

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MANUFACTURING RESOURCES INTERNATIONAL, INC.,
Petitioner,
v.
SAMSUNG ELECTRONICS CO., LTD,
Patent Owner

U.S. Patent Nos.

8,223,311
8,942,253

Case Nos. IPR2023-01202, IPR2023-01203

DECLARATION OF BRUCE W. SMITH, PH.D.

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I. INTRODUCTION

1. I have been retained by counsel for Patent Owner Samsung Electronics Co., Ltd. (“Samsung”) in the above-captioned proceedings. I understand that Petitioner Manufacturing Resources International, Inc. (“MRI”) seeks *Inter Partes* Review (IPR) of U.S. Patent Nos. 8,223,311 (“the ’311 patent”) and 8,842,253 (“the ’253 patent”). I submit this declaration in support of Patent Owner’s Preliminary Responses for the ’311 patent and ’253 patent and in response to the opinions of Dr. Carl D. Meinhart provided in Ex. 1003.

2. MRI’s Petition for the ’311 patent challenges claims 1-7 and 9-13. I have been informed and understand that Samsung has disclaimed claim 12 of the ’311 patent, and that I should not consider claim 12 in my analysis. I understand that claims 1-7, 9-11, and 13 remain at issue (“the ’311 challenged claims”).

3. MRI petition for the ’253 patent challenges claims 1-2, 4-12, and 14-20 of the ’253 patent. I have been informed and understand that Samsung has disclaimed claims 1-2, 4, 5, 7, 9, and 10 of the ’253 patent, and that I should not consider these claims in my analysis. I understand that claims 6, 8, 11-12, and 14-20 remain at issue (“the ’253 challenged claims”).

4. As explained in detail below, it is my opinion that Dr. Meinhart fails to show that any challenged claim of the ’311 patent or ’253 patent is invalid.

5. I note that, in connection with my prior art analysis, a failure to demonstrate that even one claim limitation is disclosed in the prior art has the result that every claim incorporating that limitation has not been shown to be invalid. For each challenged claim of the '311 patent and '253 patent, I have identified at least one limitation that is missing from the prior art cited in MRI's Petitions. I note, however, that my election not to address other limitations of the claims herein is not intended as an admission that those other limitations are found in the prior art.

6. In connection with providing my opinions, I have also been asked to discuss the technology addressed by the '311 and '253 patents and the relevant state of the technical art at the time of the claimed invention.

7. I am being compensated for my time at my standard rate of \$550/hour. My compensation has not, and will not, affect my opinions in this matter, and my compensation is not dependent on the content of my opinions. I have no financial interest in the outcome of this proceeding, and my compensation will be unaffected by the outcome of this proceeding.

II. SUMMARY OF OPINIONS

8. None of the '311 challenged claims or the '253 challenged claims would have been obvious in light of the prior art cited by Petitioner, or combination of prior art, or under the knowledge of a person of ordinary skill in the art because each asserted prior art reference lacks at least one element of the asserted claims and

because a person of ordinary skill in the art (“POSITA”) would not have been motivated to modify or combine the prior art at the time of the invention in the ways asserted by Petitioner.

III. MATERIALS RELIED UPON

9. A list of the materials on which I have relied in forming my opinions can be found below:

Materials Relied Upon
Petition for IPR2023-01202 (“’311 Petition”)
Petition for IPR2023-01203 (“’253 Petition”)
U.S. Patent No. 8,223,311 (“’311 patent” or “Ex. 1001”)
U.S. Patent No. 8,842,253 (“’253 patent” or “Ex. 1001”)
Prosecution Histories of U.S. Patent No 8,223,311 and U.S. Patent No. 8,842,253
Declaration of Dr. Carl D. Meinhart (“Ex. 1003”)
Curriculum Vitae of Dr. Carl D. Meinhart (“Ex. 1004”)
JP2006-163217A to Nagayama (“Ex. 1005”)
Certified Translation of JP2006-163217A (“Ex. 1006”)

Materials Relied Upon
U.S. Patent No. 6,493,440 to Gromatzky (“Ex. 1007”)
WO 2007/116125 to Karppanen (“Ex. 1008”)
U.S. Patent No. 6,104,451 to Matsuoka, et al. (“Ex. 1009”)
WO 2008/050660A2 to Utsunomiya (“Ex. 1010”)
U.S. Patent No. 6,825,828 to Burke, et al. (“Ex. 1011”)
German Utility Model DE 20 2007 000 047 U1 to Hannemann (“Ex. 1012”)
Certified Translation of German Utility Model DE 20 2007 000 047 U1 (“Ex. 1013”)
Willem den Boer, Active Matrix Liquid Crystal Displays: Fundamentals and Applications (2005) (“Ex. 2003”)

IV. BACKGROUND AND QUALIFICATIONS

10. My qualifications for forming the opinions in this report are briefly summarized here and explained in more detail in my *curriculum vitae*, which has been marked as Ex. 2002.

11. I am currently a Distinguished Professor of Electrical and Microelectronic Engineering in the Kate Gleason College of Engineering at the Rochester Institute of Technology (“RIT”). I have been a faculty member at RIT

since 1988, and in this role I teach and carry out research in various fields of microelectronics, optics, optoelectronics, and imaging systems. I teach and work with undergraduate and graduate students in the colleges of Engineering and Science and in RIT's Center for Imaging Science.

12. I have over 35 years of experience in the fields of optoelectronics, LCD display technology, LCD-TFT (thin film transistor) technology, IC (integrated circuit) processing, semiconductor device materials, microelectronics, and microlithography. I earned a B.S., M.S., and Ph.D. in the field of Imaging Science from RIT. I was previously the Director of RIT's Microsystems Engineering Ph.D. program, the Associate Dean of Graduate Programs in the College of Engineering, and the Intel Professor of Microelectronic Engineering at RIT. I am a graduate faculty member of the Center for Imaging Science and Material Science and Engineering programs at RIT. I am a Fellow of the Institute of Electrical and Electronics Engineers ("IEEE"), the International Society for Photo-optical Instrumentation Engineering ("SPIE"), the Optical Society of America ("OSA"), and a member of the American Vacuum Society, a member of the Society for Information Display ("SID"). I am the recipient of RIT's Trustees Scholarship Award, the SPIE Research Mentoring Award, RIT's Creators Award, and the Rush Henrietta Outstanding Alumni Award, among others, and I have been inducted into RIT's Innovator Hall of Fame.

13. Prior to joining RIT, I held development positions at AMI Semiconductor in San Jose, CA, and Digital Equipment Corporation in Hudson, MA. I have also worked with various research groups including SEMATECH, IMEC (Belgium), and Rutherford Appleton Labs (Oxford). I was also the President of Amphibian Systems in Rochester, NY, a company that built laser-based optical imaging systems for research and development applications in microelectronics.

14. I am an inventor of 27 US and international patents in the fields of optical-imaging systems, integrated circuit processing, and semiconductor lithography. I have authored over 200 technical articles and have delivered over 50 presentations by invitation at various conferences. I have authored four textbook chapters and have edited three textbook editions. I have served as an academic and research advisor to over 60 graduate students in microelectronics, imaging science, and microsystems.

15. Based on my education and experience, I consider myself to be expert in flat panel display technology including liquid crystal displays (LCDs), LCD integration and viewing optimization, LCD optical components (including polarizers and filtering), liquid crystal deterioration effects and mitigation, and backlighting technology including cold cathode fluorescent lamps (CCFL) and light-emitting diodes (LEDs).

V. LEGAL STANDARDS

16. I am not an attorney and offer no opinions on the law. I am, however, informed on several legal principles, summarized below, which I have used in reaching my opinions.

A. Obviousness

17. I understand that a patent is invalid if it is established that the differences between the subject matter of the patent and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. I also understand that the question of obviousness requires consideration of (a) the scope and content of the prior art; (b) the level of ordinary skill in the art; (c) the differences between the claimed invention and the prior art; and (d) secondary considerations of non-obviousness. I also understand that the scope and content of the prior art must be viewed through the perspective of a person of ordinary skill in the art at the time of the invention.

18. Because the test for obviousness is what would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains, I understand that analyses that rely on hindsight to establish obviousness are improper. I understand that the best way to avoid

hindsight reasoning is to demonstrate that a person having ordinary skill in the art would have been motivated to modify the prior art to meet the claimed invention.

19. I understand that in forming an opinion regarding obviousness, one must consider so-called “secondary considerations” or “objective indicia” of non-obviousness, which include, for example:

- a. Whether the invention was commercially successful as a result of the merits of the claimed invention (rather than the result of design needs or market-pressure advertising or similar activities);
- b. Whether the invention satisfied a long-felt need;
- c. Whether others had tried and failed to make the invention;
- d. Whether others invented the invention at roughly the same time;
- e. Whether others copied the invention;
- f. Whether there were changes or related technologies or market needs contemporaneous with the invention;
- g. Whether the invention achieved unexpected results;
- h. Whether others in the field praised the invention;
- i. Whether persons having ordinary skill in the art of the invention expressed surprise or disbelief regarding the invention;
- j. Whether others sought or obtained rights to the patent from the patent holder; and

k. Whether the inventor proceeded contrary to accepted wisdom in the field.

20. I understand that any secondary considerations must have some relationship or nexus to the invention claimed in the patents at issue.

B. Claim Construction

21. I understand that claim terms are generally given their ordinary and customary meaning to a person of ordinary skill in the art (“POSITA”) at the time of the invention.

VI. PERSON OF ORDINARY SKILL IN THE ART (“POSITA”)

22. I understand that the ’311 and ’253 Patents are to be viewed from the perspective of one of ordinary skill in the art. I understand that the perspective of one of ordinary skill in the art means the level of skill of an ordinarily skilled person in the art in question at the time of the claimed invention.

23. I have been asked to assume that the relevant date for conducting my analysis is April 22, 2008.

24. I understand that factors such as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made inform the relevant level of skill in the art for a POSITA.

25. In my opinion, the POSITA at the time of the alleged invention of the Asserted Patents would have had a (1) Bachelor's degree in a pertinent discipline, such as mechanical engineering, electrical engineering, physics, product design, or a related field and (2) 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 would have been able to collaborate with one or more other persons of skill in another art (e.g., one of skill in the art of electrical engineering) for one or more aspects with which the other person may have expertise, experience, and/or knowledge that was obtained through her own education, industrial or academic experience. My opinion regarding the qualifications of a POSITA is based on my knowledge, skill, training, experience and review of the materials discussed herein.

26. I am aware that Petitioner has provided its own definition of a POSITA as a person that would have had the following qualifications: Bachelor of Science degree in mechanical engineering, electrical engineering, or a similar degree with one or two years of graduate school training or one to two years of industry experience in the fields of mechanical design, fluid mechanics, heat transfer, or

electronics cooling. Lack of work experience could have been remedied by additional education, and vice versa. Such academic and industry experience would be necessary to appreciate what was obvious and/or anticipated in the industry and what a POSITA would have thought and understood at the time.

27. I believe MRI's definition is not meaningfully different from my definition of a POSITA. My opinions would not change regardless of which definition of POSITA is applied.

28. Based on my qualifications outlined above, I qualify as at least a POSITA under both parties' definitions, as of the effective filing dates for the Challenged Claims and today.

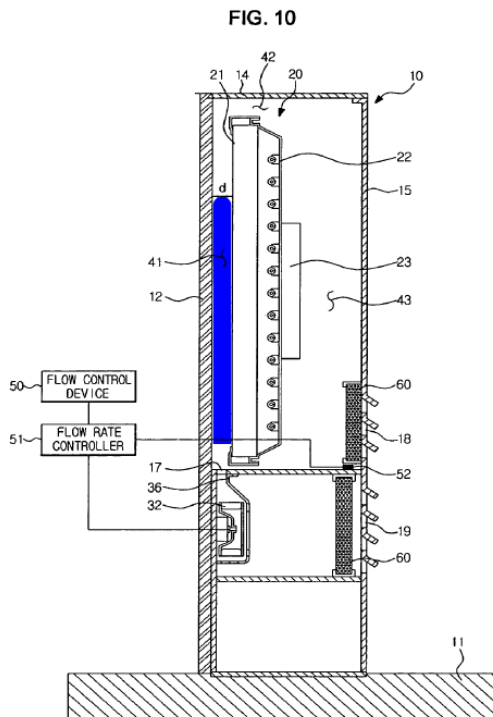
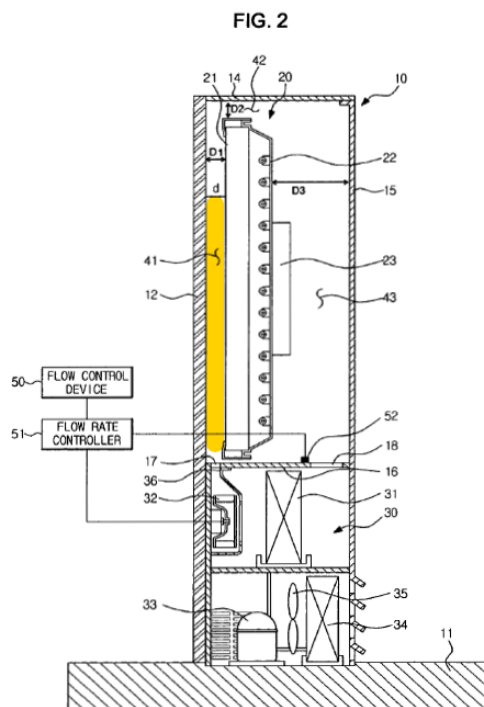
VII. OVERVIEW OF THE '253 AND '311 PATENTS

29. The '253 and '311 Patents are related and share the same specification. In general, I will cite the specification of the '311 Patent, but citations to either specification should be understood to include the same disclosure in the other.

30. The '311 Patent, which is titled "Liquid crystal display device including airflow channel," issued from U.S. Application Ser. No. 12/478,832 filed on June 5, 2009.

31. The '253 Patent, titled "Liquid crystal display device having air conditioner," issued from U.S. Application Ser. No. 13/780,137 filed on February 28, 2013.

32. The '311 and '253 Patents relate to a liquid crystal display device with components such as a cooling fan, control device, flow rate controller, and a temperature sensor working together to cool the display panel of the device. Ex. 1001 ('311 Patent) at 1:15-19. As the patents recognize, heat from LCD backlights and heat from sunlight in displays placed outside can cause the liquid crystals to degrade. *Id.* at 1:25-47. In the prior art, elements that cool the liquid crystal panel were located on the back of the liquid crystal panel as they were focused on removing heat generated by the backlight and not on the heat on the frontside of the display caused by sunlight. *Id.* at 1:25-47. The patents resolved this issue by arranging the display such that there is a channel defined as the gap between a front protective glass and the liquid crystal panel and the inclusion of a flow control device that provides turbulent air to this channel in order to remove the heat on the front side of the display. *Id.* at 1:61-67. The flow control device can include a temperature sensor that sends a signal, based on the measured temperature, to a flow rate controller to control the airflow through the channel. *Id.* at 2:44-61. The yellow highlighting in Figure 2 and the blue highlighting in Figure 10 below show the channel cooled by the flow control device in two different embodiments.



VIII. CLAIM CONSTRUCTION

33. For all terms, I have applied the plain and ordinary meaning of the term as it would be commonly understood by a POSITA at the time of the invention.

IX. BACKGROUND OF THE TECHNOLOGY

34. Flat panel display technology includes several electro-optic display device technologies, including Liquid Crystal Displays (LCDs), Plasma Display Panels (PDPs), and organic electroluminescent displays (such as organic light emitting diodes, OLEDs).

35. An LCD is made up of multiple liquid crystal (LC) cells in an array of picture elements, known as pixels. A diagram of a portion of an active matrix (AM) LCD using thin film transistors to control pixel switching is shown below. Each

pixel is driven separately by its own thin film transistor (TFT) switch. These TFTs are fabricated on the bottom glass substrate of the display, known as the TFT plate or substrate. The LC is sandwiched between this bottom glass and a top color filter substrate or plate and controlled by applying an electric field to shutter light between the top and bottom of the display. Thus, the electrical switching is carried out by the neighboring TFT associated with each pixel. Ex. 2003 (den Boer) at 49.

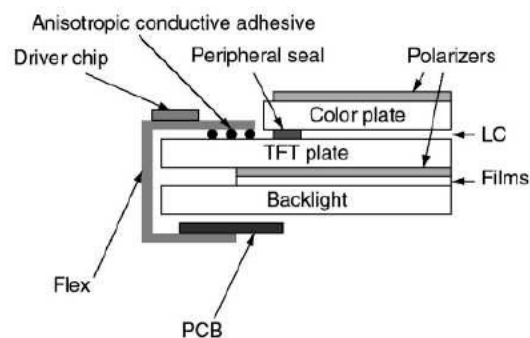


Figure 3.2: Cross section of an edge of a TFT LCD.

Id. at Fig. 3.2.

36. When liquid crystal is heated beyond a certain temperature, it undergoes a phase transition from a nematic state to an isotropic liquid. This temperature is known as the clearing point or clearing temperature. As a liquid crystal is heated toward the clearing point, the desired optical properties of the crystalline nematic state (or phase) begin to decline. Above the clearing point, the liquid crystal becomes isotropic and a display device will fail. *Id.* at 8. The diagram below shows the different crystalline phases:

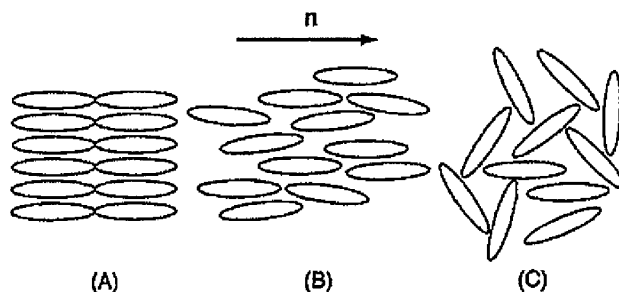


Figure 1.4: Orientation of LC molecules in (A) smectic, (B) nematic, and (C) isotropic phase.

Id. at Fig. 1.4.

X. OVERVIEW OF THE ASSERTED ART

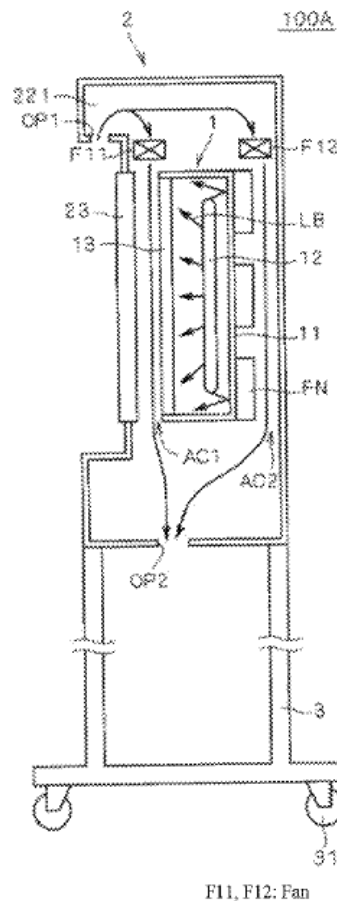
37. The Petition and Meinhart Declaration (Ex. 1003) cite a number of references as alleged prior art to the Asserted Patents. I address each of those references below.

A. Nagayama

38. Japanese Patent Publication No. 2006-163217A (“Nagayama”) (Ex. 1006) was filed on December 10, 2004, and published on June 22, 2006.

39. Nagayama generally relates to an outdoor display device using a flat panel type display device as a display section. Ex. 1006 (Nagayama) at [0001]. Since the device is to be used outside, the invention focuses on providing an enclosure, or device box, around the liquid crystal display device to protect it from the elements and allow for efficient heat dissipation. Ex. 1006 (Nagayama) at [0007]-[0008].

40. The proposed outdoor display device uses a flat panel display device, in a device box, wherein the device box comprises a transparent plate inserted into a wall face-to-face with a display panel of the flat panel display device, and an airflow generating means such as a fan for generating an airflow in “a front air passage that is at least a gap provided between the transparent plate and the display panel.” Ex. 1006 (Nagayama) at [0010]. The device is illustrated, for example, in Figure 3 below:



Ex. 1006 (Nagayama) at Fig. 3.

41. As shown in Nagayama's Figure 3, the liquid crystal display device 1 comprises a liquid crystal panel 13 (display panel), a backlight 12, and a housing 11 that houses the backlight 12 and also the drive circuit of the liquid crystal panel 13. Ex. 1006 (Nagayama) at [0015].

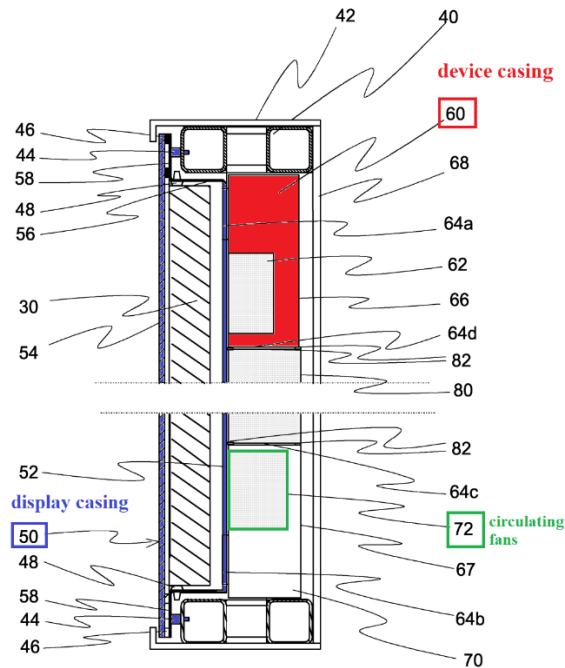
42. According to Nagayama, it is desirable to store electronic devices such as the back light 12 and the drive circuit of the liquid crystal panel 13 in the housing 11 and to seal the housing 11 with packings, fillers, etc. so that there is no gap and so there can be a support structure with a cushioning material sandwiched between the housing 11 of the liquid crystal display 1 and the inner wall of the device box 2 in order to mitigate shocks caused by a fall or something similar. Ex. 1006 at [0037]-[0038]. This protects the interior components from damage.

B. Karppanen '125

43. International Patent Publication No. 2007/116125 A1 ("Karppanen '125") (Ex. 1008) was filed as PCT Application on February 22, 2007, and published on October 18, 2007.

44. Karppanen '125 generally relates to an "electronic information board comprising a frame, a flat display element for presenting information and electronic equipment for controlling the operation of the information board." Ex. 1008 (Karppanen '125) at 1:1-4.

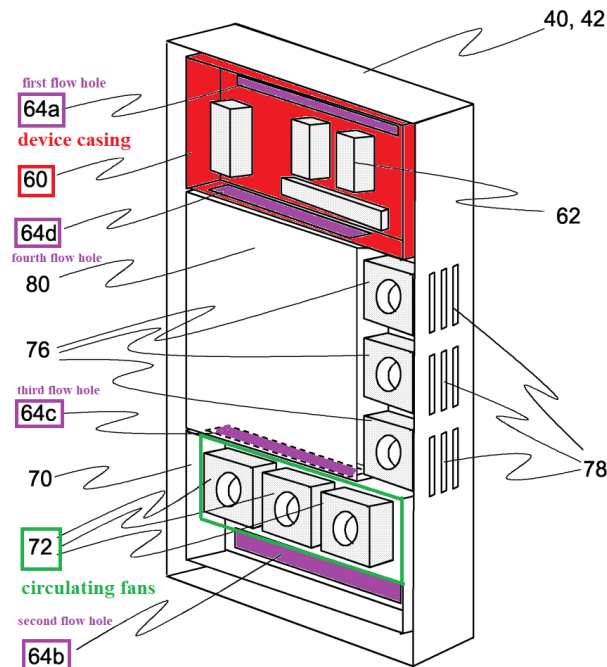
45. Figure 1 of Karppanen '125, shown below, shows an example of a cross-sectional drawing of an electronic information board according to the invention:



Ex. 1008 (Karppanen '125) at Fig. 1 (annotated).

46. Karppanen '125 describes that Figure 1 includes “a display casing 50 comprising a back wall 52, a transparent front plate 54 and an edge part 56 having a flange-like fastening collar 58 running in the direction of the front plate has been fastened to the frame by fastening means 44.” Ex. 1008 (Karppanen '125) at 6:9-12.

47. Figure 2 of Karppanen '125, which shows a perspective drawing, depicted obliquely from behind, of an electronic information board according to the invention, is shown below:



Ex. 1008 (Karppanen '125) at Fig. 2 (annotated).

48. As shown in Figure 2 of Karppanen '125, the electronic information board includes “circulating fans 72 inside the fan casing with the help of which a closed cooling air circulation is generated through the fan casing 70, cross-flow cell 80, device casing 60 and display casing 50.” Ex. 1008 (Karppanen '125) at 8:6-9. Karppanen '125 also discloses and describes transducers. Specifically, Karppanen '125 states:

transducers (not shown in the figures) that measure the temperature and are connected to the control unit in the device casing of the information board. The control unit controls the operation of the circulating fans 72 based on the measured temperatures in accordance with a predetermined control logic. With the help of the internal

cooling air circulation generated with circulating fans, the temperatures of the inner parts of the display casing and the device casing can be standardized and the heat can be effectively transferred away from the inside of the casings.

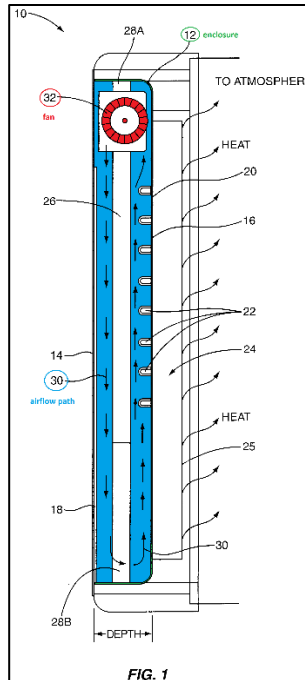
Ex. 1008 (Karppanen '125) at 9:14-21.

49. Karppanen '125 further describes that “cooling fans 76” are fastened “[t]o the back wall 52 of the display casing 50...with the help of which a forced air flow is generated through the cross-flow cell along the horizontal second air ducts. . . . Also the operation of the cooling fans is controlled with the control unit in the device casing.” Ex. 1008 (Karppanen '125) at 9:32-10:4.

C. Gromatzky

50. U.S. Patent No. 6,493,440 (“Gromatzky”) (Ex. 1007) was filed on April 23, 2001, and issued on December 10, 2002.

51. Gromatzky generally relates to a “thermal management system for a LCD display having a thin depth enclosure.” Ex. 1007 (Gromatzky) at 1:7-9. Gromatzky discloses “an environmentally-sealed enclosure 12” that “protects the internal components of the LCD display 10, including “LCD module 26,” from “external elements that may affect the proper operation, such as water, dust, etc.” Ex. 1007 (Gromatzky) at 2:63-3:2; Fig. 1. Annotated Figure 1 of Gromatzky is shown below:



Ex. 1007 (Gromatzky) at Fig. 1 (annotated).

52. Gromatzky describes that the enclosure 12 is “constructed out of a heat conducting material” so that the heat generated “can be dissipated outside of the enclosure 12 to the atmosphere using convective heat transfer.” Ex. 1007 (Gromatzky) at 3:3-7. Gromatzky further explains that its enclosure is environmentally-sealed and thus heat must be dissipated outside the enclosure:

Because the enclosure 12 is environmentally-sealed, heat generated by the backlights 22, the electronic circuitry, and external sources needs to be dissipated outside of the enclosure 12 in order for the LCD module 26 to operate at a lower temperature. For example, some LCD modules 12

may need to be kept at temperatures at or lower than
70 degrees Celsius to operate properly.”

Ex. 1007 (Gromatzky) at 3:54-58.

53. Gromatzky discloses that “[i]n order to dissipate heat in the ambient air in the enclosure 12, a fan 32 is placed in the airflow path 30” at “the top of the enclosure” and “rotates counter-clockwise to create the counter-clockwise circular airflow path 30” so that “ambient air is routed to the rear of the LCD module 26 and to the rear portion 16 of the enclosure 12 for dissipation through the enclosure 12 to the heat sink 24 and to the atmosphere.” Ex. 1007 (Gromatzky) at 4:52-63. According to Gromatzky, while other types of fans may be used, a laminar flow fan is preferred. Gromatzky explains:

The laminar airflow is more efficient than turbulent airflow for moving air and transferring heat from the front of the LCD module 26 to the rear portion 16 of the enclosure 12. A more efficient fan 32 allows selection of a fan 32 that is smaller in size since it may require less rotations of the fan 32 to move an amount of air desired and/or move the same amount of air in a smaller airflow path 30. Each of these factors contributes to a smaller fan 32 size that in turn contributes to a thinner depth enclosure 12.

Ex. 1007 (Gromatzky) at 4:64-5:15.

D. Utsunomiya

54. International Patent Publication No. 2008/050660A2 (“Utsunomiya”) (Ex. 1010) was filed as a PCT Application on October 11, 2007, and published on May 2, 2008.

55. Utsunomiya generally relates to “an apparatus for cooling a heat generating spot (area) of an electronic device, a cooling method therefor, and a liquid crystal projector apparatus[.]” Ex. 1010 (Utsunomiya) at 1:8-14. Utsunomiya seeks to solve a problem in the art relating to the increase in heat load on the components of the liquid crystal projector, which it describes as follows:

“[i]n recent years, a reduction in size and an increase in luminance have been increasingly requested for liquid crystal projector apparatuses in accordance with their versatile usages. To respond to such requests, an increase in lamp power and a reduction in size of display device are now under progress, resulting in an increase in flux density of light incident on the liquid crystal unit, and a continuous increase in heat load on each component which forms part of liquid crystal unit 2.

Ex. 1010 (Utsunomiya) at 4:12 18.

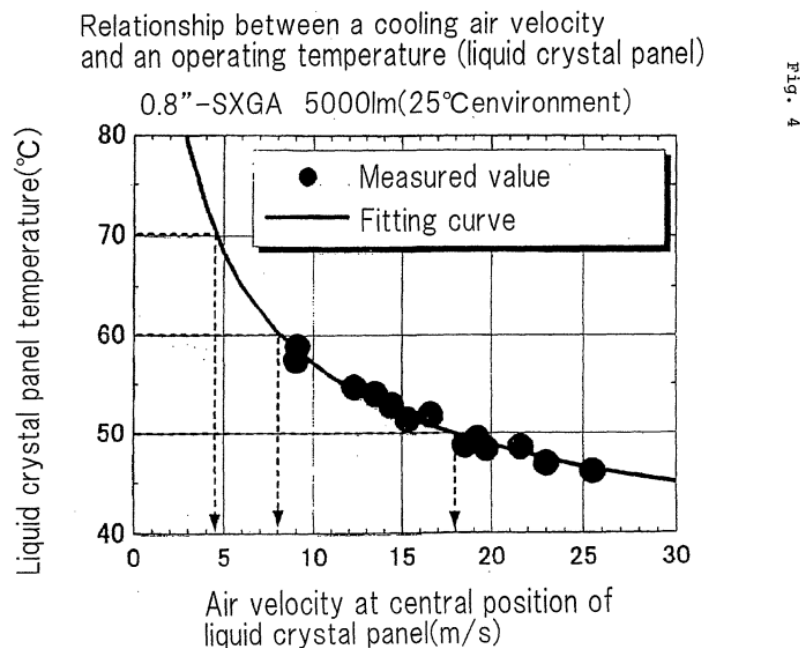
56. Utsunomiya discloses certain information concerning the cooling of its projector system. Utsunomiya states:

in a laminar flow region, the average heat transfer coefficient of forced convection is proportional to the

square root of the air velocity, while the operating temperature of the panel is reciprocally proportional to the square root of the air velocity. Thus, a reduction in the operating temperature of the panel to some extent will result in a lower sensitivity of a change in panel temperature to a change in air velocity.

Ex. 1010 (Utsunomiya) at 5:14-22.

57. Figure 4 of Utsunomiya is “a graph showing the relationship between a panel cooling air velocity and the panel operating temperature in 0.8"-SXGA (5000-lm class, 25°C environment).” Ex. 1010 (Utsunomiya) at 5:20-22.



Ex. 1010 (Utsunomiya) at Fig. 4.

E. Matsuoka

58. United States Patent No. 6,104,451 to Matsuoka (“Matsuoka”) (Ex. 1009) was issued on August 15, 2000.

59. Matsuoka relates to a “thin display unit such as a liquid-crystal display” such as those to be used “with portable computers such as notebook-type personal computers or portable terminals.” Ex. 1009 (Matsuoka) at 1:5-9. Matsuoka describes that “[i]t is an object of the present invention to provide a thin display unit having a structural body suitable for large thin displays, such as a liquid crystal display unit.” *Id.* at 1:63-65. Matsuoka further describes that “[t]o achieve the object, the body of a thin display unit of the present invention preferably has a horizontally or vertically disposed first enclosure, a vertical second enclosure located at the front of the first enclosure, and a vertical third enclosure located above the rear of the first enclosure and at the rear of the second enclosure.” *Id.* at 1:66-2:4.

60. Matsuoka discloses Figure 1, which is a central longitudinal sectional view of an LCD of an embodiment of its invention, shown below:

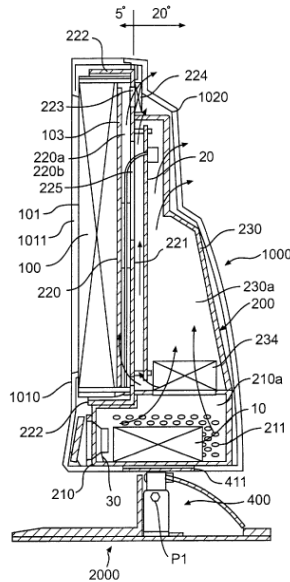


FIG. 1

Ex. 1009 (Matsuoka) at Fig. 1.

XI. VALIDITY OF THE ASSERTED PATENTS

61. As described below, there are claim elements of each and every challenged claim of the '311 patent and '253 patent that are not disclosed or taught by the asserted prior art.

A. Gromatzky Does Not Motivate Turbulent Airflow in Nagayama or Karppanen '125's Systems

62. Claim 1 of the '311 patent requires “a flow control device to impart turbulence to an airflow in the channel.” Claim 6 of the '311 patent further requires “the width of the channel is in a range of 5 to 25 mm.”

63. Dr. Meinhart and MRI assert two separate grounds of prior art for claims 1 and 6 of the '311 patent.

Ground	Prior Art
Ground 1	Nagayama and Gromatzky
Ground 3	Karppanen '125 and Gromatzky

64. Neither Nagayama nor Karppanen '125 disclose or suggest the use of turbulent airflow in their display systems. Nagayama and Karppanen '125 also do not disclose or suggest a channel with a width in a range of 5 to 25 mm. I understand that Dr. Meinhart does not contend that either Nagayama or Karppanen '125 discloses or teaches these claim elements. Ex. 1003 (Meinhart Decl.) ¶¶ 223-25 (Nagayama); ¶¶ 308-10 (Karppanen '125). Instead, Dr. Meinhart argues that a POSITA would have utilized turbulent airflow in either Nagayama or Karppanen '125's system based on the disclosure of Gromatzky. *Id.*

65. In my opinion, a POSITA would not have been motivated by Gromatzky's disclosure to use turbulent airflow in Nagayama or Karppanen '125's display system. While Gromatzky states that "the present invention may use any type of fan 32, including those that generate turbulent air," Gromatzky discloses that laminar airflow is preferred over turbulent airflow in a thin-depth enclosure. Gromatzky explains:

[a] laminar flow fan 32 creates a sheet of air, rather than turbulent air, across the LCD module 26. ***The laminar airflow is more efficient than turbulent airflow*** for moving air and transferring heat from the front of the LCD module 26 to the rear portion 16 of the enclosure 12.

A more efficient fan 32 allows selection of a fan 32 that is smaller in size since it may require less rotations of the fan 32 to move an amount of air desired and/or move the same amount of air in a smaller airflow path 30. ***Each of these factors*** contributes to a smaller fan 32 size that in turn ***contributes to a thinner depth enclosure 12.***

Ex. 1007 (Gromatzky) at 5:9-14 (emphasis added).

66. A POSITA would have thus understood that Gromatzky discloses that laminar airflow is more efficient and allows for a thinner depth enclosure. Based on these disclosures of Gromatzky, a POSITA would have, if anything, been motivated by Gromatzky to use laminar airflow over the front surface of a liquid crystal panel.

67. Gromatzky discloses an embodiment of the invention in which “[t]he front of the LCD module 26 is placed approximately 9.4 millimeters from the lens 18.” Ex. 1007 (Gromatzky) at 4:39-42. However, there is no disclosure in Gromatzky that teaches or suggests that a channel of this size is compatible with turbulent air flow. Instead, Gromatzky teaches that a fan generating laminar airflow is preferred over a fan generating turbulent air because a fan generating laminar airflow is more efficient and allows for a thin depth enclosure. Ex. 1007 (Gromatzky) at 5:9-15.

68. Considering its disclosure as a whole, Gromatzky suggests to a POSITA that an embodiment of the invention implementing a fan generating turbulent airflow would be less efficient and larger in size, and accordingly require

larger width of airflow path 30 between the lens 18 and LCD module 26, leading to a larger depth enclosure.

69. Thus, it is my opinion that Nagayama in combination with Gromatzky or Karppanen '125 in combination with Gromatzky does not disclose claim elements 1[c] and 6 of the '311 patent.

B. The Cited Prior Art Does Not Disclose the Claimed Temperature Sensor

70. Dr. Meinhart and MRI's Petition for the '311 patent assert claims 1-3, 5-7, 9, 11, and 13 of the '311 patent are obvious over the following prior art:

'311 Patent Ground	Prior Art
Ground 1	Nagayama and Gromatzky
Ground 3	Karppanen '125 and Gromatzky

71. Dr. Meinhart and MRI's Petition for the '253 patent assert claims 6, 11-12, 14-18, and 20 of the '253 patent are obvious over the following prior art:

'253 Patent Ground	Prior Art
Ground 1	Nagayama, Gromatzky, and Matsuoka
Ground 3	Karppanen '125
Ground 5	Karppanen '125 and Gromatzky

72. It is my opinion, as set forth below, that none of the '311 challenged claims or '253 challenged claims are obvious over the asserted prior art because none of the asserted prior art references teach or disclose at least the claimed

temperature sensor. All of the challenged claims of the '311 patent and '253 patent require a temperature sensor:

- '311 Patent, Claim 1: “a temperature sensor to measure the temperature of air discharged from the channel”;
- '311 Patent, Claim 9: “a flow control device to detect temperature variation caused by heat incident on a front side of the liquid crystal panel”;¹
- '311 Patent, Claim 11: “a temperature sensor to detect a temperature variation of the air having passed through the channel”;
- '311 Patent, Claim 13: “a temperature sensor to measure the temperature of air discharged from the channel”;
- '253 Patent, Claim 6: “the sensor is a temperature sensor to measure a temperature of air having passed through the front channel”;
- '253 Patent, Claim 11: “a sensor to measure a temperature of air in the housing”;

¹ A POSITA would understand that “a flow control device to *detect* temperature variation” as recited in claim 9 of the '311 patent refers to the use of a temperature sensor to measure temperature variations “caused by heat incident on a front side of the liquid crystal panel” as claimed.

- '253 Patent, Claim 16: “the sensor measures the temperature of the air having passed through the front channel.”

73. Further, the claimed temperature sensor is not a simple design choice in the '311 and '253 patents, and Dr. Meinhart and MRI have not identified any reason that a POSITA would have modified either Nagayama or Karppanen '125 to achieve the claimed inventions outside of the teachings and inventions of the '311 and '253 patents.

1. None of the Asserted Prior Art Discloses or Teaches These Claim Elements

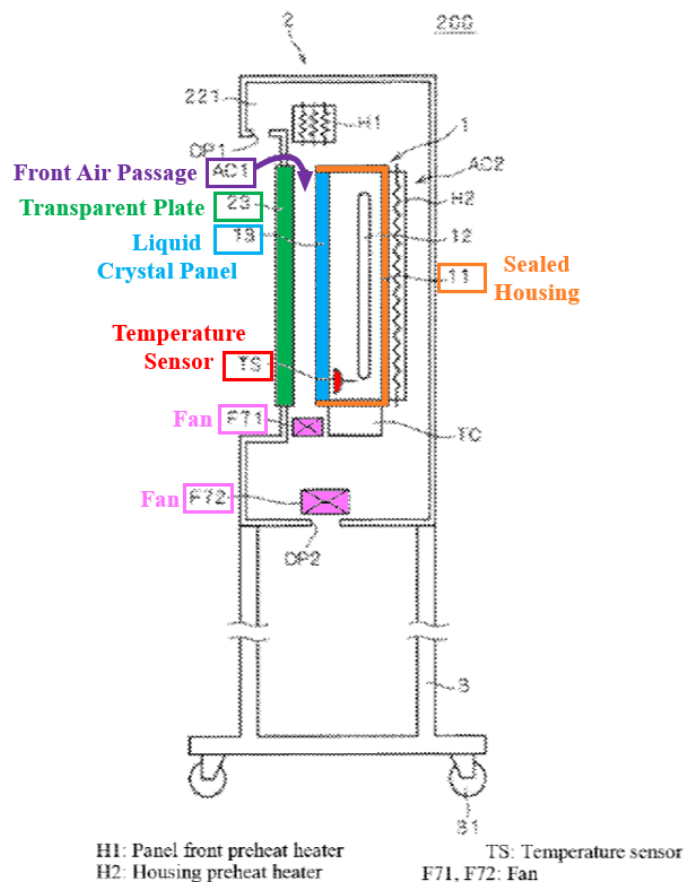
74. Neither Nagayama nor Karppanen '125, the two primary references cited in the Grounds asserted by Dr. Meinhart and MRI against the '311 patent and the '253 patent, disclose the claimed temperature sensor.

75. **Nagayama:** Nagayama does not teach or disclose a temperature sensor that measures the temperature of air as claimed. The temperature sensor of Nagayama does not measure the temperature of air discharged from the channel, air having passed through the channel, or air in the housing.

76. Nagayama discloses a “temperature sensor TS” that is “attached to the back surface of the liquid crystal panel 13” and measures “the temperature of the liquid crystal panel 13.” Ex. 1006 (Nagayama) at [0074]. Nagayama discloses that behind liquid crystal panel 13 is a backlight 12. *Id.* at [0037]. Nagayama explains that the backlight 12, liquid crystal panel 13, and drive circuitry for the liquid crystal

panel 13 are preferably located in a “seal[ed]” housing 11. *Id.* Nagayama states that it is preferable to have a sealed housing to prevent the ambient air from “reduc[ing] the illuminance of the backlight 12.” *Id.* Thus, Nagayama’s temperature sensor TS, which is mounted on the back surface of liquid crystal panel 13 and contained within the preferably sealed housing 11, is separated from the air in front air passage AC1, which is between the front of the liquid crystal panel 13 and transparent plate 23. Ex. 1006 (Nagayama) at [0071]. This disclosure of Nagayama is depicted in Nagayama’s Figure 9, which is annotated below:

[FIG. 9]



Ex. 1006 (Nagayama) at Fig. 9 (annotated).

77. **Karppanen '125:** Karppanen '125 does not teach or disclose a temperature sensor that measures the temperature of air as claimed. The temperature sensor of Karppanen '125 does not measure the temperature of air discharged from the channel, air having passed through the channel, or air in the housing.

78. Karppanen '125's "transducers" operate as temperature sensors that measure the temperature of Karppanen '125's casings. Karppanen '125 discloses that its system includes a display casing 50 and device casing 60, explaining:

[i]nside the frame 40 there is a device casing 60 fastened to the upper part of the back wall 52 of the display casing 50, inside of which device casing has been placed essentially all electronic equipment 52 required for controlling the display element 30 and the whole information board, such as a computer, a control unit of the display and power supplies [sic] of the control unit and the display's background light.

Ex. 1008 (Karppanen '125) at 6:31-7:1.

Karppanen '125 explains that its cooling system, including its transducers, operates as follows:

circulating air flow running through the device and display casing is generated with the help on which the temperature of the casings is maintained within desired limits. The circulating air flow rinses the surface of the parts that warm up, such as that of the display element, whereupon the heat transfers effectively from the warming up components directly to the air flow. Inside the device and display casing are placed transducers (not shown in the figures) that measure the temperature and are connected to

the control unit in the device casing of the information board. The control unit controls the operation of the circulating fans 72 based on the measured temperatures in accordance with a predetermined control logic.

Ex. 1008 (Karppanen '125) at 9:9-18. Karppanen '125 further explains that through this cooling air circulation, “the temperatures of the inner parts of the display casing and the device casing can be standardized and the heat can be effectively transferred away from the inside of the casings.” *Id.* at 9:19-21.

Finally, Karppanen '125 emphasizes that “[t]he circulation of the inner space air enables the cooling of the edges of the display element especially in the upper parts of the display casing.” *Id.* at 9:24-25.

79. Karppanen '125's transducers measure the temperature of the physical elements of the electronic information board rather than the temperature of any of the air inside the frame 40. Karppanen '125 provides that “a circulating air flow running through the device and display casing is generated with the help on which the *temperature of the casings is maintained* within desired limits [i]n the device and display casing are placed transducers (not shown in the figures) that *measure the temperature* and are connected to the control unit in the device casing of the information board.” Ex. 1008 (Karppanen '125) at 9:9-16 (emphasis added). Karppanen '125 further provides that “[w]hen the information board is in operation, the display element 30 and the electronic devices 62 in the device casing warm up,

whereby the temperature of the device casing 60 and the display casing 50 rises.”
Id. at 9:4-6.

80. In addition to Nagayama and Karppanen ’125, Dr. Meinhart and MRI cite three secondary references, including Gromatzky and Utsunomiya for both the ’311 patent and ’253 patent, and Matsuoka for the ’253 patent. MRI and Dr. Meinhart do not cite to Gromatzky, Utsunomiya, or Matsuoka for any disclosure relating to the temperature sensor. None of these references disclose the claimed temperature sensor.

81. **Gromatzky:** Gromatzky’s disclosure does not refer to the use of a temperature sensor in its LCD display systems.

82. **Utsunomiya:** Utsunomiya’s disclosure does not refer to the use of a temperature sensor in its liquid crystal projector apparatus.

83. **Matsuoka:** Matsuoka’s disclosure does not refer to the use of a temperature sensor in its thin liquid-crystal or plasma display unit.

84. MRI and Dr. Meinhart do not name any other prior art reference in the Grounds asserted against the ’311 patent or ’253 patent.

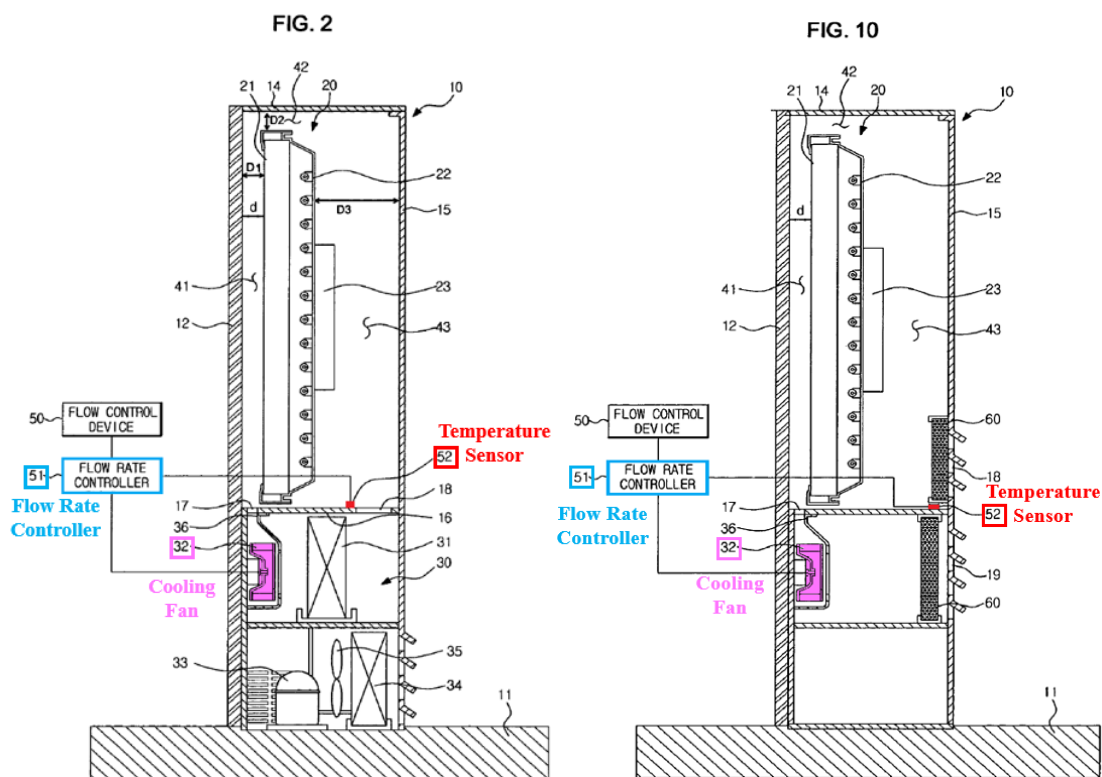
2. The Claimed Temperature Sensor is Not a Simple Design Choice in the ’311 and ’253 Patents

85. Dr. Meinhart and MRI’s petitions for the ’311 and ’253 patents acknowledge that none of the prior art discloses the claimed temperature sensor.

Instead, Dr. Meinhart and MRI argue that the location and function of the temperature sensor would have been an obvious design choice. '311 Petition at 25-27, 42-44; '253 Petition at 32-35, 38-39, 40-42, 55-57; Ex. 1003 (Meinhart Decl.) ¶¶ 100-02, 121, 132, 168-70, 190, 201 ('253 patent), 227-29, 262-64, 292, 312-14, 342, 347-350, 376 ('311 patent). In my opinion, the claimed temperature sensor would not have been an obvious design choice.

86. The '311 and '253 patent specifications describe that the temperature sensor 52 functions as a key component in the claimed inventions. Specifically, the shared specification of the '311 and '253 patents states that the “temperature sensor 52 determines the temperature when the air absorbed heat as much as possible while passing through the first to third channels,” and “the flow rate controller 51 regulates the flow rate of air in the cooling fan 32 according to a signal transmitted from the temperature sensor 52 . . .” Ex. 1001 ('311 patent), 8:60-9:2. The specification explains that the benefit of the claimed temperature sensor is that its location and function enables measurement of the maximum temperature of the display unit, including by considering the temperature of air in the front of the display (which is exposed to sunlight). Based on this temperature measurement, a signal is sent to operate a fan to control the air flow through the front channel between the display panel and front cover. This configuration of the display allows for the effective removal of heat incident on the front side of the liquid crystal panel, which is the

invention of the '311 and '253 patents. Ex. 1001 ('311 patent) at 1:48-52 (“In order to solve the problems described above due to limitations and disadvantages of the related art, the present general inventive concept is directed to an LCD device with a heat dissipation structure to remove or release heat incident on a front side of a liquid crystal panel.”). Based on the description in the specification, a POSITA would understand the temperature sensor to be a key component with a functional role in the claimed inventions of the '253 and '311 patents. The temperature sensor **52** is annotated in Figures 2 and 10 shown below:



Ex. 1001 ('311 patent) at Figs. 2, 10 (annotated).

87. Dr. Meinhart and MRI cite two references—Hannemann and Burke—and argue that for both the '311 and '253 patents a POSITA would have known, as

demonstrated by these references, that the location and number of temperature sensors could vary such that arriving at the claimed temperature sensor would have been a simple design choice for a POSITA. As described above, I disagree with Dr. Meinhart that the temperature sensor of the '311 and '253 patents is a simple design choice, and Hannemann and Burke do not suggest otherwise.

88. Dr. Meinhart cites to the following disclosure from Hannemann:

[t]he interior temperature is monitored by at least one temperature sensor that is advantageously arranged in the upper region of the display unit. The number of the temperature sensors and their physical location within the display unit can vary without modifying the spirit of the invention. Said sensors can also be used to regulate the cooling or heating.

Ex. 1003 (Meinhart Decl.) ¶¶ 101, 169, 228, 262, 313 (citing Ex. 1013 (Hannemann) at [0019]).

89. Dr. Meinhart additionally cites to the following disclosure from Burke:

As shown in the exemplary embodiment depicted in FIG. 5, the controller 500 also monitors the temperature in the backlit LCD monitor through temperature sensors 502. Multiple temperature sensors 502 may be used in the backlit LCD monitor. For example, one temperature sensor 502 may monitor the temperature in the electronics chamber and another temperature sensor 502 may monitor ambient temperature in the closed air space, or backlight chamber, between the backlight assembly 100 and the cooling assembly 300.

Ex. 1003 (Meinhart Decl.) ¶¶ 101, 169, 228, 262, 313 (citing Ex. 1011 (Burke) at 6:24-33).

90. There is no disclosure in Hannemann or Burke—including those portions relied on by Dr. Meinhart as cited above—that would have led a POSITA to choose to place the temperature sensor to measure air discharged from a front channel in Nagayama or Karppanen '125's display systems. These disclosures of Hannemann and Burke, if anything, suggest that there were many options available for the placement of temperature sensors. These general disclosures of Hannemann and Burke do not provide any specific guidance to a POSITA regarding the use of temperature sensors and would not have led a POSITA to have placed the sensor in a specific location within the display to measure the temperature of air as taught by the '311 and '253 patents.

91. As I describe further below, a POSITA would not have had a reason to modify Nagayama or Karppanen '125's temperature sensors and would not have had a reason to modify the systems of either Nagayama or Karppanen '125 to position the temperature sensor to measure the temperature of air in the channel.

3. A POSITA Would Not Have Modified Nagayama's Temperature Sensor

92. Dr. Meinhart has not established any reason why a POSITA would have modified Nagayama's temperature sensor. Nagayama's invention relies on its accurate measurement of the temperature of the liquid crystal panel itself. Nagayama describes that “[t]he present invention . . . is intended to provide a display device capable of efficiently dissipating heat generated from a flat panel display

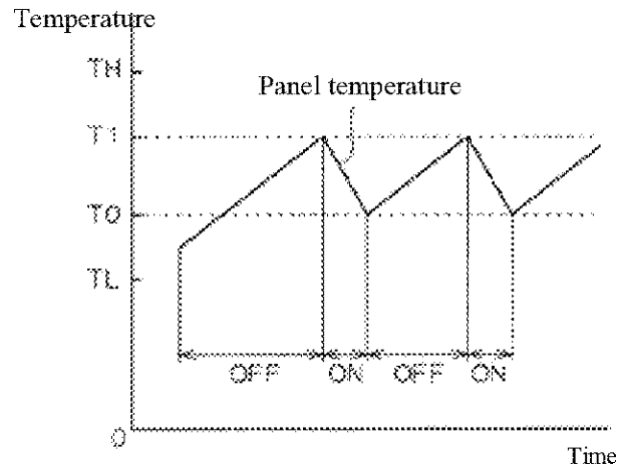
device.” Ex. 1006 (Nagayama) at [0009]. Modifying Nagayama’s temperature sensor in the manner asserted by Dr. Meinhart would not result in predictable temperature measurements for the LCD panel due to the changes it would cause in the operation of Nagayama’s system, which, as described further below, would require a number of further modifications to Nagayama’s system. A POSITA would not have made these modifications to Nagayama without having any reason or benefit in doing so.

93. Dr. Meinhart argues that a POSITA would have understood that the temperature of air exiting the channel would “provide a more accurate indication of temperature of the LCD panel 13” and it would have been an “obvious design choice” to position the sensor there. Ex. 1003 (Meinhart Decl.) ¶ 102. I disagree with Dr. Meinhart’s unsupported argument that a POSITA would understand that the temperature of air would “provide a more accurate indication of the temperature of the LCD panel 13,” which is also inconsistent with how a POSITA would have understood Nagayama’s teachings.

94. Modifying Nagayama’s temperature sensor in the manner asserted by Dr. Meinhart would impact the function of Nagayama’s system and would not yield predictable temperature measurement results. As described above, Nagayama’s temperature sensor is located on the back of LCD panel 13, which is placed inside

sealed housing 11. The location of the temperature sensor has an integral role in the function of Nagayama's display system.

95. Nagayama's display system is designed with both a cooling and warming operation. Nagayama explains that its invention is "described from the perspective of cooling the liquid crystal panel in order to suppress temperature rise, but if the operating temperature of the liquid crystal panel is maintained appropriately and power consumption is reduced, not only cooling but heating may be necessary." Ex. 1006 (Nagayama) at [0070]. Nagayama explains that when the liquid crystal display is activated, the fan F71 is off: "[w]hen the liquid crystal display device 1 is activated, the panel temperature begins to rise due to heat input from the backlight 12, etc. At this stage, the fan F71 is off." *Id.* at [0078]. Nagayama's Figure 11, depicted below, is "a characteristic diagram illustrating a temperature change when controlling panel temperature by ON/OFF control of fan F71." *Id.* at [0076]. In Fig. 11, "the time is shown on the horizontal axis and the temperature is shown on the vertical axis, representing the ON and OFF periods of the fan F71 and the change in the temperature (panel temperature) of the liquid crystal panel 13 in each period." *Id.* at [0077]. TL represents the lower limit of the LCD panel operable temperature, T0 represents the lower limit of the temperature control setting, T1 represents the upper limit of the temperature control setting, and TH is the upper limit of the LCD panel operable temperature. *Id.*



Id. at Fig. 11.

96. Modifying Nagayama to place the temperature sensor in a location to measure the temperature of air, including air discharged from the channel or having passed through the channel, would modify the system of Nagayama such that its sensor would only indirectly measure the temperature of the LCD panel. That indirect measurement would be inefficient for the purposes of determining the temperature of Nagayama’s LCD panel and would require additional modifications to Nagayama’s system.

97. To explain further, Nagayama’s system operates by turning the fan F71 on and off dependent on whether the panel temperature has hit a required threshold. Because the Fan F71 is only “on” when the panel temperature is above the threshold temperature, there will be no air circulation in front air passage AC1 of Nagayama when the temperature is below that threshold. A temperature sensor measuring air discharged from the channel or having passed through the channel would not yield

predictable temperature measurement results in those circumstances, and would thus fail to serve the purpose of the temperature sensor TS in Nagayama's display, i.e. to provide accurate measurements of the temperature of the LCD panel.

98. MRI and Dr. Meinhart's asserted temperature sensor modification would have required additional changes to the operation of Fans F71 and F72 and also Nagayama's temperature control board TC, which controls the fans F71, F72 and heaters H1, H2, to maintain adequate control in both warming and cooling operations. A POSITA would not have been motivated to implement multiple modifications to Nagayama's system where there would have been no apparent benefit.

4. A POSITA Would Not Have Modified Karppanen '125's Transducers

99. Dr. Meinhart has not established any reason why a POSITA would have modified Karppanen '125's transducers. In my opinion, a POSITA would not have had any reason to make the modifications to Karppanen '125 that MRI and Dr. Meinhart suggest.

100. As described above, Karppanen '125 discloses that its transducers are used to measure the temperature of its casings. Karppanen '125 provides that "a circulating air flow running through the device and display casing is generated with the help on which the *temperature of the casings is maintained* within desired limits [i]n the device and display casing are placed transducers (not shown in

the figures) that *measure the temperature* and are connected to the control unit in the device casing of the information board.” Ex. 1008 (Karppanen ’125) at 9:9-16 (emphasis added). Although Karppanen ’125 does not show its transducers in its figures, Karppanen ’125 emphasizes that its cooling system operates with a focus on cooling the components in the upper parts of its display. Specifically, Karppanen ’125 describes that the “transparent window” in the front of the display causes “a significant rise of temperature in the upper parts of the display especially on the visible side of the display.” Ex. 1008 (Karppanen ’125) at 2:19-21. According to Karppanen ’125, “the temperatures of the upper parts set a limit to the highest possible operating temperature allowed for the whole display device.” *Id.* at 2:31-33.

101. Based on these disclosures of Karppanen ’125, a POSITA may have, if anything, been motivated to place the transducers on the parts or casing in the upper region to measure the temperature of those components, which Karppanen ’125 emphasizes as indicative of the highest possible operating temperature. There is no teaching or suggestion in Karppanen ’125 that a POSITA should or could measure the temperature of air in the display. Dr. Meinhart’s assertion that a POSITA could have done so as an indirect measurement of the temperature of the casings is not based on any teaching of Karppanen ’125 and is contrary to the

teachings of Karppanen '125 that focus on measuring the temperature of the physical casings to operate its cooling system.

C. The Cited Prior Art Does Not Disclose the Claimed Airflow Velocities

102. Certain challenged claims of the '311 and '253 patents recite airflow velocity ranges for air flow through the front channel:

- '311 Patent, claim 4: “the flow rate controller controls [the] fan such that the air in the channel has a velocity in a range of 4 to 14 m/s.”
- '311 Patent, claim 10: “the flow control device has a flow rate controller to regulate the flow rate of the air such that air in the channel has a flow velocity of not less than 4 m/s when the channel defined between the liquid crystal panel and the protection panel has a spacing distance in a range of 5 to 25 mm.”
- '253 Patent, claim 8: “the flow rate controller regulates the flow rate of the air in the fan such that the flow velocity of air in the front channel is maintained at 4 m/s or more.”
- '253 Patent, claim 19: “the control device regulates a flow rate of the air in the fan such that a flow velocity of the air in the front channel is maintained at 4 m/s or more.”

103. Dr. Meinhart and MRI's petition for the '311 patent assert that claims 4 and 10 of the '311 patent are obvious over the following prior art:

Ground	Prior Art
Ground 2	Nagayama, Gromatzky, and Utsunomiya
Ground 4	Karppanen '125, Gromatzky, and Utsunomiya

104. Dr. Meinhart and MRI's petition for the '253 patent assert that claims 8 and 19 of the '253 patent are obvious over the following prior art:

Ground	Prior Art
Ground 2	Nagayama, Gromatzky, Matsuoka, and Utsunomiya
Ground 4	Karppanen '125 and Utsunomiya

105. It is my opinion, as set forth below, that none of these claims are obvious over the asserted prior art because a POSITA would not have combined the teachings of these references to arrive at these claims.

1. Nagayama and Utsunomiya

106. In my opinion, a POSITA would not have looked to Utsunomiya if seeking to improve Nagayama's system. Utsunomiya seeks to solve different problems than those faced in Nagayama. Nagayama relates to cooling and mitigating temperature increases from its display panel and protecting outdoor displays, whereas Utsunomiya relates to high-intensity lamp projectors. A projector is an optical device that is used to project an image onto a surface some distance away from the projector and is a different type of LCD device than that disclosed by Nagayama. The lens of a projector is typically small—Utsunomiya discloses that its projector has a 0.8" lens. Further, as compared to Nagayama's display device that is designed for use outdoors, the device of Utsunomiya is intended to be used indoors.

107. Utsunomiya explains that it seeks to solve the following problem in the art:

[i]n recent years, a reduction in size and an increase in luminance have been increasingly requested for liquid crystal projector apparatuses in accordance with their versatile usages. To respond to such requests, an increase in lamp power and a reduction in size of display device are now under progress, resulting in an increase in flux density of light incident on the liquid crystal unit, and a continuous increase in heat load on each component which forms part of liquid crystal unit 2.

Ex. 1010 (Utsunomiya) at 4:12-18.

108. In contrast, Nagayama describes that it seeks to solve the following problem:

Since conventional liquid crystal advertising media are configured as above, if the device is installed on an outdoor road, etc., the liquid crystal surface may be touched by a passerby, and the liquid crystal panel may be damaged, and if a transparent plate is installed on the front of the liquid crystal panel so that it cannot be directly touched, the transparent plate suppresses the heat dissipation from the front of the liquid crystal panel, and the temperature of the liquid crystal panel increases and it will not function normally.

In addition, for outdoor use, it is necessary to surround the liquid crystal display device in some kind of enclosure so that rainwater and dust do not directly reach the liquid crystal display device, but in such a case, it was difficult to efficiently dissipate heat emitted from the liquid crystal display device.

Ex. 1006 (Nagayama) at [0006]-[0007].

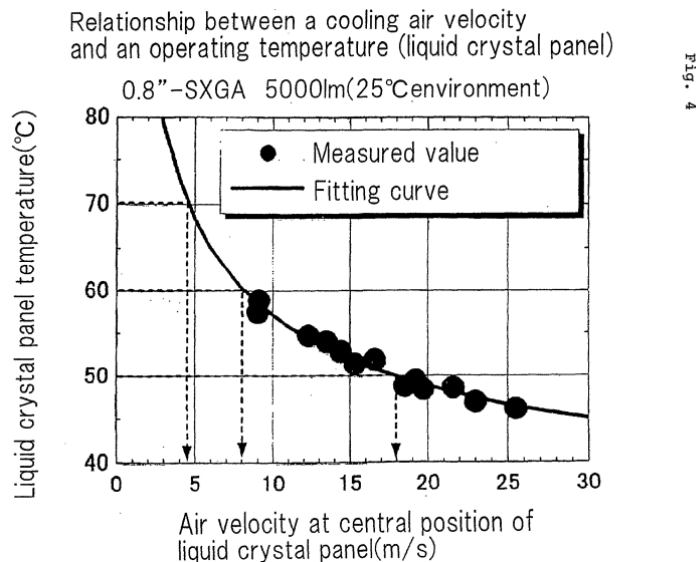
109. There are different challenges that confront the systems described by Nagayama and Utsunomiya. For instance, the size and design of the systems is fundamentally different and raises different considerations for which components of the system will need cooling and how to achieve efficient cooling of those components. Further, Nagayama's device is subject to a host of environmental considerations due to the nature of its being designed for outdoor use versus Utsunomiya's device.

110. Nagayama intends to address both internal heat from its LCD components and external heat from sunlight, whereas Utsunomiya is focused on addressing internal heat sources from "an increase in lamp power and a reduction in size of display device. . . resulting in an increase in flux density of light incident on the liquid crystal unit, and a continuous increase in heat load on each component which forms part of liquid crystal unit." Ex. 1010 (Utsunomiya) at 4:12-18. The

thermal management for heat sources from different locations puts different components at risk of damage, and accordingly require cooling different locations.

111. In view of the fundamental differences in the physical systems as well as their conditions of use, a POSITA would not have expected that the heat generated by the high power lamp of Utsunomiya and the cooling of its system would be applicable to Nagayama's LCD display.

112. Utsunomiya discloses that "a reduction in the operating temperature of the panel to some extent will result in a lower sensitivity of a change in panel temperature to a change in air velocity." Ex. 1010 (Utsunomiya) at 5:14-20. The relationship between temperature and velocity in a laminar flow region is depicted in Figure 4 of Utsunomiya. Utsunomiya describes Figure 4 as "a graph showing the relationship between a panel cooling air velocity and the panel operating temperature in 0.8"-SXGA (5000-lm class, 25°C environment)." Ex. 1010 (Utsunomiya) at 5:20-22.



Ex. 1010 (Utsunomiya), Fig. 4.

113. Utsunomiya does not disclose or suggest that its air velocity ranges for a projector system with a 0.8" lens recorded at indoor temperatures of 25°C are applicable to outdoor LCD display devices.

114. Dr. Meinhart does not identify a reason that a POSITA would have looked to Utsunomiya's disclosure to modify Nagayama's display. While a POSITA may have recognized that airflow speed "would be needed to design an effective cooling system for the device" (Ex. 1003 (Meinhart Decl.) ¶ 58), Utsunomiya would not provide that information for Nagayama. Due to the differences in the physical systems and thermal management problems Nagayama and Utsunomiya seek to address, a POSITA looking at Nagayama's display would

not have understood that the data recorded by Utsunomiya in Figure 4 would have applied to Nagayama's display.

2. Karppanen '125 and Utsunomiya

115. In my opinion, a POSITA would not have looked to Utsunomiya in seeking to improve Karppanen '125's system. Like as explained above with respect to Nagayama, Utsunomiya's projector apparatus is different from the viewable displays of Karppanen '125.

116. The objectives of Karppanen '125 and Utsunomiya also differ considerably. Karppanen '125 seeks to address both internal and external heat (e.g., sunlight) in sealed displays that are operated in outdoor environments and that are much larger in size than Utsunomiya's liquid crystal projectors. Ex. 1008 (Karppanen '125) at Abstract, 2:31-33, 2:19-26, 9:6-9. Karppanen '125 describes its invention as an "electronic information board comprising a frame, a flat display element for presenting information and electronic equipment for controlling the operation of the information board." *Id.* at 1:3-5. Karppanen '125 seeks to solve the problem in the art of the temperature variation in the display when located in outdoor environments, explaining "[i]n addition to the own heat production of the devices also the ambient circumstances of the casings, such as the temperature of the location in which they are placed and sunshine, affect their warming up." *Id.* at 9:6-9.

117. Karppanen '125 further explains the problem in the art as follows:

[T]he present solutions have the problem of temperature control caused by the integration of the electronics controlling the display and the actual display. As a result, there are often situations in which heat is cumulated in certain parts of the device when components that are warming increase the temperatures of each other. If the design has not been critically checked, temperatures may become too high locally.

Ex. 1008 (Karppanen '125) at 2:21-26.

118. The heat that Karppanen '125 seeks to manage includes both the internal heat from its electronic components and external heat from sunlight. Karppanen '125 recognizes that the “transparent window” in front of the display of an electronic information board results in “a significant rise of temperature in the upper parts of the display especially on the visible side of the display.” *Id.* at 2:19-21. Therefore, according to Karppanen '125, “the temperatures of the upper parts set a limit to the highest possible operating temperature allowed for the whole display device.” *Id.* at 2:31-33.

119. By contrast, Utsunomiya relates to a projector, and its stated objective is to manage increasing internal heat sources from “an increase in lamp power and a reduction in size of display device. . .” Ex. 1010 (Utsunomiya) at 4:12-18. A POSITA would have understood that the thermal management for heat sources from different locations puts different components at risk of damage, and accordingly require cooling different locations. In view of the fundamental differences in the

physical systems of Karppanen '125 and Utsunomiya, as well as their conditions of use, a POSITA would not have expected that the heat generated by the high power lamp of Utsunomiya and the cooling of its system would be applicable to Nagayama's LCD display.

120. Dr. Meinhart opines that a POSITA “would be motivated to use the air flows disclosed by Utsunomiya as a basis for selecting suitable air flow speeds” and that “it would have been obvious to try air flows at or above 4.5 meters per second.” Ex. 1003 (Meinhart Decl.) ¶¶ 63-65. Dr. Meinhart does not provide further explanation as to how Utsunomiya's disclosure would provide “a *basis* for selecting suitable air flow speeds.”

121. A POSITA would not have been motivated to apply the air velocity ranges disclosed in Figure 4 of Utsunomiya (which, as described above, show the relationship between panel cooling air velocity and panel temperature for the 0.8" lens in conditions of 25°C) to apply to Karppanen '125's system. Due to the differences between Karppanen '125's display devices and Utsunomiya's projector and the challenges that they seek to address, a POSITA would not understand that the air flow velocities recorded in Utsunomiya would apply to the different systems of Karppanen '125.

D. The Cited Prior Art Combination Does Not Disclose the Claimed Partitioning of the Housing

122. Claim 20 of the '253 patent depends from claim 11 and further requires “the housing is partitioned into an upper space and a lower space in which the fan is disposed to blow the air to at least one of front side and back side of the display assembly.”

123. Dr. Meinhart and MRI assert that the combination of Nagayama, Gromatzky, and Matsuoka disclose this claim element.

124. In my opinion, the cited prior art does not disclose this claim element. First, Matsuoka does not disclose the claimed upper and lower space with a fan in the lower space to blow the air to at least one side of the display assembly. Dr. Meinhart describes that Matsuoka’s housing configuration is “similar” to the '253 patent, but ultimately appears to rely on his argument that it would have been an “obvious design choice” to partition Nagayama as recited in the claims of the '253 patent. Ex. 1003 (Meinhart Decl.) ¶¶ 91-92.

125. I disagree that the partitioning of Nagayama would have been an “obvious design choice.” Dr. Meinhart has not identified any teaching or suggestion in the prior art that would have led a POSITA looking to improve the cooling system of Nagayama to partition its housing in the manner asserted by Dr. Meinhart. Further, the partitioning of the housing is a structural component that will impact

the function and operation of the system, and not a simple design choice with little design considerations as Dr. Meinhart suggests.

126. Further, a POSITA would not have been motivated to combine Nagayama with Matsuoka. The inventions of Nagayama and Matusoka relate to different types of systems and each has different objectives. Matsuoka relates to a thin display unit to be used in portable computers such as notebook-type personal computers, whereas Nagayama relates to cooling and mitigating temperature increases from a liquid crystal display panel used outdoors.

127. A POSITA would not have had a reason to partition the Nagayama display in the manner asserted by Dr. Meinhart. Matsuoka is related to a different type of device and its invention seeks to solve different and unrelated problems. There is no suggestion nor teaching in Matsuoka that would have motivated a POSITA to modify the invention of Nagayama in the manner recited in claim 20 of the '253 patent. In view of the differences in Nagayama and Matsuoka's function and design, a POSITA would not have been motivated to partition the device box of Nagayama based on the disclosures of Matsuoka.

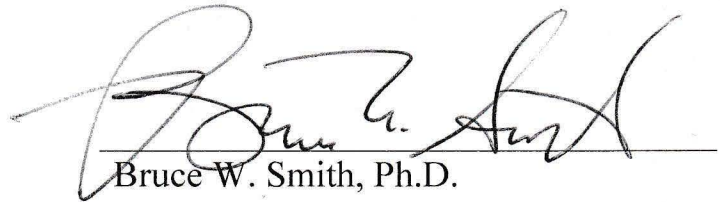
XII. CONCLUSION

128. Based on the above, it is my opinion that none of the '311 challenged claims or '253 challenged claims are invalid in view of the prior art asserted by Dr. Meinhart and MRI.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed in Rochester, NY

Dated: November 9, 2023



Bruce W. Smith, Ph.D.