:20-21) and has been made “weatherproof.” (*Id.*, 4:6-8.) In view of these disclosures, a POSITA would understand that Karppanen discloses a rear cooling chamber containing electronic components that may be used to operate the display that are being cooled by a closed loop of air.

289. It would have been obvious to combine the teaching in Karppanen to place electronic components in a closed loop cooling system to the display in Nagashima. A POSITA would have been motivated to modify the rear cooling chamber to prevent ambient air from entering (if needed) because such ambient air can include contaminants which could damages vital electronic components.

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Indeed, Nagashima recognizes that ambient air traveling through the display may contain such contaminants including “dust and dirt.” (Ex. 1007, 6:13-16.) Because the rear cooling chamber in Nagashima contains critical electronic components including at least the CPU, power source circuits, hard disk drive, chip sets, and display controllers (*Id.*, 4:4-22), a POSITA would have been motivated to seal the rear cooling chamber in which these components are housed in order to prevent dust, dirt and other contaminants from entering.

290. Additionally, air flow generated by the fan on the heat receiving head within Nagashima’s closed loop cooling chamber circulates within the chamber created by the cover **12** and rear surface of the chassis **3**. (Ex. 1007, FIGs. 1, 6B.) Modifying Nagashima with Karppanen’s sealed rear closed loop cooling chamber advantageously constrains the flow of air, and ensures that the air flows from Nagashima’s fan on heat receiving head **8** circulates between motherboard **4** and cover **12**.

291. The combination of Nagashima and Karppanen would have been combining known prior art elements relating to cooling electronic components located in a sealed closed loop chamber (i.e. using a fan for air movement and a device casing) according to known methods (employing a continuous closed loop) to obtain the predictable results of reliable energy, temperature and pressure

efficiency.

**IX. GROUND 3 – CLAIMS 1, 4, 5, 8-23 ARE OBVIOUS OVER OHTA
AND MARUMOTO**

A. Independent Claim 1

292. In my opinion, Ohta and Marumoto render obvious claim 1.

1. Element 1[pre]

| | |
|--------|--|
| 1[pre] | An electronic display assembly comprising: |
|--------|--|

293. In my opinion, to the extent that the claim 1 preamble is limiting, the combination of Ohta and Marumoto discloses or renders obvious “[a]n **electronic display assembly.**”

294. In particular, Ohta discloses a “cooling device” for a “plasma display panel **1**” (Ex. 1004, ¶¶[0006], [0010], FIGs. 1-4.) The “plasma display panel **1** is produced by [first] sealing two glass substrates on which electrodes have been formed in such a way as to maintain the space necessary for discharge and then filling the space with a dischargeable noble gas,” and “is incorporated with a front face plate **3** that is sufficiently permeable to visible light by interposing a sealant **2** also serving as spacer therebetween along the edges, so as to form an airtight container between the same and the display face of the plasma display panel **1**.” (*Id.*, ¶¶[0010], [0026].)

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295. In March 2008, a POSITA would have understood a plasma display panel produced by sealing two glass substrates on which electrodes have been formed in such a way as to maintain the space necessary for discharge and which is filled with a noble gas, and which also incorporates a front face plate that is permeable to light, is a type of “electronic display device.”

296. Likewise, Marumoto discloses a “liquid crystal panel 1” that can be an “active matrix type.” (Ex. 1005, ¶[0010], FIG. 1.) Marumoto notes that it already was “well-known that [such] liquid crystal panels are used in the display instrument of notebook PCs and word processors.” (*Id.*, ¶[0002].) In my opinion, in March 2008, a POSITA would have understood that an active matrix liquid crystal panel is a type of “electronic display device.”

297. Accordingly, Ohta and Marumoto disclose or render obvious “[a]n **electronic display assembly.**”

2. Element 1[a]

| | |
|------|--------------------------------|
| 1[a] | An electronic display housing; |
|------|--------------------------------|

298. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 1[a] of “**an electronic display housing.**”

299. For example, Ohta explains that, in “embodiment example 5” of the “present invention,” the “panel display panel 1 is incorporated with a housing 11.”

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(Ex. 1004, ¶¶[0030]-[0033], FIG. 5.) As discussed below, the “embodiment example 3” of Ohta discloses nearly all elements in limitations 1[b]-1[e]. (*See infra*, §§IX.A.3-6.)

300. While a housing is not explicitly disclosed in Ohta’s “embodiment example 3,” a POSITA in March 2008 would have understood that, based on the teaching in Ohta’s “embodiment example 5” that the electronic display and cooling systems taught in Ohta could be included in the same housing. Moreover, a POSITA in March 2008 would have been motivated to contain the display and its accompanying cooling system in a single housing to protect both from the environment during outdoor use and to facilitate easier transfer.

301. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “**an electronic display housing.**”

3. Element 1[b]

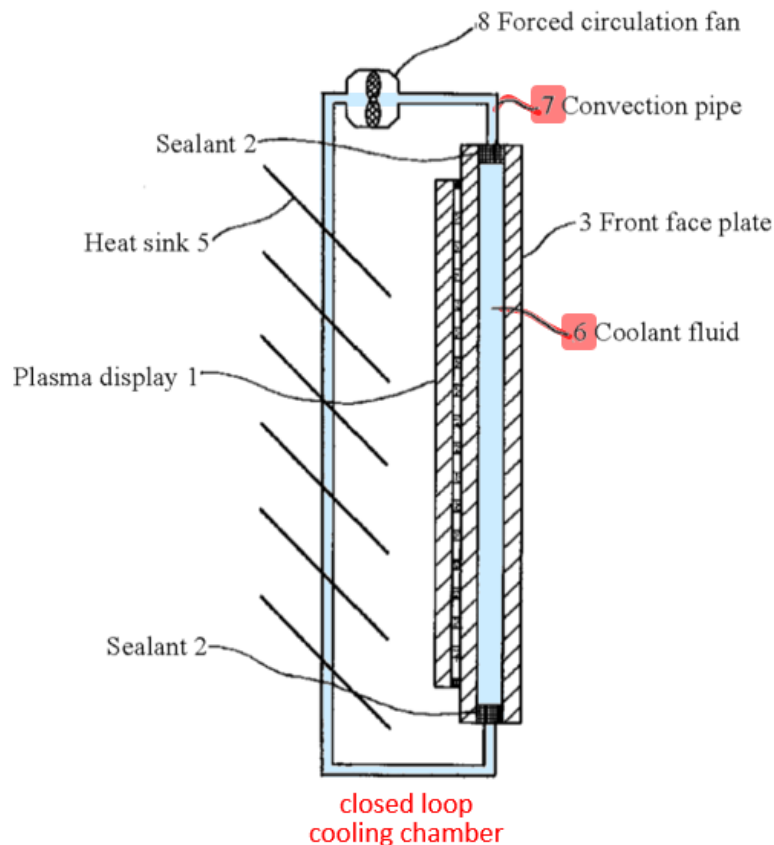
| | |
|------|---|
| 1[b] | a gas-containing closed loop gas cooling chamber located within the electronic display housing; |
|------|---|

302. In my opinion, Ohta in combination with Marumoto renders obvious the limitation of claim 1[b] of “**a gas-containing closed loop gas cooling chamber located within the electronic display housing.**”

303. As shown in annotated Figure 3 below, Ohta discloses a closed loop

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cooling chamber located within the electronic display housing:

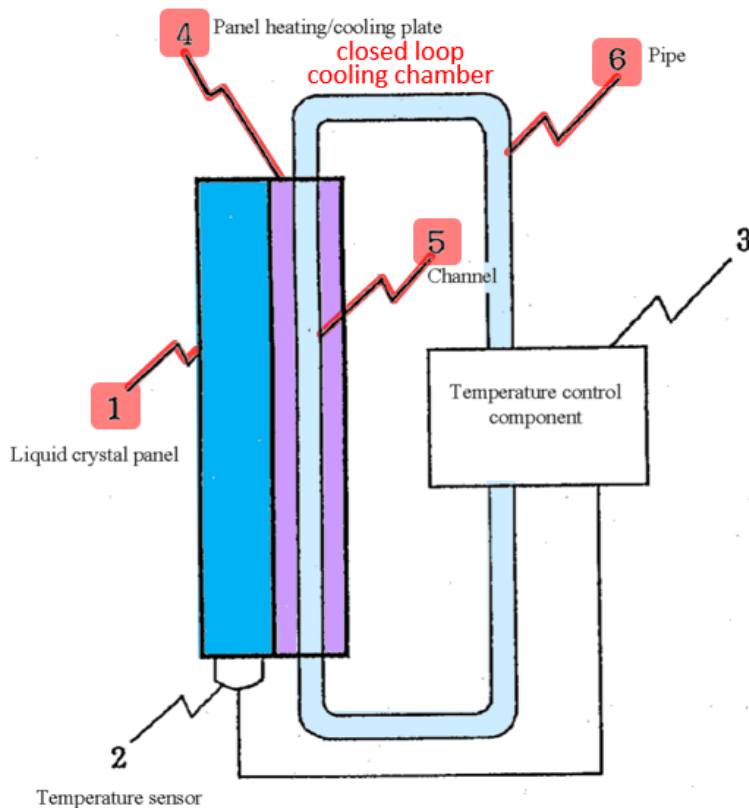


(Ex. 1004, FIG. 3 (annotated).) The closed loop cooling chamber contains a coolant fluid **6** and “forced circulation fan **8**” which “caus[es] the cooling fluid **6** to circulate within the interior of the” closed loop “of the airtight container formed between the front face plate **3** and the display face of the plasma display panel **1** and within the interior of the convection tube, such that the heat from the plasma display panel **1** is expelled to the exterior from the heat sink **5**, thereby cooling the panel.” (*Id.* ¶[0021].) Ohta, in Figure 5 and accompanying discussion,

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additionally discloses a similar structure wherein air is moved under the action of a fan across through a gap between the front surface of the display panel and the front faceplate. (*Id.*) While the Figure 5 embodiment discloses an open loop system, it would have been obvious to a POSITA based on the teachings of Ohta alone to combine the closed loop approach with the approach of using air as the working fluid as disclosed in the Figure 5 embodiment since this approach would preserve the benefits of eliminating contamination of the display front surface that could occur when using an open loop system but would still provide the expected result of cooling the display as disclosed in both embodiments.

304. Marumoto similarly discloses a closed loop “cooling/heating system for liquid crystal panel” shown in annotated Figure 1 below:



(Ex. 1005, ¶[0006], FIG. 1 (annotated).) Marumoto further teaches that the “heating/cooling material may be a gas or fluid.” (*Id.*, ¶0007].) In the embodiment shown above in Figure 1, Marumoto discloses the an active matrix type liquid crystal panel 1, “a temperature sensor 2 [that] is attached to this liquid crystal panel 1 to measure the temperature of the environment in which the panel is installed, which is supplied to the temperature control component 3.” (*Id.*, ¶0010].)

305. As further shown in Marumoto’s Figure 1 above, the panel heating/cooling plate 4 “is bonded to the back face of the liquid panel 1.” (*Id.*, ¶0011].) The panel heating/cooling plate 4 comprises “a high heat transmission

plate, in the interior of which a channel **5** for heating/cooling material is formed in an articulated manner.” (*Id.*) The “entry and exit of this channel **5** are connected, respectively to the pipe **6** and the temperature control component **3**.” (*Id.*) The heating/cooling material “circulates between the panel heating/cooling plate **4** and the temperature control component **3**.” (*Id.*) Accordingly, Muromoto’s closed loop circulates isolated air within the housing, and is a “gas pathway within a display housing containing gas that is essentially isolated from external air,” so as to satisfy the Delaware District Court’s construction for “closed loop.” (Ex. 1011, p.2; Ex. 1012, p.8.)

306. In my opinion, a POSITA in March 2008 would have been motivated to modify the closed loop cooling system in Ohta by replacing the cooling fluid with gas to reduce maintenance costs, prevent leakage of the liquid cooling fluid and reduce energy costs. A POSITA would have understood that, based on the teachings in Marumoto that both gas and liquid can be used to cool the display when it is outside the closed loop, the liquid cooling system in Ohta could be advantageously replaced with a transparent gas like air without degrading overall system performance. In my opinion, a POSITA would have immediately recognized the advantage of this simple modification when reviewing Marumoto in view of the existing advantageous of the closed loop cooling system of Ohta.

307. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “a gas-containing closed loop gas cooling chamber located within the electronic display housing.”

4. Element 1[c]

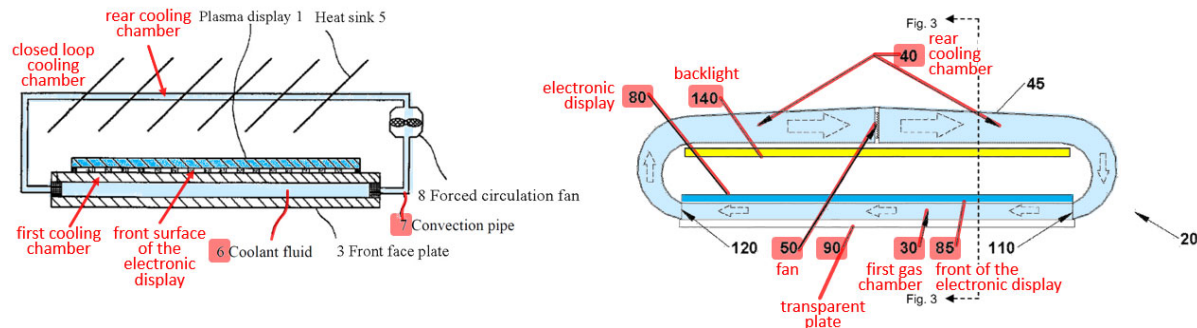
| | |
|------|--|
| 1[c] | an electronic display positioned within the electronic display housing but outside of the closed loop gas cooling chamber, and |
|------|--|

308. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 1[c] of “an electronic display positioned within the electronic display housing but outside of the closed loop gas cooling chamber.”

309. As noted above in conjunction with claim 1[a], Ohta discloses an electronic display located in a housing (*supra*, §IX.A.2), and as further discussed with respect to claim 1[b], Ohta in combination with Marumoto teaches a closed loop gas cooling chamber located in the housing (*supra*, §IX.A.3.) As noted in the annotated figures above, in both Ohta and Marumoto, the electronic display is located outside the disclosed closed loop cooling chamber. (*See* Ex. 1004, FIG. 3; Ex. 1005, FIG. 1.)

310. Indeed, as shown in the annotated illustrations below, the positioning of the electronic display relative to the closed loop cooling chamber Ohta is nearly

identical to the positioning in the '287 patent:



(Ex. 1004, FIG. 3 (annotated); Ex. 1001, FIG. 2 (annotated).)

311. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “an electronic display positioned within the electronic display housing but outside of the closed loop gas cooling chamber.”

5. Element 1[d]

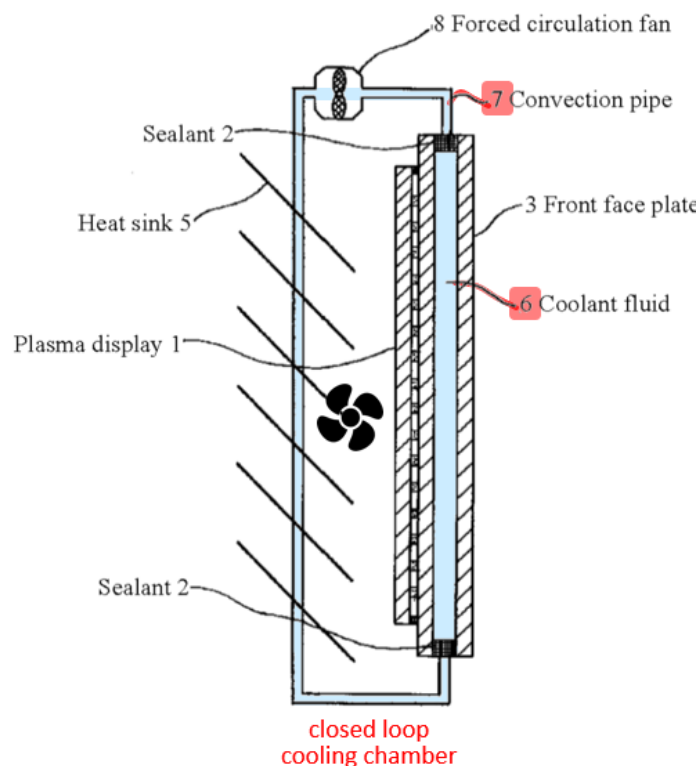
| | |
|------|--|
| 1[d] | an open loop ambient air pathway through the electronic display housing; |
|------|--|

312. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 1[d] of “**an open loop ambient air pathway through the electronic display housing.**”

313. Ohta’s “embodiment example 3” includes “heat sinks 5” which can be “forcibly air cooled” (Ex. 1004, ¶¶[0019], [0024], FIG. 3.) In my opinion, a POSITA in March 2008 would have understood this disclosure to require cooling of the heat

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sinks using open loop ambient air provided by a fan. To determine where to position the fan to “air cool” the heat sinks, a POSITA would have considered various locations and factors, including other portions of the display system that could be advantageously cooled by the flow of ambient air. An exemplary implementation for Ohta’s “forcibly air cooled” heat sink is shown below in annotated Figure 3:



(*Id.*, ¶[0019], FIG. 3 (annotated).) Ohta thus discloses an open loop of ambient air through the electronic display housing.

314. Accordingly, Ohta in combination with Marumoto discloses or renders obvious **“an open loop ambient air pathway through the electronic display**

housing.”

6. Element 1[e]

| | |
|------|---|
| 1[e] | wherein the electronic display is coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air flow through the open loop ambient air pathway in the electronic display housing. |
|------|---|

315. In my opinion, Ohta in combination with Marumoto renders obvious the requirement of claim 1[e] of “wherein the electronic display is coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air flow through the open loop ambient air pathway in the electronic display housing.”

316. Ohta discloses with reference to “embodiment example 3” that when a specified temperature inside the display housing is exceeded, “the forced circulation fan **8** activates, causing the cooling fluid to circulated within” the closed loop “such that heat from the plasma display panel **1** is expelled to the exterior from the heat sink **5**, thereby cooling the panel.” (Ex. 1004, ¶[0021], FIG. 3.) Ohta thus discloses that the display is coolable by the closed loop cooling chamber.

317. As noted above in conjunction with the requirement of claim 1[d], Ohta’s heat sink **5** is cooled using an open loop ambient air pathway. (*Supra*,

§IX.A.5.) In addition, in March 2008 it would have been obvious to a POSITA to position the open loop fan used to cool the heat sinks in a direction that would also allow the fans to cool the rear surface of the LCD display in Ohta as modified by Marumoto. The electronic display is thus coolable by a combination of the closed loop and open loop.

318. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “wherein the electronic display is coolable by a combination of gas circulation within the closed loop gas cooling chamber and ambient air flow through the open loop ambient air pathway in the electronic display housing.”

B. Claim 4

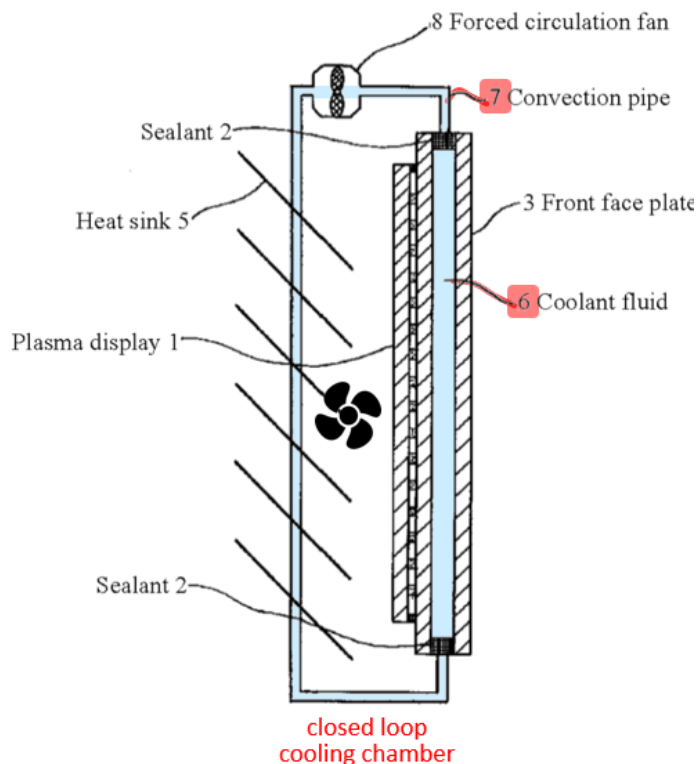
| | |
|---|---|
| 4 | The electronic display assembly of claim 1 wherein: the gas within the closed loop gas cooling chamber is isolated from the open loop of ambient air. |
|---|---|

319. On my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 4 of “[t]he electronic display assembly of claim 1 wherein: the gas within the closed loop gas cooling chamber is isolated from the open loop of ambient air.”

320. As noted above in conjunction with the discussion of claim 1[b], in my opinion, Ohta in combination with Marumoto discloses a closed loop gas cooling

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chamber. (*Supra*, §IX.A.3.) Meanwhile, Ohta teaches that the air in the closed loop cooling chamber is essentially isolated from the external air in the housing of the display containing the open loop of ambient air, as shown in Figure 3:



(Ex. 1004, FIG. 3 (annotated); *cf.* Ex. 1001, 4:9-11.)

321. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “[t]he electronic display assembly of claim 1 wherein: the gas within the closed loop gas cooling chamber is isolated from the open loop of ambient air.”

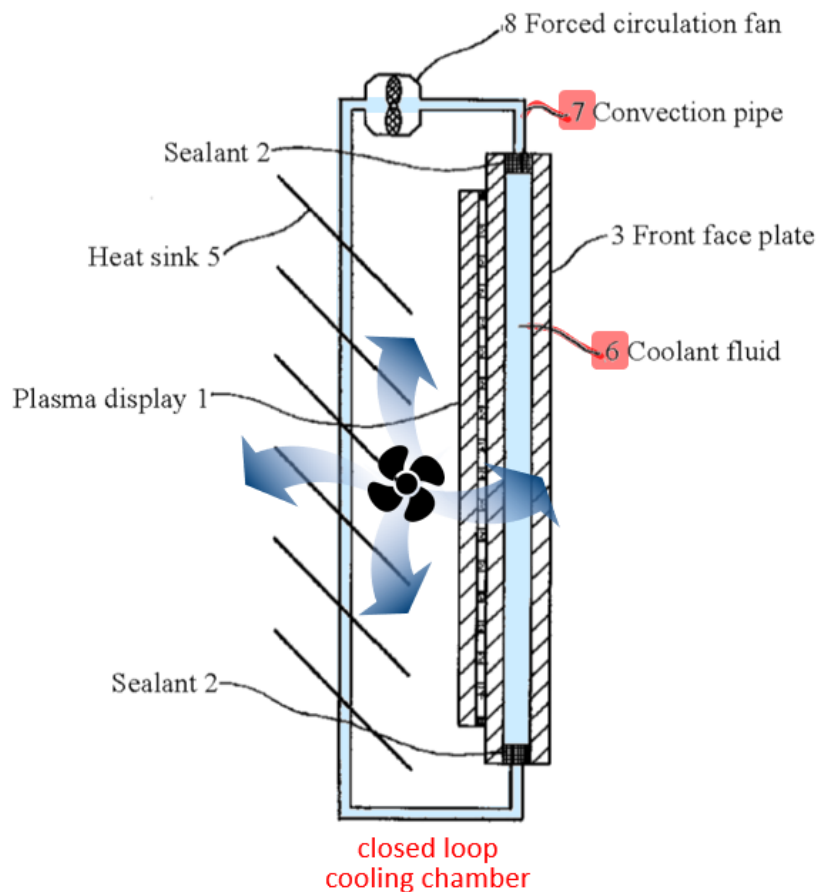
C. Claim 5

| | |
|---|---|
| 5 | The electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber and the ambient air pathway are configured such that gas circulation within the gas cooling chamber will occur in a direction that is substantially perpendicular to the direction that ambient air will flow through the electronic display housing. |
|---|---|

322. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 5 of “[t]he electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber and the ambient air pathway are configured such that gas circulation within the gas cooling chamber will occur in a direction that is substantially perpendicular to the direction that ambient air will flow through the electronic display housing.”

323. As noted above in conjunction with the discussion of claim 1[b], in my opinion, Ohta in combination with Marumoto discloses cooling an LCD display using a closed loop gas cooling chamber. (*Supra*, §IX.A.3.) As shown in the annotated version of Ohta’s Figure 3 below, while air within the closed loop gas cooling chamber in Ohta as modified by Marumoto moves in both vertical and horizontal directions, it moves predominantly in a vertical direction:

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(Ex. 1004, FIG. 3 (annotated).)

324. As noted above in the discussion of claim 1[d] (*supra*, §IX.A.5), in my opinion, Ohta discloses “forcibly air-cool[ing]” the heat sink using fans. A POSITA in March 2008 would have understood that the fan which cools the heat sinks 5 could be located in multiple different areas to optimize thermal performance. For example, a POSITA would have sought to blow ambient air on a substantial portion of the heat sink in order to facilitate removal of heat from the heat sink. In the case of Ohta, a POSITA would also be motivated to have some ambient air access the rear

surface of the LCD display so as to dissipate heat generated by the backlight. To achieve both goals, a POSITA would be motivated to place the fan in the middle of the display so that it blows along the rear surface of the LCD display and through a portion of the heat sink as shown below. The ambient air thus flows in a third direction that is perpendicular to the airflow in the closed loop cooling chamber and, again, occurs in a manner similar to what is disclosed in the specification. (*Cf.* Ex. 1001, FIG. 1.)

325. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “[t]he electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber and the ambient air pathway are configured such that gas circulation within the gas cooling chamber will occur in a direction that is substantially perpendicular to the direction that ambient air will flow through the electronic display housing.”

D. Claim 8

| | |
|---|--|
| 8 | The electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber is partially defined by a sealed rear plenum that prevents ambient air from entering the plenum. |
|---|--|

326. In my opinion, Ohta in combination with Marumoto renders obvious the requirement of claim 8 of “[t]he electronic display assembly of claim 1 wherein:

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the closed loop gas cooling chamber is partially defined by a sealed rear plenum that prevents ambient air from entering the plenum.”

327. As noted above in conjunction with claim 1[b], Ohta in combination with Marumoto discloses or renders obvious a closed loop gas cooling chamber. (*Supra*, §IX.A.3.) A POSITA in March 2008 would have recognized that ambient air is not permitted to enter the close loop cooling chamber in either Ohta or Marumoto. A POSITA would thus have understood that the entire closed loop in either Ohta or Marumoto is sealed plenum.

328. Alternatively, Ohta teaches a front face plate **3** “with sufficient permeability to visible light is integrated with a plasma display panel **1** by interposing sealant **2** also serving as spacer therebetween along the edges, so as to form an airtight container between the same and the display face of the plasma display panel **1**.” (Ex. 1004, ¶[0019], FIG. 3.) Additionally, convection pipe 7 in Ohta forms a secondary plenum ensuring that the circulating fluid is fully isolated from the ambient air. In light of these disclosures, in my opinion, a POSITA in March 2008 would understand that front face plate **3** operates as a sealed plenum to the rear of the electronic display which prevents ambient air from entering the plenum.

329. Accordingly, Ohta in combination with Marumoto discloses or renders

obvious “[t]he electronic display assembly of claim 1 wherein: the closed loop gas cooling chamber is partially defined by a sealed rear plenum that prevents ambient air from entering the plenum.”

E. Claim 9

| | |
|---|---|
| 9 | The electronic display assembly of claim 8 further comprising: one or more electronic devices for operating the electronic display positioned within the sealed plenum. |
|---|---|

330. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 9 of “[t]he electronic display assembly of claim 8 further comprising: one or more electronic devices for operating the electronic display positioned within the sealed plenum.”

331. Ohta teaches that forced circulation fan 8 is located within the closed loop cooling chamber. (Ex. 1004, ¶[0019], FIG. 3.) “The forced circulation fan 8 is furnished with ... an external power supply (which may be shared with the drive circuit of the plasma display panel) to drive the fan.” (*Id.* ¶[0019].)

332. In my opinion, a POSITA in March 2008 would have understood that a power supply shared with the drive circuit for the display is an electronic device for operating the display, and that in Ohta it necessarily is positioned within the sealed plenum.

333. Accordingly, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 9 of “[t]he electronic display assembly of claim 8 further comprising: one or more electronic devices for operating the electronic display positioned within the sealed plenum.”

F. Claim 10

| | |
|----|--|
| 10 | The electronic display assembly of claim 1 wherein: the electronic display is selected from the group consisting of a liquid crystal display, a light emitting diode display, an organic light emitting diode display, a field emitting display, a cathode ray tube display, and a plasma display. |
|----|--|

334. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 10 of “[t]he electronic display assembly of claim 1 wherein: the electronic display is selected from the group consisting of a liquid crystal display, a light emitting diode display, an organic light emitting diode display, a field emitting display, a cathode ray tube display, and a plasma display.”

335. Ohta discloses use of a closed loop cooling chamber and open loop ambient air fan in conjunction with a plasma display. (Ex. 1004, ¶¶[0018]-[0024]; FIGs. 1-4.) Marumoto, meanwhile, discloses use of a closed loop gas cooling chamber in conduction with an LCD display. (Ex. 1005, ¶[0006], FIG. 1.)

336. Accordingly, Ohta in combination with Marumoto discloses or renders

obvious “[t]he electronic display assembly of claim 1 wherein: the electronic display is selected from the group consisting of a liquid crystal display, a light emitting diode display, an organic light emitting diode display, a field emitting display, a cathode ray tube display, and a plasma display.”

G. Claim 11

337. In my opinion, Ohta and Marumoto render obvious claim 11.

1. 11[a]

| | |
|-------|--|
| 11[a] | The electronic display assembly of claim 1 further comprising: a gas-circulating fan for circulating the gas within the closed loop gas cooling chamber, and |
|-------|--|

338. In my opinion, Ohta in combination with Marumoto discloses the requirement of claim 11[a] of “[t]he electronic display assembly of claim 1 further comprising: a gas-circulating fan for circulating the gas within the closed loop gas cooling chamber.”

339. As noted above in conjunction with the discussion of claim 1[b], Ohta in combination with Marumoto claim discloses a closed loop gas cooling chamber. (*Supra*, §IX.A.3.) And Ohta further discloses a forced circulation fan 8 which circulates cooling medium within the closed loop. (Ex. 1004, ¶[0021], FIG. 3.)

340. In my opinion, Ohta and Marumoto thus in March 2008 would have

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disclosed or rendered obvious to a POSITA a gas circulating fan for circulating the gas within the closed loop gas cooling chamber.

341. Accordingly, Ohta in combination with Marumoto discloses the requirement of claim 11[a] of “[t]he electronic display assembly of claim 1 further comprising: a gas-circulating fan for circulating the gas within the closed loop gas cooling chamber.”

2. 11[b]

| | |
|-------|--|
| 11[b] | a fan for producing a flow of ambient air through the open loop ambient air pathway in the electronic display housing. |
|-------|--|

342. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 11[b] of “a fan for producing a flow of ambient air through the open loop ambient air pathway in the electronic display housing.”

343. As noted above, Ohta discloses a fan that produces a flow of ambient air through the open loop ambient pathway (and onto heat sink **5**). (*Supra*, §IX.A.5.)

344. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “a fan for producing a flow of ambient air through the open loop ambient air pathway in the electronic display housing.”

H. Independent Claim 12:

345. In my opinion, Ohta in combination with Marumoto renders obvious claim 12.

1. 12[pre]

| | |
|---------|--|
| 12[pre] | An electronic display assembly comprising: |
|---------|--|

346. To the extent the preamble of claim 12 is limiting, in my opinion, Ohta in combination with Marumoto discloses or renders obvious “[a]n **electronic display assembly**” for the same reasons the combination discloses the identically-worded preamble of claim 1. (*Supra*, §IX.A.1.)

2. 12[a]

| | |
|-------|------------|
| 12[a] | a housing; |
|-------|------------|

347. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 12[a] of a “**housing**” for the same reasons that the combination discloses the requirement of claim 1[a] of “an electronic display housing.” (*Supra*, §IX.A.2.)

3. 12[b]

| | |
|-------|--|
| 12[b] | a liquid crystal display (LCD) positioned within the housing and having a backlight; |
|-------|--|

348. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 12[b] of “**a liquid crystal display (LCD) positioned within the housing and having a backlight.**”

349. As noted above in conjunction with the discussion of claim 1[c], in my opinion, Ohta discloses a plasma display positioned within a housing. (*Supra*, §IX.A.4.)

350. In my opinion, Marumoto, meanwhile, discloses a cooling system for a “liquid crystal panel 1” that “comprises a panel heating/cooling plate [4], which comprises a high heat conductive plate positioned adjacently to the back face of a liquid crystal panel, in the interior of which a channel [5] for heating/cooling material is formed.” (Ex. 1005, ¶[0006], FIG. 1.) Marumoto teaches that a transparent plate 4 can be used “to enable the transmission of a backlight” in “liquid crystal panel 1.” (*Id.*, ¶[0012].)

351. In my opinion, a POSITA in March 2008 would have been motivated to replace the plasma display in Ohta with the liquid crystal panel in Marumoto. As noted in Ohta, plasma displays suffer from poor contrast due to reflection of external light onto the display. (Ex. 1004, ¶[0013].) To address this, Ohta resorts to dyeing the cooling fluid or coloring a face plate in order to reduce permeability to visible light. (Ex. 1004, ¶¶[0022]-[0023].) The use of such techniques, however, have the

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downside of darkening the images being shown on the display. In contrast, the liquid crystal panel in Marumoto provides strong contrast without the need for colored equipment or dyed fluids. A POSITA in March 2008 would thus have been motivated to replace the plasma display in Ohta with an LCD display as in Marumoto. Indeed, the structure for the example in Marumoto demonstrates that the backlight in a liquid crystal panel should be cooled and would motivate a POSITA to do so. (Ex. 1005, FIG. 1.)

352. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “a liquid crystal display (LCD) positioned within the housing and having a backlight.”

4. 12[c]

| | |
|-------|--|
| 12[c] | wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight. |
|-------|--|

353. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 12[c] of “wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and

along the backlight.”

354. As noted above in conjunction with the discussion of claims 1[b], 1[c] and 12[b], Ohta in combination with Marumoto teach an LCD display that is coolable by a closed loop of isolated gas. (*Supra*, §§IX.A.3-4, IX.H.3.)

355. In my opinion, a POSITA in March 2008 would have understood that in Ohta as modified by Marumoto, the backlight in the liquid crystal panel is located between the electronic display and heat sink **5**. The very name “backlight” suggests that this element is behind the liquid crystal panel part of the LCD. Additionally, as noted above in conjunction with the discussion of claim 1[d], Ohta discloses an open loop of ambient air which cools the heat sink **5**. (*Supra*, §IX.A.5.) In my opinion, in March 2008 it would have been obvious to a POSITA to modify the open loop of ambient air to direct the fan along the backlight in Ohta display as modified by Marumoto because, like the heat sink **5**, the backlight generates heat. In this configuration, Ohta’s open loop of ambient air passes through the housing and is in thermal communication with the backlight.

356. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.”

I. Claim 13

| | |
|----|--|
| 13 | The electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD. |
|----|--|

357. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 13 of “[t]he **electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD.**”

358. As noted above in conjunction with the discussion of claim 12[c] (*supra*, §IX.H.4), the closed loop of isolated gas which circulates in Ohta as modified by Marumoto cools a front surface of the LCD. (Ex. 1004, FIG. 3.)

359. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “[t]he electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD.”

J. Claim 14

360. In my opinion, Ohta and Marumoto render obvious claim 14.

1. 14[a]

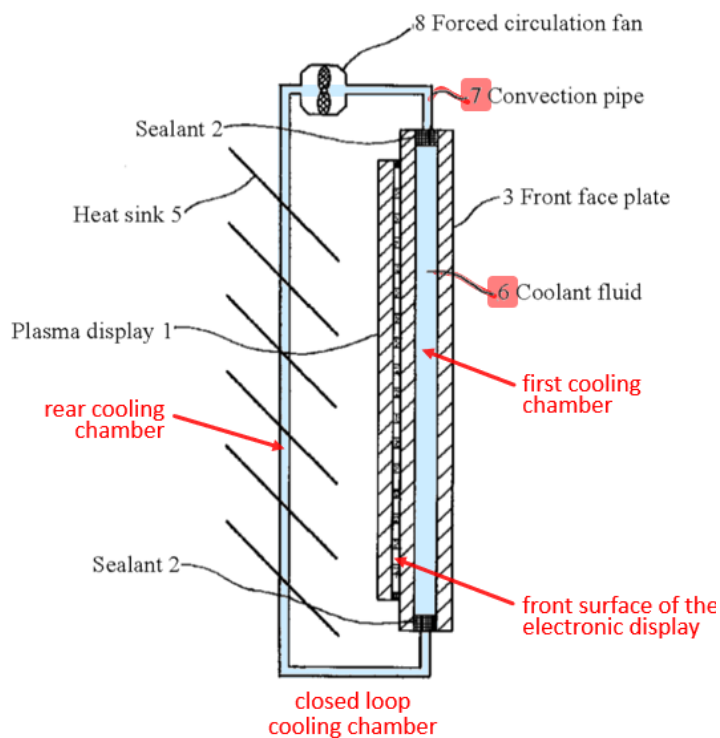
| | |
|-------|---|
| 14[a] | The electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas; |
|-------|---|

361. In my opinion, Ohta in combination with Marumoto discloses or

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renders obvious the limitation of claim 14[a] requiring “[t]he electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas.”

362. In my opinion, in the annotated illustration of Figure 3 from Ohta below as modified by Marumoto, there is a rear cooling chamber positioned behind the LCD which contains a closed loop of isolated gas:



(Ex. 1004, FIG. 3 (annotated).)

363. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “[t]he electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of

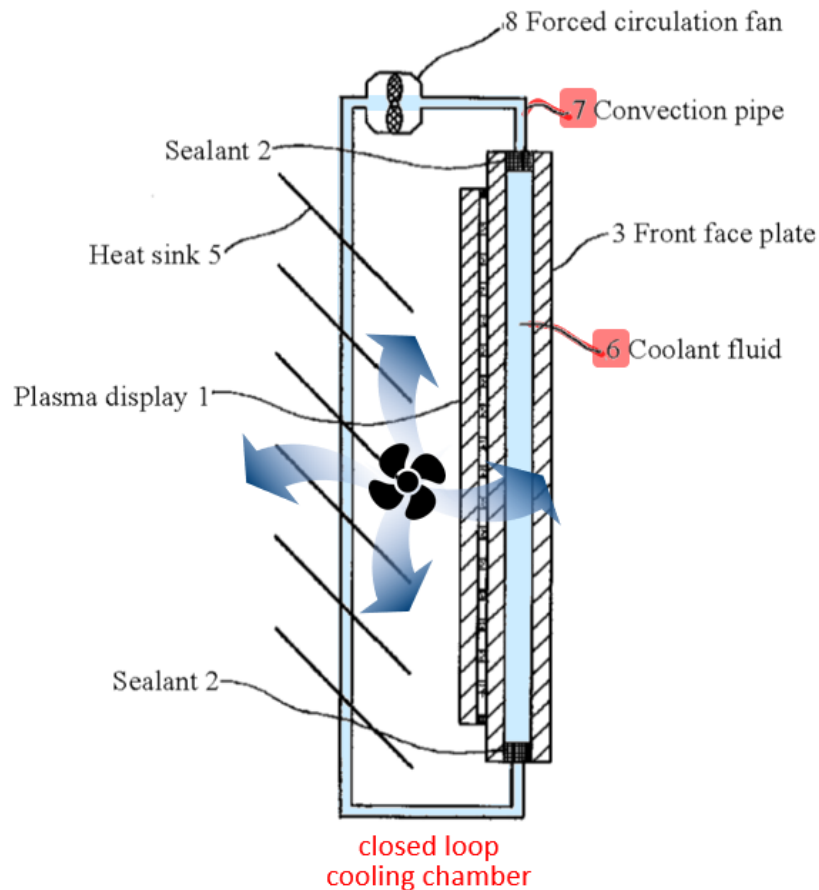
isolated gas.”

2. 14[b]

| | |
|-------|---|
| 14[b] | and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber. |
|-------|---|

364. In my opinion, for the reasons discussed in conjunction with claims 1[d], 8 and 12[c] (*supra*, §§IX.A.5, IX.D, IX.H.4), Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 14[b] of “**and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber.**”

365. In my opinion, when Ohta is modified by Marumoto as discussed in conjunction with for the 12[c] above (*supra*, §IX.H.4), it would be obvious to direct the open loop ambient air to contact an exterior surface of the chamber as well as the rear surface of the backlight and heat sinks **5**, as reflected in the modified and annotated version of Ohta’s Figure 3 below:



(Ex. 1004, FIG. 3 (annotated).)

366. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber.”

K. Claim 15

| | |
|----|---|
| 15 | The electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber. |
|----|---|

367. In my opinion, for the reasons discussed in conjunction with claim 9 (*supra*, §IX.E), Ohta in combination with Marumoto also discloses or renders obvious the requirement of claim 15 of “[t]he **electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber.**”

L. Claim 16

| | |
|----|---|
| 16 | The electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber. |
|----|---|

368. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 16 of “[t]he electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber.”

369. As noted above in conjunction with the discussion of claim 14[a], the closed loop of isolated gas in Ohta will contact an interior surface of the rear cooling chamber. (*Supra*, §IX.J.1.) And as further discussed in conjunction with claim 14[b], the open loop of ambient air will contact an exterior surface of the rear cooling

chamber. (*Supra*, §IX.J.2.)

370. Accordingly, Ohta in combination with Marumoto renders obvious this limitation.

M. Claim 17

| | |
|----|--|
| 17 | The electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow. |
|----|--|

371. In my opinion, for the reasons discussed in conjunction with claims 5, 12[c], 14[b], and 16 (*supra*, §§IX.H.4, IX.J.2, IX.L), Ohta in combination with Marumoto discloses or renders obvious the requirement of claim 17 of “[t]he **electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow.**”

N. Independent Claim 18

372. In my opinion, Ohta in combination with Marumoto renders obvious claim 18.

1. 18[pre]

| | |
|---------|--|
| 18[pre] | An electronic display assembly comprising: |
|---------|--|

373. To the extent the preamble of claim 18 is limiting, in my opinion, Ohta

in combination with Marumoto discloses or renders obvious “[a]n **electronic display assembly**” for the same reasons the combination discloses the identically-worded limitation of claim 1. (*Supra*, §IX.A.1.)

2. 18[a]

| | |
|-------|------------|
| 18[a] | a housing: |
|-------|------------|

374. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 18[a] of “**a housing**” for the same reasons the combination discloses the requirement of claim 1[a] “an electronic housing.” (*See supra*, §IX.A.2.)

3. 18[b]

| | |
|-------|--|
| 18[b] | an electronic display positioned within the housing; |
|-------|--|

375. In my opinion, for the same reasons Ohta in combination with Marumoto discloses or renders obvious “an electronic display positioned within the electronic display as required by claim 1[c] (*see supra*, §IX.A.4), Ohta in combination with Marumoto likewise disclose or render obvious the requirement of claim 18[b] of “**an electronic display positioned within the housing.**”

4. 18[c]

| | |
|-------|---|
| 18[c] | a rear cooling chamber positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display; |
|-------|---|

376. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 18[c] of “a rear cooling chamber positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display.”

377. As noted above in conjunction with the discussion of claims 9 and 14[a] (*supra*, §§IX.E, IX.J.1), Ohta discloses a rear cooling chamber positioned behind the electronic display (e.g., a rear portion of the closed loop chamber) and that an electrical component is located in the sealed rear cooling chamber. Specifically Ohta discloses that forced circulation fan 8 is located inside the rear cooling chamber along with a power supply for the fan that “may be shared with the drive circuit of the plasma display panel.” (Ex. 1004, ¶[0019].)

378. In my opinion, a POSITA in March 2008 would have recognized that a shared power supply with the drive circuit is electrically connected to the display. To the extent that Ohta does not explicitly disclose that the shared power supply is located in the rear cooling chamber, in my opinion to a POSITA in March 2008 it

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would have been obvious to include such a shared power supply in the rear cooling chamber to facilitate cooling.

379. Similarly, in my opinion Marumoto discloses a temperature control component **3** located in the rear cooling chamber of the closed loop. (Ex. 1005, FIG. 1.) The temperature control component **3** is an electrical component electrically connected to the display through temperature sensor **2**. (*Id.*)

380. Alternatively, in my opinion, in March 2008 it would have been obvious to a POSITA to place an electrical component that is electrically connected to the electronic display (such as a programmable logic controller or power supply) in the rear chamber of the closed loop in Ohta, as modified by Marumoto, in order to cool it.

381. Accordingly, Ohta in combination with Marumoto discloses or renders obvious “a rear cooling chamber positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display.”

5. 18[d]

| | |
|-------|--|
| 18[d] | a front surface on the electronic display which faces an intended viewer and a rear surface on the electronic display which opposes the front surface; |
|-------|--|

382. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 18[d] of “a front surface on the electronic display which faces an intended viewer and a rear surface on the electronic display which opposes the front surface.”

383. Ohta discloses a front surface of an electronic display that faces an intended viewer through front face plate 3. (Ex. 1004, FIG. 3.) Ohta likewise discloses a rear surface on the electronic display that opposes the front surface. (*Id.*)

6. 18[e]

| | |
|-------|---|
| 18[e] | wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air. |
|-------|---|

384. In my opinion, for the reasons provided in the discussions of claims 12[c], 13 and 14 (*supra*, §§IX.H.4, IX.I, IX.J), Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 18[e] of “**wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air.**”

385. In my opinion, Ohta as modified by Marumoto discloses a closed loop of isolated gas that cools the front surface of the electronic display. (Ex. 1004,

¶¶[0021], FIG. 3.) And as noted above in conjunction with the discussion of claim 14[b] (*supra*, §IX.J.2), in March 2008 it would have been obvious to a to modify the open loop fan to direct ambient air onto the rear surface of the electronic display as well as the heat sink.

O. Claim 19

| | |
|----|---|
| 19 | The electronic display assembly of claim 18 wherein: the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas when it passes through the housing. |
|----|---|

386. In my opinion, Ohta in combination with Marumoto disclose or render obvious the requirement of claim 19 of “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas when it passes through the housing.”

387. As noted above in conjunction with the discussion of claim 14[b], the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas. (*Supra*, §IX.J.2.)

P. Claim 20

| | |
|----|--|
| 20 | The electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber. |
|----|--|

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388. In my opinion, Ohta in combination with Marumoto disclose or render obvious the requirement of claim 19 for “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber.”

389. As noted above in conjunction with the discussion of claim 18[c] (*supra*, §IX.N.4), the open loop of ambient air in Ohta as modified by Marumoto passes in the space that separates the rear surface of the electronic display and an exterior surface of the rear cooling chamber. Ohta’s open loop as modified by Marumoto thus also satisfies the Delaware District Court’s construction of “between.” (Ex. 1011, at 1; Ex. 1012, at 9-10.)

Q. Independent Claim 21

390. In my opinion, Ohta in combination with Marumoto renders obvious claim 21 obvious.

1. 21[pre]

| | |
|---------|--|
| 21[pre] | An electronic display assembly comprising: |
|---------|--|

391. To the extent the preamble of claim 21 is limiting, in my opinion, Ohta in combination with Marumoto discloses or renders obvious “[a]n **electronic display assembly**” for the same reason the combination discloses or renders obvious the preamble of claim 1. (*See supra*, §IX.A.1.)

2. 21[a]

| | |
|-------|--------------------------------|
| 21[a] | an electronic display housing: |
|-------|--------------------------------|

392. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 21[a] of “**an electronic display assembly**” for the same reasons the combination discloses or renders obvious the limitation of claim 1[a]. (*Supra*, §IX.A.2.)

3. 21[b]

| | |
|-------|---|
| 21[b] | a closed loop of cooling gas adapted for circulation within the electronic display housing: |
|-------|---|

393. In my opinion, Ohta in combination with Marumoto disclose or render obvious the limitation of claim 21[b] of “**a closed loop of cooling gas adapted for circulation within the electronic display housing**” for the same reasons that the combination discloses or renders obvious the limitations of claims 1[b] and 12[c]. (*Supra*, §§IX.A.3, IX.H.4.)

4. 21[c]

| | |
|-------|--|
| 21[c] | an open loop ambient air pathway through the electronic display housing; and |
|-------|--|

394. In my opinion, Ohta in combination with Marumoto discloses or

renders obvious the limitation of claim 21[c] of “**an open loop ambient air pathway through the electronic display housing**” for the same reasons the combination discloses or renders obvious the limitation of claim 1[d]. (*See supra*, §IX.A.5.)

5. 21[d]

| | |
|-------|---|
| 21[d] | an electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop ambient air pathway; |
|-------|---|

395. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 21[d] of “an electronic display positioned within the electronic display housing such that the electronic display is isolated from the closed loop of cooling gas but contactable by ambient air flowing through the open loop ambient air pathway.”

396. As noted above in conjunction with the discussion of claim 1[c], Ohta’s plasma display **5** is isolated from the closed loop of cooling gas. (*Supra*, §IX.A.4.) In my opinion, a POSITA in March 2008 would understand that the electronic display in Ohta as modified by Marumoto is contactable by ambient air flowing through the open loop pathway.

6. 21[e]

| | |
|-------|---|
| 21[e] | wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing. |
|-------|---|

397. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 21[e] of “wherein the electronic display is coolable by a combination of closed loop cooling gas circulation within the electronic display housing, and ambient air flow through the open loop ambient air pathway in the electronic display housing” for the same reasons that the combination discloses the limitation of claim 1[e]. (*Supra*, §IX.A.6.)

R. Claim 22

398. In my opinion, Ohta and Marumoto render obvious claim 22.

1. 22[a]

| | |
|-------|--|
| 22[a] | The electronic display assembly of claim 21 wherein: the closed loop of cooling gas is isolated within a continuous loop gas cooling chamber, and |
|-------|--|

399. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 22[a] of “[t]he electronic display assembly of claim 21 wherein: the closed loop of cooling gas is isolated within a continuous

loop gas cooling chamber” for the same reason the combination discloses or renders obvious claim 4. (*Supra*, §IX.B.)

2. 22[b]

| | |
|-------|---|
| 22[b] | the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling chamber when it flows through the electronic display housing. |
|-------|---|

400. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of 22[b] of “the open loop ambient air pathway is configured to direct the ambient air over an exterior surface of the gas cooling chamber when it flows through the electronic display housing” for the same reasons the combination discloses the limitation of claim 14[b]. (*Supra*, §IX.J.2.)

S. Claim 23

401. In my opinion, Ohta and Marumoto render obvious claim 23.

1. 23[a]

| | |
|-------|---|
| 23[a] | The electronic display assembly of claim 22 further comprising: a fan located within the electronic display housing, |
|-------|---|

402. In my opinion, Ohta in combination with Marumoto discloses or renders obvious the limitation of claim 23[a] of “[t]he **electronic display assembly of claim 22 further comprising: a fan located within the electronic display**

housing” for the same reason the combination discloses the limitation of claim 21[b]. (*Supra*, §IX.Q.3.)

2. 23[b]

| | |
|-------|--|
| 23[b] | the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display |
|-------|--|

403. In my opinion, Ohta as modified with Marumoto discloses or renders obvious the limitation of claim 23[b] of “the fan configured and oriented to move air located within the housing between a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display” for the same reason the combination discloses the limitation of claim 21[d]. (*Supra*, §IX.Q.5.)

404. I note that Ohta’s fan as modified by Marumoto moves air located within the housing in the space that separates a surface of the continuous loop gas cooling chamber and a rear surface of the electronic display, so as to satisfy the Delaware District Court’s construction of “between.” (Ex. 1011, at 1; Ex. 1012, at 9-10.)

T. Motivation to Combine Ohta and Marumoto

405. In my opinion, a POSITA in March 2008 would have been motivated to combine Ohta’s closed loop cooling system for a plasma display that employs a

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cooling fluid that may be transparent (*see* Ex. 1004, ¶¶[0006], [0023]), with Marumoto’s closed loop cooling system for a LCD panel that employs gas cooling medium (Ex. 1005, ¶[0007]) in two ways: (i) to replace the liquid cooling medium in Ohta with gas and (ii) to replace the plasma display in Ohta with an LCD as in Marumoto.

406. First, a POSITA would have been motivated to replace the liquid closed loop cooling system in Ohta with the gas used in the closed loop cooling system disclosed in Marumoto in order to reduce maintenance costs, prevent leakage of the liquid cooling fluid and reduce energy costs.

407. Ohta teaches as part of an “embodiment example 5,” a panel display panel **1** that is “incorporated with a housing **11**.” (Ex. 1004, ¶[0031].) While a housing is not explicitly disclosed in Ohta’s “embodiment example 3,” a POSITA using ordinary knowledge would have understood that Ohta teaches in at least “embodiment example 5” the concept that an electronic display and cooling system could be included in the same housing. In particular, in discussing “embodiment example 5,” Ohta acknowledges both that “[a] plasma display panel **1** is incorporated with a housing **11** having an integrally formed front face plate **3** that maintains an appropriate distance between itself and the display face of the plasma display panel **1**.” (*Id.*, ¶[0031], FIG. 5.) And in “embodiment example 3,” Ohta teaches “a front

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face plate **3** with sufficient permeability to visible light is integrated with a plasma display panel **1** by interposing sealant **2** also serving as a spacer therebetween along the edges, so as to form an airtight container between the same and the display face of the plasma display panel **1**.” (*Id.* ¶[0019]; FIG. 3.) A POSITA would have understood both from the description of “embodiment example 5” that the plasma display panel is “incorporated with housing **11**” and the outline of that housing **11** in Figure 5 which extends around the entirety of front face plate **3**, that this configuration would work equally well in the closed loop cooling system of “embodiment example 3” exemplified by Figure 3.

408. Marumoto discloses its own extremely similar closed loop “cooling system for liquid crystal panel” as exemplified by Figure 1 can utilize either a gas or a fluid. (Ex. 1005, ¶¶[0006]-[0007], FIG. 1.) A POSITA thus would have been motivated to modify the closed loop cooling system in Ohta by modifying the transparent cooling fluid to be gas, as taught by Marumoto, in order to reduce maintenance costs, prevent leakage of the liquid cooling fluid and reduce energy costs. Ohta already contemplates the use of a transparent cooling fluid, and explicitly contemplates using gas for at least an open loop cooling system. Ex. 1004, ¶¶[0023]-[0024].) And the fact that Marumoto discloses that its cooling material “may be a gas,” one example of which is air (i.e. a transparent cooling fluid), in

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addition to any other kind of “fluid,” underscores that a POSITA would have had a reasonable expectation of succeeding in replacing the transparent cooling fluid of Ohta with a transparent gas, as taught by Marumoto. Indeed, Ohta independently discloses in “embodiment example 5” that “outside air [] blown into the space between the plasma display panel **1** and the front face plate **3**” can sufficiently cool the electronic display. (Ex. 1004, ¶[0031].) And while Ohta teaches that a benefit from using liquid cooling fluid is it can be dyed with pigment to reduce the permeability of the cooling fluid to visible light by 50% (*id.*, ¶[0019]), it also discloses that the “face plate **3** [may be] colored to have roughly 50% permeability to visible light and using transparent cooling fluid **6**” (*id.*, ¶[0023]). Thus, the transparent liquid cooling fluid can easily be replaced with gas without degrading overall system performance, while producing cost savings by removing the need for dyed pigment. A POSITA would have recognized this predictable benefit of modifying Ohta’s closed loop transparent cooling fluid by use of Marumoto’s transparent gas, including air.

409. Second, a POSITA would have been motivated to modify the display assembly in Ohta by replacing the plasma display with an LCD display and placing the closed loop cooling chamber on the rear side of the display as in Marumoto. In both Ohta and Marumoto, the electronic display, whether it be a plasma panel or an

LCD panel, is located outside the closed loop cooling chamber, reflecting that the substitution of gas/air for a transparent cooling liquid will work in either cooling system. (Ex. 1004, FIG. 3; Ex. 1005, FIG. 1.)

410. The power systems for both Ohta and Marumoto are likewise compatible. Ohta discloses a rear cooling chamber positioned behind the electronic display (e.g., a rear portion of the closed loop chamber), and that the an electrical component is located in the sealed rear cooling chamber. Specifically Ohta discloses that forced circulation fan **8** is located inside the rear cooling chamber along with a power supply for the fan that “may be shared with the drive circuit of the plasma display panel.” (Ex. 1004, ¶[0019].) A shared power supply with the drive circuit is electrically connected to the display. To the extent that Ohta does not explicitly disclose that the shared power supply is located in the rear cooling chamber, it would have been obvious to a POSITA to include such a shared power supply in the rear cooling chamber to facilitate cooling. In any event, Marumoto discloses a temperature control component **3** located in the rear cooling chamber of the closed loop. (Ex. 1005, FIG. 1.) The temperature control component **3** is an electrical component electrically connected to the display through temperature sensor **2**. (*Id.*) As a result, to a POSITA, it would have been obvious to place an electrical component that is electrically connected to the electronic display (such as a

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programmable logic controller or power supply) in the rear chamber of the closed loop in Ohta, as modified by Marumoto, in order to cool it. The need for such a power supply or programmable logic would be self-evident to a POSITA, and it would be obvious to position it in the rear chamber of the closed loop to minimize complexity of the system and to reduce the length of the electrical connection. Indeed, this is precisely why Marumoto already electrically connects the temperature control component **3** to the display through temperature sensor **2**.

411. A POSITA in March 2008 would have been motivated to modify the display assembly in Ohta by replacing the plasma display with an LCD display and placing the closed loop cooling chamber on the rear side of the display as in Marumoto. As noted in Ohta, plasma displays suffer from poor contrast due to reflection of external light onto the display. (Ex. 1004, ¶[0013].) To address this, Ohta resorts to dyeing the cooling fluid or coloring a face plate in order to reduce permeability to visible light. (*Id.*, ¶¶[0022]-[0023].) The use of such techniques, however, have the downside of darkening the images being shown on the display. In contrast, the liquid crystal panel in Marumoto provides strong contrast without the need for colored equipment or dyed fluids. A POSITA in March 2008 would thus have been motivated to replace the plasma display in Ohta with an LCD display as in Marumoto.

412. The fact that the cooling chamber of the closed loop in Ohta borders the front surface of the plasma display but that the cooling chamber of the closed loop in Marumoto borders the rear surface of the LCD display would not dissuade a POSITA from replacing the plasma display in Marumoto with an LCD display. Rather, a POSITA would recognize the need to cool the front surface of an LCD display to protect it from solar load when placed outdoors. And the fact that Ohta discloses that at least one fan is place to the rear of the display to “forcibly air cool[]” the heat sink would inform a POSITA that Ohta already discloses a way to cool the backlight of the LCD.

413. Finally, to a POSITA, the combination of Ohta and Marumoto would have been combining known prior art elements according to known methods (employing a gas like air as a cooling fluid to a LCD panel located outside the closed loop cooling chamber and contained within a common housing) to obtain the predictable results described above. A POSITA would have also understood this combination to be the use of known techniques (the use of gas as the cooling fluid in a closed loop system) to improve a similar apparatus (Ohta’s display system) in the same way as Marumoto describes, to yield predictable results described above.

414. Additionally, a POSITA would have understood that these predictable, beneficial results can be obtained without requiring substantial changes or

modifications to either Ohta's or Marumoto'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 the use of gas as a cooling liquid – something already explicitly contemplated by Ohta for open loop systems. As such, a POSITA would have expected the combination of Ohta and Marumoto to succeed. For these reasons, it would have been obvious to one of ordinary skill in the art to combine Ohta and Marumoto.

X. GROUND 4 – CLAIMS 1, 4, 5, 8-12 AND 14-23 ARE OBVIOUS OVER OHTA AND MARUMOTO IN FURTHER IN VIEW OF YARE

415. Ground 3 explains how and why the combination of Ohta and Marumoto discloses the limitations in claims 1, 4, 5 and 8-23. (*Supra*, §IX.) Nevertheless, to the extent that the combination of Ohta and Marumoto does not disclose a housing for use with the combined open and closed loop cooling system, it would have been obvious to include a housing such as that disclosed by Yare (Ex. 1013).

416. As noted above, a POSITA would be motivated to combine Ohta's closed loop cooling system Marumoto's closed loop cooling system. (Ex. 1005, ¶[0007].) And in my opinion, a POSITA would be further motivated to use Yare's cabinet (Ex. 1013, 1:4-6) as the housing for the combined Ohta and Marumoto closed loop cooling system.

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417. In particular, as discussed *supra* §IX.A.2, Ohta teaches a panel display panel **1** that is “incorporated with a housing **11**.” (Ex. 1004, ¶[0031].) And as further discussed *supra* §IX.A.2, while a housing is not explicitly disclosed in Ohta’s “embodiment example 3,” a POSITA using ordinary knowledge in March 2008 would have understood that Ohta teaches in at least “embodiment example 5” the concept that an electronic display and cooling system could be included in the same housing. In particular, in discussing “embodiment example 5,” Ohta acknowledges both that “[a] plasma display panel **1** is incorporated with a housing **11** having an integrally formed front face plate **3** that maintains an appropriate distance between itself and the display face of the plasma display panel **1**.” (*Id.*, ¶[0031], FIG. 5.) And in “embodiment example 3,” Ohta teaches “a front face plate **3** with sufficient permeability to visible light is integrated with a plasma display panel **1** by interposing sealant **2** also serving as a spacer therebetween along the edges, so as to form an airtight container between the same and the display face of the plasma display panel **1**.” (*Id.* ¶[0019], FIG. 3.) As noted *supra* §IX.T, a POSITA would have understood both from the description that the plasma display panel is “incorporated with housing **11**” and the outline of that housing **11** in Figure 5 which extends around the entirety of front face plate **3**, that this configuration would work equally well in the closed loop cooling system of “embodiment example 3”

exemplified by Figure 3.

418. However, to the extent that a housing for the closed loop cooling system of Ohta and Marumoto is not explicitly disclosed by Ohta, even if contemplated by Ohta, a POSITA would be motivated to add Yare's "cabinet having improved cooling facilities" as the housing (Ex. 1013, 1:4-6) for the electronic display cooling system disclosed in Ohta as modified by Marumoto. Yare explicitly 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." (*Id.*) The cabinet disclosed in Yare is an electronic display housing for a variety of display types including plasma display and LCD, and would have been immediately apparent to a POSITA as suitable for housing the electronic display cooling system disclosed in Ohta as modified by Marumoto. Yare also discloses a dual open and closed loop cooling system that leverages the use of a heat sink as in Ohta. Yare discloses a variety of benefits achieved by placing the display and dual open and closed loop cooling system into a housing including that "[d]ue to the design and configuration of the cabinet and components," the display and cooling system will be "much easier to clean [] facilitating reduced downtime and maintenance costs" and that "should a fire occur in the sealed [closed loop] zone, any smoke created would be contained and the fire should burn out very quickly." (*Id.*, 7:8-20.)

419. A POSITA would have recognized this predictable benefit of modifying Ohta's and Marumoto's closed loop transparent liquid cooling system for an LCD panel is located outside the closed loop cooling chamber by commonly encompassing the system in Yare's electronic display housing, because a housing is necessitated for all three systems, and Yare's will work and is designed to accommodate all three of them. (Ex. 1004, FIG. 3; Ex. 1005, FIG. 1; Ex. 1013, FIG. 1.) Meanwhile, Ohta at least acknowledges in "embodiment example 5" the concept that an electronic display and cooling system could be included in the same housing. (Ex. 1004, ¶31.)

420. Moreover, to a POSITA, the combination of Ohta and Marumoto with Yare would have been combining known prior art elements according to known methods (employing a common housing for a LCD panel located outside the closed loop cooling chamber) to obtain the predictable results described above. A POSITA would have also understood this combination to be the use of known techniques (the closed loop gas cooling chamber used with a heat sink forcibly cooled using ambient air) to improve a similar apparatus (Ohta's and Marumoto's display systems) in the same way as Yare describes, to yield predictable results described above.

421. Additionally, a POSITA would have understood that these predictable, beneficial results can be obtained without requiring substantial changes or

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modifications to any of Ohta's, Marumoto's or Yare'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 the use of common housing for cooling system – something, as noted, already is contemplated by Ohta for open loop systems. As such, a POSITA would have expected the combination of Ohta, Marumoto and Yare to succeed. For these reasons, it would have been obvious to one of ordinary skill in the art to combine Ohta, Marumoto and Yare.

XI. GROUND 5 – CLAIMS 12-20 ARE OBVIOUS OVER KITAMURA AND HARRIS

A. Independent Claim 12:

422. In my opinion, Kitamura in combination with Harris renders obvious claim 12.

1. 12[pre]

| | |
|---------|--|
| 12[pre] | An electronic display assembly comprising: |
|---------|--|

423. In my opinion, Kitamura alone or in combination with Harris, discloses or renders obvious the limitation “[a]n **electronic display assembly**.”

424. Kitamura discloses a direct-view “LED display device” that includes display panel **5**, LED module **6**, and electrical parts for control **7**. (Ex. 1017, Title,

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¶¶[0014], [0017], [0022], FIG. 4.) In my opinion, given these components, a POSITA in March 2008 would have understood Kitamura’s direct-view LED display device to be an “electronic display assembly.”

425. Accordingly, Kitamura and Harris discloses or renders obvious “[a]n **electronic display assembly.**”

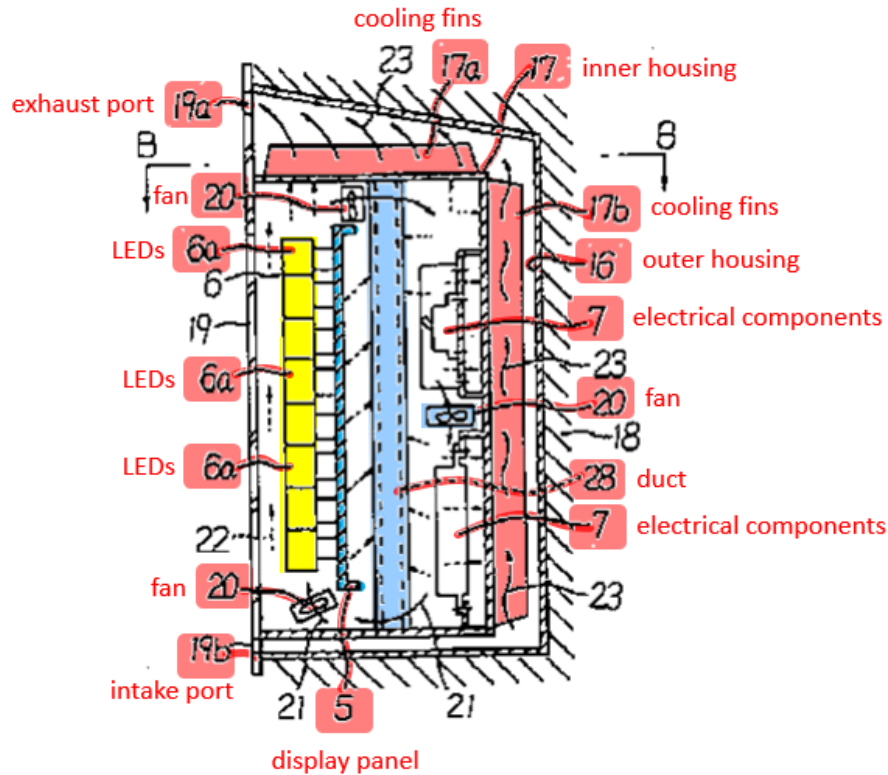
2. 12[a]

| | |
|-------|------------|
| 12[a] | a housing; |
|-------|------------|

426. In my opinion, Kitamura alone or in combination with Harris discloses or renders obvious the limitation of claim 12[a] of “**a housing.**”

427. Kitamura discloses an “LED display device” suitable for installation inside the wall of a building. (Ex. 1017, ¶[0011].) An “outer housing **16**” is installed in the wall, and an “inner housing **17**” houses the electronic display. (*Id.*, ¶¶[0011], [0014], FIG. 4.) As reflected by annotated Figure 4 below, the combination of the outer housing **16** installed in the wall and the inner housing **17** forms “a housing”:

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(Ex. 1017, FIG. 4 (annotated).)

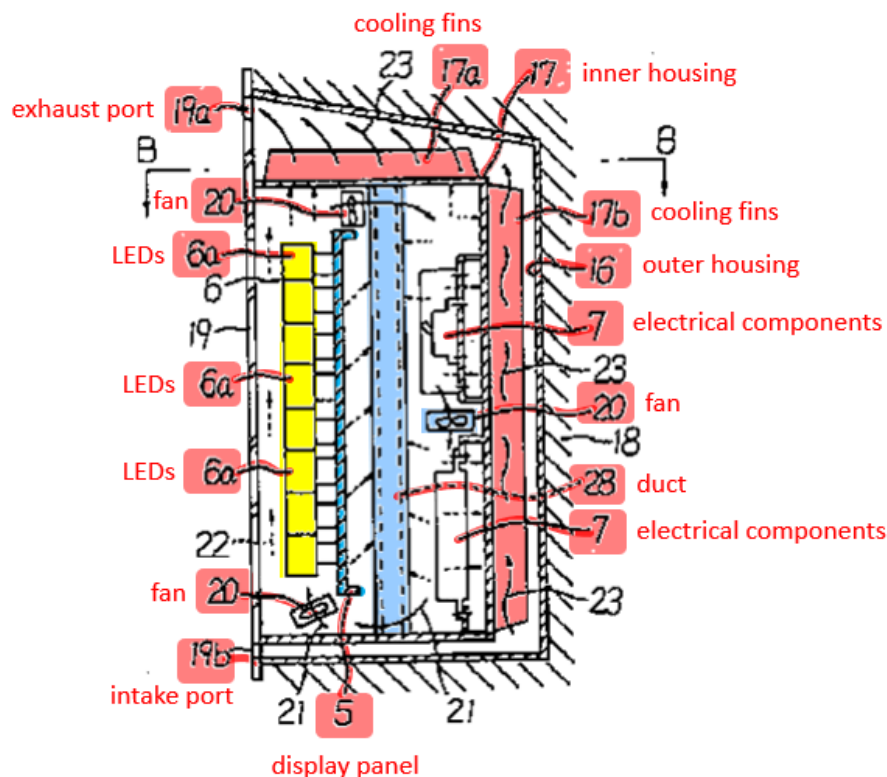
428. Accordingly, Kitamura in combination with Harris discloses or renders obvious “**a housing.**”

3. 12[b]

| | |
|-------|--|
| 12[b] | a liquid crystal display (LCD) positioned within the housing and having a backlight; |
|-------|--|

429. In my opinion, Kitamura in combination with Harris discloses or renders obvious the limitation of claim 12[b] of “**a liquid crystal display (LCD) positioned within the housing and having a backlight.**”

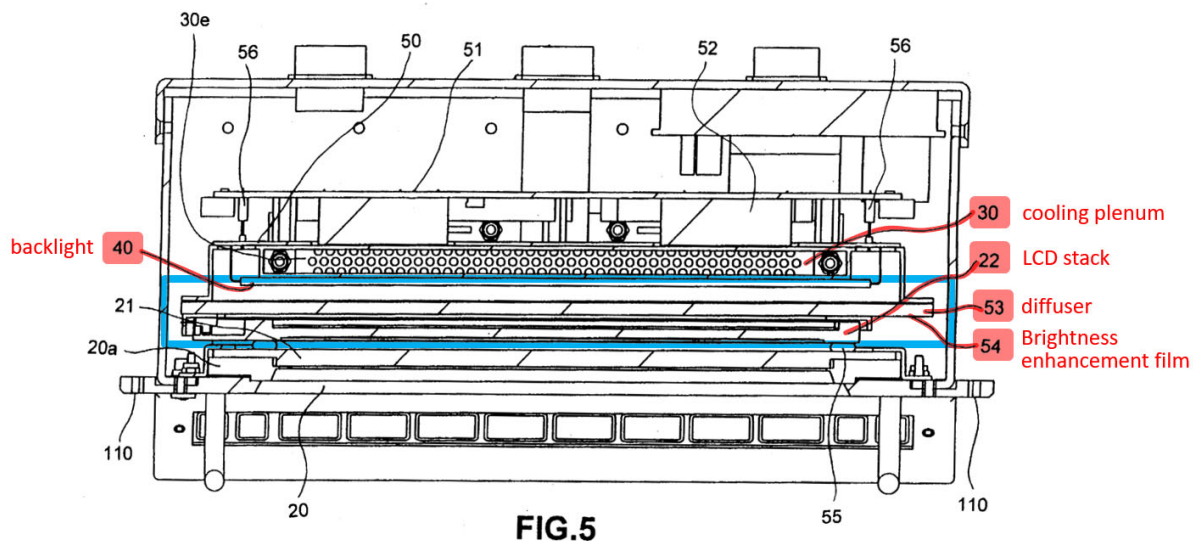
430. As noted above in conjunction with the preamble of claim 1 (*supra*, §XI.A.1), Kitamura discloses a direct-view LED display device, the key components of which are reflected in annotated Figure 4 below:



(Ex. 1017, FIG. 4 (annotated).)

431. Meanwhile, Harris discloses an LCD display positioned within a housing and having a backlight. Specifically, Harris discloses an “environmentally-sealed enclosure” that “houses a liquid crystal display” and includes a “backlighting unit [that] backlights the display screen.” (Ex. 1018, 2:8-18.) As shown in annotated Figure 5 below, the LCD display in Harris includes backlight **40**, diffuser **53**, LCD

stack **22** and brightness enhancement film **54**:



(*Id.*, 5:41-61, 7:31-44, 8:28-35, FIG. 5 (annotated).)

432. As more particularly discussed, *infra*, IX.J, in my opinion a POSITA in March 2008 would have been motivated to replace the display portion of the assembly in Kitamura located to the left of duct **28** (e.g., display panel **5** and LED module **6**) as shown in Figure 4, with the LCD display and associated cooling apparatus disclosed in Harris Figure 5, in order to improve the overall reliability and functionality of the display.

433. Accordingly, Kitamura in combination with Harris discloses or renders obvious “a liquid crystal display (LCD) positioned within the housing and having a backlight.”

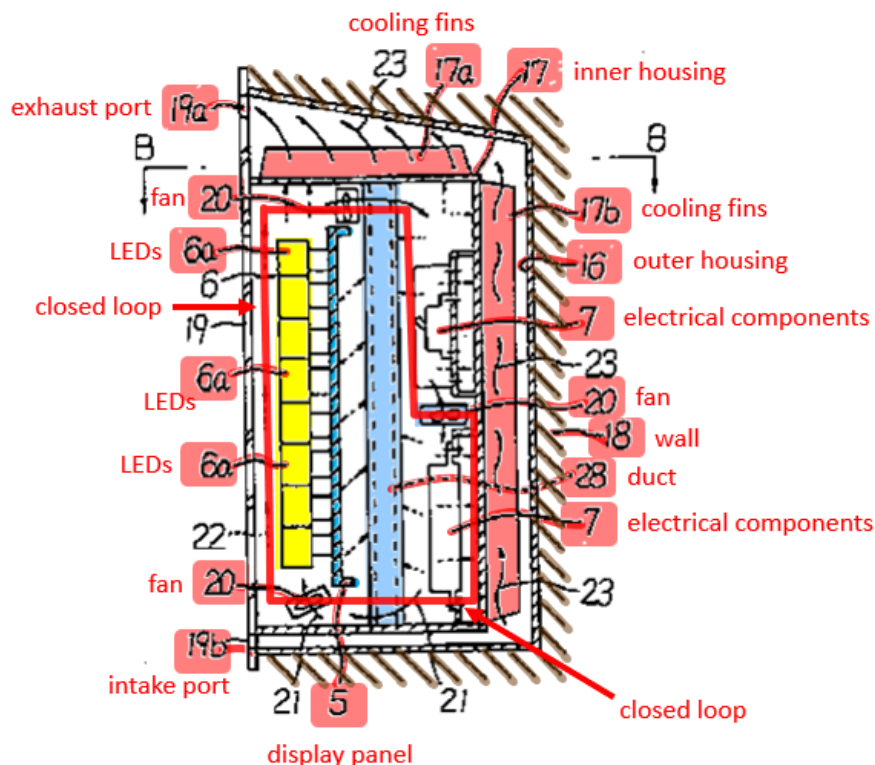
4. 12[c]

| | |
|-------|--|
| 12[c] | wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight. |
|-------|--|

434. In my opinion, Kitamura in combination with Harris discloses or renders obvious the limitation of claim 12[c] of “wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.”

435. Specifically, in my opinion, Kitamura, as modified by Harris includes an electronic display coolable by a combination of a the claimed “closed loop of isolated gas” and “open loop of ambient air.” The inner housing **17** in Kitamura is “hermetically sealed” due to the convective cooling facilitated by the fins located on the outer surface of inner housing **17** and the inner surface of duct **28**. (Ex. 1017, ¶[0024].) The fans **20** create a closed loop encircling the direct-view LED display (display panel **5** and LED module **6**) and the electrical parts for control **7** as shown in annotated Figure 4 below:

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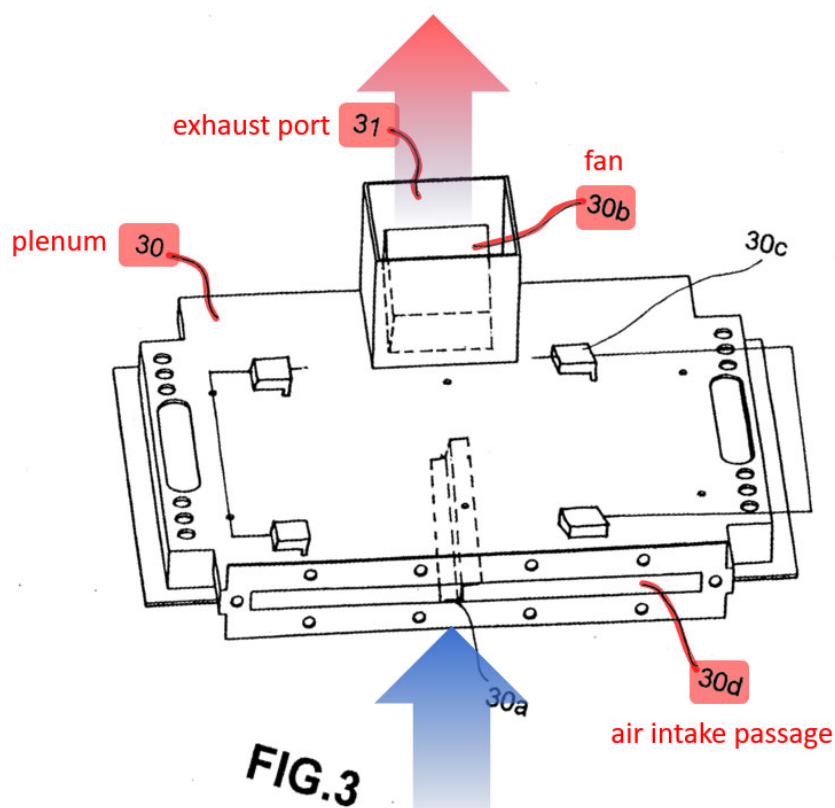


(Ex. 1017, ¶[0022], FIG. 4 (annotated).) Air that is essentially isolated from external air in the housing of the display continuously circulates within the housing, and produces a “gas pathway within a display housing containing gas [i.e. circulated air] that is essentially isolated from external air,” so as to satisfy the Delaware District Court’s construction for “closed loop.” (Ex. 1011, p.2; Ex. 1012, p.8.)

436. In my opinion, Harris teaches an open loop of ambient air which passes through the housing and along a backlight because Harris’s open loop of ambient air passes through the housing and is in thermal communication with, the backlight. The plenum 30 is “a hollow channel [] for airflow” behind the display where “forced

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convection cooling is used to dissipate the heat removed from the sealed flow path created by the plenum **30**.” (Ex. 1018, 5:18-23, 6:5-9.) The open loop cooling apparatus in Harris includes an air intake passage **30d**, an exhaust port **31**, fan **30b** and a plenum **30**. (*Id.*, 5:18-41, FIG. 3.) “[F]an **30b** is mounted within the exhaust port **31** for evacuating heat, generated by bulbs **40**, through the exhaust port **31**.” (*Id.*, 5:39-41.) Ambient air thus enters through air intake passage **30d** and exhausts through port **31** as shown in annotated Figure 3 below:

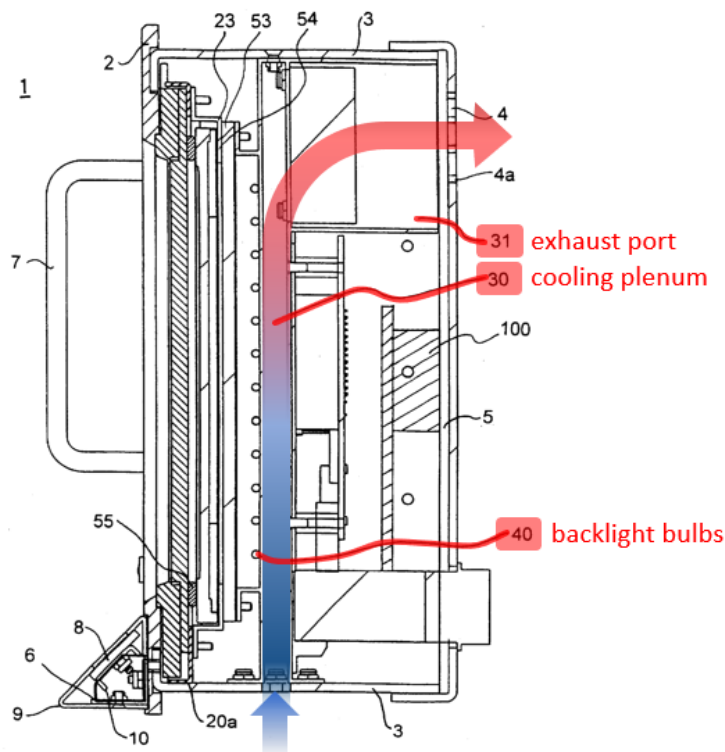


(*Id.*, 6:26-31, FIG. 3 (annotated).)

437. Further, in my opinion, the open loop of ambient air in Harris also

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passes through the housing and along the backlight, and is in thermal communication with the backlight. As can be seen from annotated Figure 1 below, the backlight module in Harris is mounted directly to a plenum **30**:



(*Id.*, 5:41-52, FIG. 1 (annotated).)

438. In my opinion, among the reasons a POSITA in March 2008 would have been motivated to modify Kitamura with Harris is the structural similarity between the two electronic display assemblies, namely, the cooling plenum **30** in Harris and the duct **28** in Kitamura. In my opinion, just as the LCD backlight in Harris was mounted to the plenum in order to maximize cooling efficiency, a POSITA in March 2008 would have been motivated to mount the backlight in a

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modified version of Kitamura to the duct **28**. A POSITA would also have been motivated to modify duct **28** in Kitamura by adding a drawing fan similar to fan **30b** in Harris in order to provide sufficient ambient air to cool the backlight of the LCD display while maintaining the sealed environment inside inner housing **17**. Kitamura as modified by Harris thus discloses an open loop of ambient air that passes through the housing and along the backlight.

439. In addition, Kitamura as modified by Harris would also retain the closed loop of isolated gas in inner housing **17** disclosed in Kitamura that encircles the direct-view LED display (display panel **5** and LED module **6**) and the electrical parts for control **7**.

440. In my opinion, Kitamura as modified by Harris thus discloses an electronic display that is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.

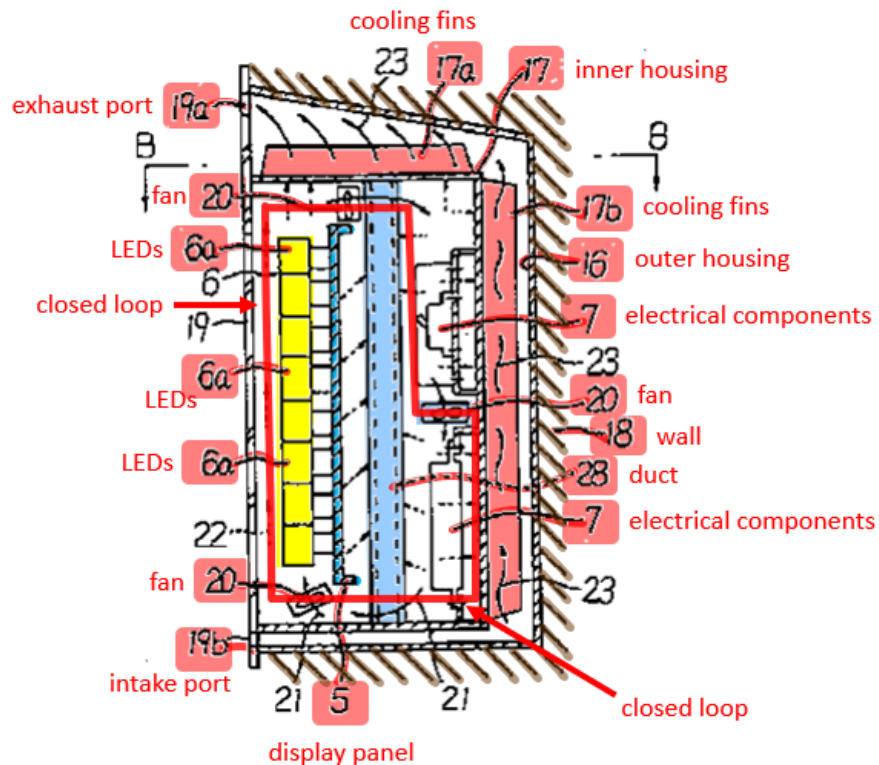
441. Accordingly, Kitamura in combination with Harris discloses or renders obvious “wherein the electronic display is coolable by a combination of a closed loop of isolated gas which circulates within the housing and an open loop of ambient air which passes through the housing and along the backlight.”

B. Claim 13

| | |
|----|--|
| 13 | The electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD. |
|----|--|

442. In my opinion, Kitamura in combination with Harris renders obvious the requirement of claim 13 of “[t]he electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD.”

443. As noted above in conjunction with claim 12[c], (*supra*, §XI.A.4), Kitamura as modified by Harris includes a closed loop of isolated gas on either side of duct **28** in Kitamura that encircles the direct-view LED display (display panel **5** and LED module **6**) and the electrical parts for control **7** and which, as reflected by annotated Figure 4 below, thus cools a front surface of the LCD:



(Ex. 1017, FIG. 4 (annotated).) In my opinion, a POSITA in March 2008 would have understood that the closed loop in this configuration which passes on each side of the LCD would necessarily cool a front surface of the LCD.

444. Accordingly, Kitamura in combination with Harris discloses or renders obvious “[t]he electronic display assembly of claim 12 wherein: the isolated gas will cool a front surface of the LCD.”

C. Claim 14

445. In my opinion, Kitamura in combination with Harris renders obvious claim 14.

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1. 14[a]

| | |
|-------|---|
| 14[a] | The electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas; |
|-------|---|

446. In my opinion, Kitamura in combination with Harris discloses or renders obvious the limitation of claim 14[a] of “[t]he electronic display assembly of claim 12 further comprising: a rear cooling chamber positioned behind the LCD and containing the closed loop of isolated gas.”

447. As discussed above in conjunction with claim 12[c] and claim 13 (*supra*, §§XI.A.4, XI.B), Kitamura as modified by Harris retains the closed loop of isolated gas taught by Kitamura, including the portion of closed loop of isolated gas located on the rear side of duct **28**. This portion of the closed loop of isolated gas located on the rear side of duct **28** is contained within a rear cooling chamber positioned behind the LCD that replaces Kitamura’s direct-view LED display.

2. 14[b]

| | |
|-------|---|
| 14[b] | and wherein the open loop ambient air will contact an exterior surface of the chamber, but is not permitted to enter the chamber. |
|-------|---|

448. In my opinion, Kitamura in combination with Harris discloses or renders obvious the limitation of claim 14[b] of “and wherein the open loop ambient

air will contact an exterior surface of the chamber, but is not permitted to enter the chamber.”

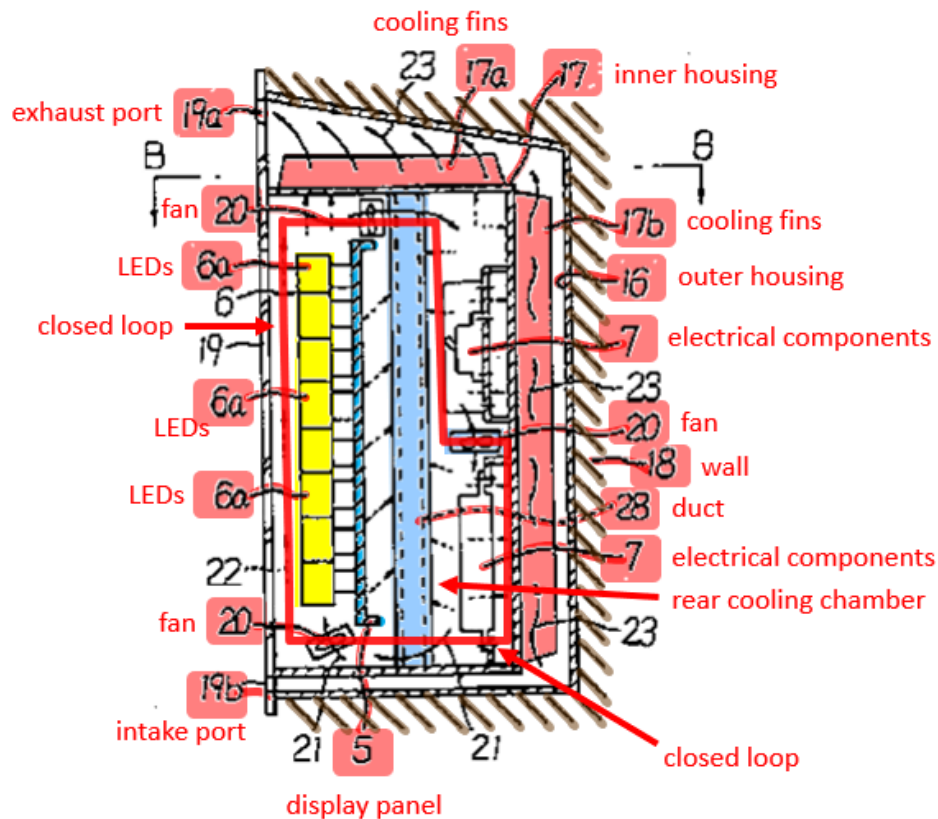
449. In the combined electronic display device created by modifying Kitamura with Harris by utilizing Harris’s LCD display and backlight, the open loop of ambient air traveling through Kitamura’s duct **28** contacts the exterior surface of the closed loop of isolated gas, but is not permitted to enter the sealed chamber. The closed loop of isolated gas is located outside duct **28**.

D. Claim 15

| | |
|----|--|
| 15 | The electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber. |
|----|--|

450. In my opinion, Kitamura in combination with Harris discloses or renders obvious the requirement of claim 15 of “[t]he electronic display assembly of claim 12 further comprising: one or more electronic components for driving the LCD positioned within the rear cooling chamber.”

451. Kitamura discloses a rear chamber containing “electrical parts for control **7**” which are cooled by the closed loop of isolated gas created by fan **20** specifically the portion of the cooling chamber located behind the display as shown below. (Ex. 1017, ¶[0022].)



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

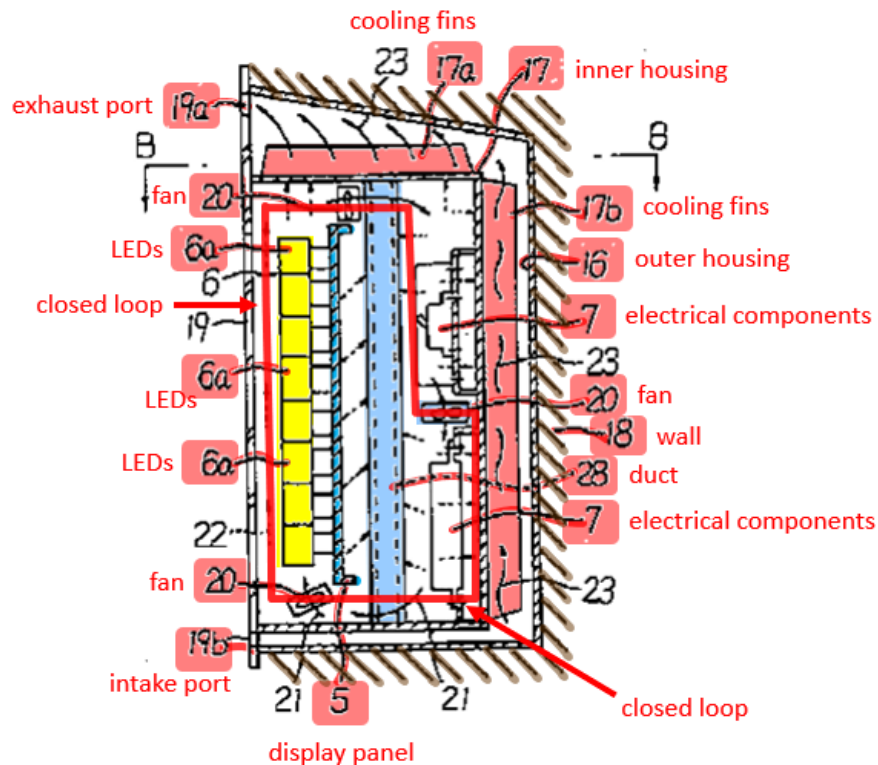
452. (Ex. 1017, ¶[0022].) A POSITA in March 2008 would have understood that in the modified system of Kitamura and Harris these electrical parts for control 7, as evidenced by the use of the word “control,” would include drivers for the LCD display. As noted above in conjunction with claim 12[c] (*supra*, §XI.A.4), this cooling chamber would be retained even after modifying Kitamura in view of Harris.

E. Claim 16

| | |
|----|---|
| 16 | The electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber. |
|----|---|

453. In my opinion, Kitamura in combination with Harris discloses or renders obvious the requirement of claim 16 of “[t]he electronic display assembly of claim 12 wherein: the open loop of ambient air will contact an exterior surface of the rear cooling chamber while the closed loop of isolated gas will contact an interior surface of the rear cooling chamber.”

454. As noted below (*infra*, §XI.J), in my opinion a POSITA in March 2008 would have been motivated to modify Kitamura to replace the direct-view LED display with an LCD display and to add a fan to duct **28** to cool the LCD backlight. In my opinion, as explained in conjunction with claim 14[b] (*supra*, §XI.C.2), the resultant open loop of ambient air contacts an exterior surface of the rear cooling chamber located behind the display. Meanwhile, as reflected by annotated Figure 4 from Kitamura below, the closed loop of isolated gas is permitted to contact an interior surface of the rear cooling chamber:



(Ex. 1017, FIG. 4 (annotated).)

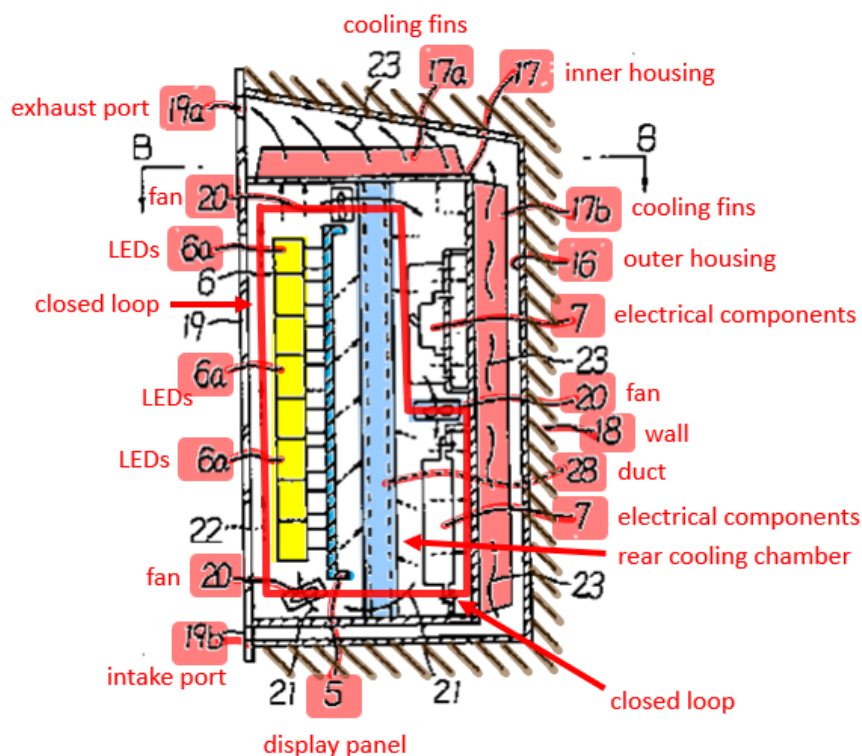
F. Claim 17

| | |
|----|---|
| 17 | The electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow. |
|----|---|

455. In my opinion, Kitamura in combination with Harris discloses or renders obvious the requirement of claim 17 of “[t]he electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air

flow.”

456. In my opinion, in the combined system of Kitamura and Harris, the fans **20** in Kitamura cause air to flow in three dimensions around the LCD display and its associated electrical components in the closed loop isolated gas chamber, including in a lateral direction across the LCD display and associated electrical components. Meanwhile, in my opinion ambient air flowing through duct **28** in Kitamura as modified with the open loop fan in Harris flows entirely in a vertical direction.



(Ex. 1017, FIG. 4 (annotated).) The intended direction of the closed loop isolated gas flow is thus substantially perpendicular to the intended direction of open loop

ambient air flow.

457. Accordingly, Kitamura in combination with Harris discloses or renders obvious “[t]he electronic display assembly of claim 12 wherein: the intended direction of closed loop isolated gas flow is substantially perpendicular to the intended direction of open loop of ambient air flow.”

G. Claim 18

458. In my opinion, Kitamura in combination with Harris renders obvious claim 18.

**1. 18

```
[pre]
```**

| | |
|---------------------|--|
| 18 <pre>[pre]</pre> | An electronic display assembly comprising: |
|---------------------|--|

459. To the extent the preamble of claim 18 is limiting, in my opinion for the reasons explained above in conjunction with the preamble of claim 12 (*supra*, §XI.A.1), Kitamura alone in combination with Harris discloses or renders obvious “[a]n electronic display assembly.”

2. 18[a]

| | |
|-------|------------|
| 18[a] | a housing: |
|-------|------------|

460. In my opinion, for the reasons explained above in conjunction with claim 12[a] (*supra*, §XI.A.2), Kitamura in combination with Harris discloses or

renders obvious the limitation of claim 18[a] of “**a housing.**”

3. 18[b]

| | |
|-------|--|
| 18[b] | an electronic display positioned within the housing: |
|-------|--|

461. In my opinion, for the reasons explained above in conjunction with claim 12[b] (*supra*, §XI.A.3), Kitamura alone or in combination with Harris discloses or renders obvious the limitation of claim 18[b] of “**an electronic display positioned within the housing.**”

4. 18[c]

| | |
|-------|---|
| 18[c] | a rear cooling chamber positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display; |
|-------|---|

462. In my opinion, Kitamura in combination with Harris discloses or renders obvious the limitation of claim 18[c] of “a rear cooling chamber positioned behind the electronic display and containing an electrical component which is electrically connected to the electronic display.”

463. As noted above in conjunction with the discussion of claim 15 (*supra*, §XI.D), Kitamura discloses or suggests a portion of the closed loop pathway includes a rear cooling chamber positioned behind the electronic display and containing an electrical component, such as driver. In my opinion, in March 2008, a POSITA

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would have understood that the electrical component located in the portion of the closed loop constituting the rear cooling chamber is electrically connected to the electronic display.

5. 18[d]

| | |
|-------|--|
| 18[d] | a front surface on the electronic display which faces an intended viewer and a rear surface on the electronic display which opposes the front surface; |
|-------|--|

464. In my opinion, Kitamura in combination with Harris discloses or renders obvious the limitation of claim 18[d] of “a front surface on the electronic display which faces an intended viewer and a rear surface on the electronic display which opposes the front surface.”

465. Kitamura discloses an electronic display mounted in, and covered by, a wall in three directions. (Ex. 1017, FIG. 4.) Kitamura includes a front surface (screen 19) facing an intended viewer, and a rear surface which opposes the front surface. (*Id.* ¶[0012], FIG. 4.) A POSITA in March 2008 would have recognized that such features would have to continue even after Kitamura is modified by Harris

6. 18[e]

| | |
|-------|---|
| 18[e] | wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air. |
|-------|---|

466. In my opinion, for the reasons provided in conjunction with the discussions of claims 12[c], 13 and 14 (*supra*, §§XI.A.4, XI.B, XI.C), Kitamura in combination with Harris discloses or renders obvious the limitation of claim 18[e] of **“wherein the front surface of the electronic display is coolable by a closed loop of isolated gas and the rear surface of the electronic display is coolable by an open loop of ambient air.”**

H. Claim 19

| | |
|----|---|
| 19 | The electronic display assembly of claim 18 wherein: the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas when it passes through the housing. |
|----|---|

467. In my opinion, Kitamura in combination with Harris discloses or renders obvious the requirement of claim 19 of “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas when it passes through the housing.”

468. As noted above in conjunction with the discussions of claims 12[c] and

14[b] (*supra*, §§XI.A.4, XI.C.2), in the modified electronic display system of Kitamura as modified by Harris, the open loop of ambient air is prohibited from mixing with the closed loop of isolated gas.

I. Claim 20

| | |
|----|--|
| 20 | The electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber. |
|----|--|

469. In my opinion, Kitamura in combination with Harris discloses or renders obvious the requirement of claim 20 of “[t]he electronic display assembly of claim 18 wherein: the open loop of ambient air will pass between the rear surface of the electronic display and an exterior surface of the rear cooling chamber.”

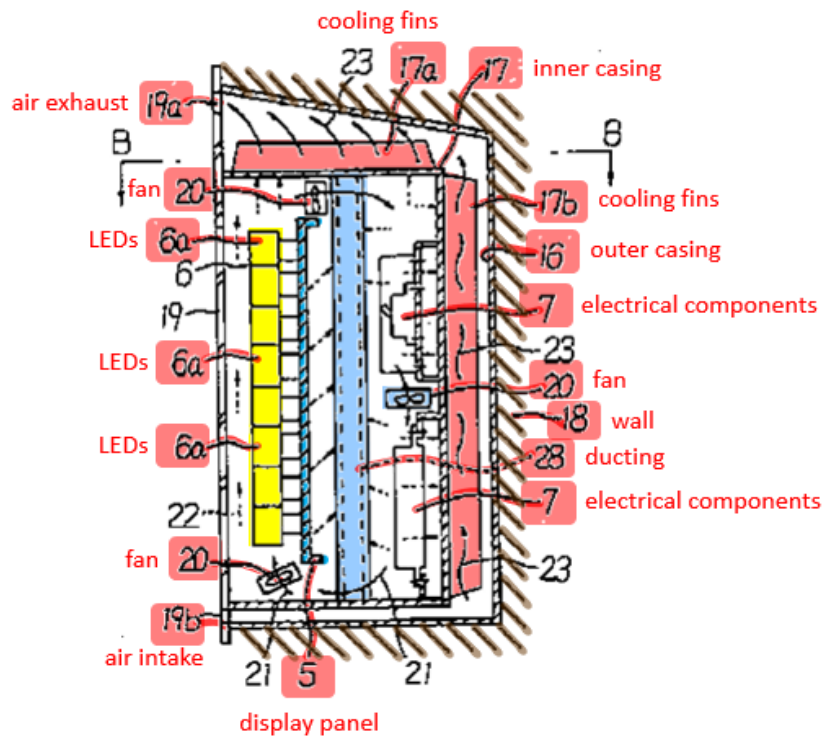
470. As noted above in conjunction with the discussion of claim 12[c] (*supra*, §XI.A.4), a POSITA would be motivated to add a fan to duct **28** in Kitamura in order to cool a modified version of Kitamura containing an LCD display. And in my opinion, the backlight of such an LCD display would be mounted to duct **28**. The open loop of ambient air in Kitamura as modified by Harris thus passes in the space that separates (i.e. “between”) the rear surface of the display and an exterior surface of the rear cooling chamber, so as to satisfy the Delaware District Court’s claim construction for “between.” (Ex. 1011, p.1; Ex. 1012, pp.9-10.)

J. Motivation to Combine Kitamura and Harris

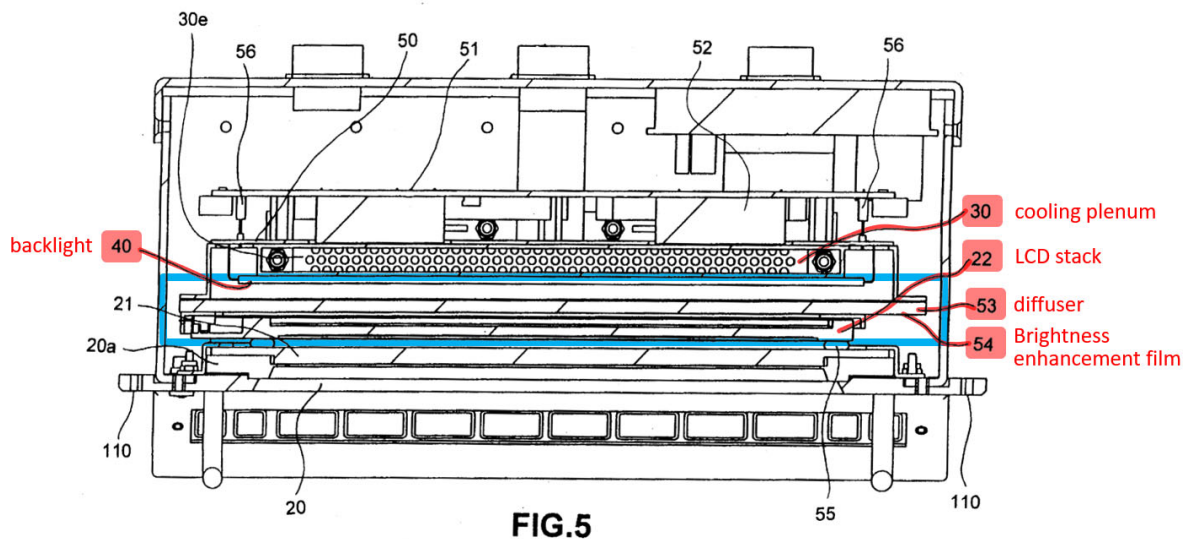
471. In my opinion, a POSITA in March 2008 would have been motivated to combine the teachings in Kitamura and Harris and to modify Kitamura by (i) replacing the direct-view LED display with an LCD and (ii) adding an open loop fan to ducting 28 to facilitate cooling of the LCD backlight while retaining the closed loop around the display and electrical components, respectively.

472. As a simple comparison of Kitamura's Figure 4 and Harris's Figure 5 reflects, the two references' structures for housing cooling systems for electronic displays are quite similar, including with respect to the duct **28** in Kitamura and the cooling plenum **30** in Harris and the placement of electrical components behind the electronic display such as electrical components **7** in Kitamura and inverter **52** in Harris:

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(Ex. 1017, FIG. 4 (annotated).)



(Ex. 1018, FIG. 5 (annotated).) In addition, both Kitamura and Harris disclose

electronic displays that are permanently mounted, for example, in the side of a building. (Ex. 1017, ¶[0011]; Ex. 1018, 2:19-26.)

473. LED displays are inherently limited in their maximum pixel resolution by the size of the LED devices. As such, LED displays are best used in low-information content applications or in large panel arrays that are viewed for a distance. Because a POSITA in March 2008 would have been motivated to look to alternative technologies to Kitamura's LEDs to provide a higher resolution information display, such a POSITA would have immediately recognized and embraced the advantages of an LCD panel (with backlight) as exemplified by Harris. And just as the LCD backlight in Harris was mounted to the plenum **30** in order to maximize cooling efficiency, a POSITA would also be motivated to mount the backlight in a modified version of Kitamura to the duct **28**. Because a POSITA would want to preserve structure of the in-wall unit from Kitamura, a POSITA would simply "plug in" Harris's LCD.

474. In my opinion, doing so would improve the overall reliability and functionality of the display. And as part of this simple modification to Kitamura's ducting **28**, a POSITA in March 2008 would also have added a drawing fan similar to fan **30b** in Harris in order to provide sufficient ambient air to cool the backlight of the LCD display while maintaining the sealed environment inside inner casing

17. Harris even provides an explicit suggestion to make this modification, noting it would improve system reliability because Harris's device design "has been certified in a number of different tests to measure its survivability and performance criteria," and proven to satisfy a variety of identified test specifications for "vibration, shock, extreme temperature, [and] humid and dusty environments." (Ex. 1018, 8:42-9:22.)

475. In addition to recognizing the advantages to substituting a LCD display and backlight for a direct-view LED display, in my opinion a POSITA in March 2008 also would have understood the modified Kitamura LCD display is advantageously cooled by not only Kitamura's existing closed loop cooling chamber, but also Harris' open loop method with its additional fan. A POSITA would have immediately recognized such a beneficial modification can be accomplished without degrading overall system performance. And, given both references' similarities in both structure and heat exchange, a POSITA would readily have recognized the predictable benefits to modifying Kitamura to employ Harris's LCD and backlight cooled with an open loop of ambient air. Modifying Kitamura with Harris's open loop-cooled LCD display and backlight would have involved combining known prior art elements relating to similar structures and similar cooling mechanisms according to known methods to obtain the predictable results of improved performance and component reliability, reduced operating temperature

and improved efficiency.

XII. NO SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

476. 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.

477. 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 '287 patent's claims. Since the Patent Owner has not yet identified any evidence of secondary considerations, the Patent Owner cannot demonstrate that the limitations of the claimed invention in particular, as opposed to other features of the products at issue, were the factors that caused any increased sales, praise, or any other asserted secondary considerations.

478. 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 '287 Patent, as follows:

479. *No commercial success of the claimed invention.* The Patent Owner

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has not cited any evidence of particular commercial success of products embodying the '287 patent as opposed to products that do not embody the '287 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 '287 patent's claims and not due to any other facts.

480. *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 '287 patent. To the contrary, as discussed above, the prior art solved the problems that the '287 patent purported to address.

481. *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 '287 patent. As shown by my analysis above, there existed prior art references that successfully disclosed and rendered obvious the subject matter claimed by the '287 patent.

482. *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 '287 patent and its claimed invention.

483. *No unexpected results of the claimed invention.* The Patent Owner has not cited any evidence of unexpected results achieved by the '287 patent's claimed invention. To the contrary, the prior art disclosed the predictable, expected results

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that show why the '287 patent's claims are obvious as discussed in my Declaration.

484. *No praise for the claimed invention.* The Patent Owner has not cited any evidence of praise for the claimed invention recited in the '287 patent.

485. *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 '287 patent.

486. *No departure from the wisdom of the prior art.* The Patent Owner has not cited any evidence that the claimed inventions of the '287 patent departed from the wisdom of the prior art. The '287 patent claims subject matter that was already present in the prior art, including in the references discussed in my analysis above.

487. 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 '287 patent is directed to techniques known in the prior art and does not provide any inventive technology.

488. 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.

XIII. CONCLUSION

489. In my opinion, based on my review of the '287 patent, the materials

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referenced herein, and my knowledge of what a person of ordinary skill in the art would have known at and before the '287 patent's priority date about the technology at issue, a POSITA would have understood all of the limitations of the challenged claims 1, 4-5, and 8-23 to be obvious over the prior art for the reasons described above.

490. Accordingly, it is my opinion that challenged claims 1, 4-5, and 8-23 should be found unpatentable.

491. Furthermore, I reserve the right to supplement my opinions in the future to respond to any arguments or positions that the Patent Owner may raise, taking account of new information as it becomes available to me.

492. 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 15, 2022



Robert Smith-Gillespie