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 No. RE45,117

Case No. IPR2023-01201

DECLARATION OF BRUCE W. SMITH, PH.D.

TABLE OF CONTENTS

I. INTRODUCTION 1

II. SUMMARY OF OPINIONS 2

III. MATERIALS RELIED UPON 2

IV. BACKGROUND AND QUALIFICATIONS 4

V. LEGAL STANDARDS 6

- **A.** OBVIOUSNESS 6
- **B.** PRIOR ART 9
- **C.** PRIORITY DATE 9
- **D.** CLAIM CONSTRUCTION 9

VI. PERSON OF ORDINARY SKILL IN THE ART ("POSITA") 10

VII. OVERVIEW OF THE ASSERTED PATENT 12

VIII. CLAIM CONSTRUCTION 15

- **A.** DISPUTED CLAIM TERMS OF THE '117 PATENT 15
  - 1. "DISPLAY PANEL" ('117 PATENT, CLAIM 1) 15
  - 2. "CIRCUIT BOARD MOUNTING PART" ('117 PATENT, CLAIMS 1, 2, 5) 15

IX. BACKGROUND OF THE TECHNOLOGY 17

X. OVERVIEW OF THE ASSERTED ART 19

- **A.** KARPPANEN '116 20
- **B.** TAKAHASHI 23
- **C.** NAGAYAMA 25
- **D.** KANEKO 27

XI. VALIDITY OF THE ASSERTED PATENTS 30

- **A.** GROUND 1: THE CHALLENGED CLAIMS ARE NOT OBVIOUS IN LIGHT OF KARPPANEN '116 IN VIEW OF TAKAHASHI 30
  - 1. NO MOTIVATION TO MODIFY KARPPANEN '116 30

2. THE COMBINATION OF KARPPANEN '116 AND TAKAHASHI DOES NOT TEACH SEPARATE COOLING PATHS AS REQUIRED BY CLAIM ELEMENT 1[F] 33

3. NEITHER KARPPANEN '116 NOR TAKAHASHI DISCLOSE THE "CASE" OF ELEMENT 1[G] OF CLAIM 1 41

4. KARPPANEN '116 IN VIEW OF TAKAHASHI DOES NOT DISCLOSE "WHEREIN THE CASE INCLUDES FRONT AND REAR CASES COUPLED TO EACH OTHER, AND THE REAR CASE INCLUDES A CIRCUIT BOARD MOUNTING PART PROVIDED ON AN OUTER SURFACE OF THE REAR CASE SUCH THAT THE CIRCUIT BOARD IS MOUNTED IN THE CIRCUIT BOARD MOUNTING PART" OF CLAIM 2 51

5. CLAIM 5 55

B. GROUND 2: THE CHALLENGED CLAIMS ARE NOT OBVIOUS IN LIGHT OF NAGAYAMA IN VIEW OF KANEKO 56

1. NO MOTIVATION TO COMBINE NAGAYAMA WITH KANEKO 56

2. NAGAYAMA IN VIEW OF KANEKO DOES NOT DISCLOSE "WHEREIN THE FIRST AND SECOND COOLING FLUID PATHS ARE SEPARATED FROM EACH OTHER" (1[F]) 58

3. NAGAYAMA IN VIEW OF KANEKO DOES NOT DISCLOSE "THE CASE INCLUDES A CIRCUIT BOARD MOUNTING PART PROVIDED ON A REAR SURFACE OF THE CASE AND PARTITIONED FROM A SPACE IN WHICH THE DISPLAY PANEL IS MOUNTED SUCH THAT THE CIRCUIT BOARD IS RECEIVED IN THE CIRCUIT BOARD MOUNTING PART" (1[G]) 61

4. NAGAYAMA DOES NOT DISCLOSE "THE FIRST COOLING FLUID PATH INCLUDES A SPACE BETWEEN A REAR SURFACE OF THE DISPLAY PANEL AND AN INNER SURFACE OF THE CASE, AND THE SECOND COOLING FLUID PATH INCLUDES AN INTERNAL SPACE OF THE CIRCUIT BOARD MOUNTING PART" (1H) 65

5. NAGAYAMA DOES NOT DISCLOSE "WHEREIN THE CASE INCLUDES FRONT AND REAR CASES COUPLED TO EACH OTHER, AND THE REAR CASE INCLUDES A CIRCUIT BOARD MOUNTING PART PROVIDED ON AN OUTER SURFACE OF THE REAR CASE SUCH THAT THE CIRCUIT BOARD IS MOUNTED IN THE CIRCUIT BOARD MOUNTING PART" (CLAIM 2) 67

6. NAGAYAMA IN VIEW OF KANEKO DOES NOT DISCLOSE "WHEREIN THE FIRST COOLING FLUID PATH INCLUDES A SPACE BETWEEN A REAR SURFACE OF THE DISPLAY PANEL AND AN INNER SURFACE OF THE REAR CASE, AND THE SECOND COOLING FLUID PATH INCLUDES AN INTERNAL SPACE OF THE CIRCUIT BOARD MOUNTING PART." (CLAIM 5) 70

XII. CONCLUSION.....71

I. INTRODUCTION

1. I have been retained by counsel for Patent Owner Samsung Electronics Co., Ltd. in the above-captioned proceeding. I understand that Petitioner Manufacturing Resources International, Inc. ("MRI") seeks *Inter Partes* Review (IPR) of claims 1, 2, and 5 (the "Challenged Claims") of U.S. Patent No. RE45,117 ("the '117 patent"). I submit this declaration in support of Patent Owner's Preliminary Response and in response to the opinions of Dr. Carl Meinhart in Ex. 1003.

2. As explained in detail below, it is my opinion that Dr. Meinhart fails to show that any challenged claim is invalid. 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, I have identified at least one limitation that is missing from the prior art cited in the Petition. 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.

3. In connection with providing my opinions, I have also been asked to discuss the technology addressed by the '117 patent and the relevant state of the technical art at the time of the claimed invention.

4. 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

5. None of the Challenged Claims would have been obvious in light of the prior art cited by MRI because each 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

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

Materials Relied Upon
Petition for IPR2023-01201 ("Petition" or "Pet.")
U.S. Patent No. RE45,117 ("'117 patent" or "Ex. 1001")
Prosecution History of U.S. Patent No. RE45,117 and U.S. Patent No. 7,667,964 ("Ex. 1002")

Materials Relied Upon
Declaration of Dr. Carl D. Meinhart ("Ex. 1003")
Curriculum Vitae of Dr. Carl D. Meinhart ("Ex. 1004")
U.S. Pat. No. 6,198,222 to Chang ("Ex. 1005")
U.S. Patent No. 6,104,451 to Matsuoka ("Ex. 1006")
U.S. Pat. No. 4,980,848 to Griffin ("Ex. 1007")
US Pat. No. 7,164,586 to Lin ("Ex. 1008")
WO 2007116116 to Karppanen ("Ex. 1009")
JP 2003075858 to Takahashi ("Ex. 1010")
Certified English Translation of JP 2003075858 to Takahashi ("Ex. 1011")
JP 2006-163217A to Nagayama ("Ex. 1012")
Certified English Translation of JP 2006-163217A to Nagayama ("Ex. 1013")
US Pub. No. 20020014840 to Kaneko ("Ex. 1014")
Willem den Boer, Active Matrix Liquid Crystal Displays: Fundamentals and Applications (2005) ("Ex. 2003")

Materials Relied Upon
Components for Certain Environmentally-Protected LCD Digital Displays and Prods. Containing Same, Inv. No. 337-TA-1349, Order No. 28, 2023 WL 6551036 (Oct. 4, 2023) ("Ex. 2004")
Excerpts from ITC Inv. No. 337-TA-1349 Hearing Transcript ("Ex. 2005")
June 14, 2023 Joint Chart Setting Forth Parties Post Hearing Claim Construction from ITC Inv. No. 337-TA-1349 ("Ex. 2006")

IV. BACKGROUND AND QUALIFICATIONS

7. 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.

8. 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.

9. 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"), a member of the American Vacuum Society, and 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.

10. 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.

11. 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.

12. Based on my education and experience, I consider myself to be an 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

13. 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

14. 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 POSITA at the time of the invention.

15. 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.

16. 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);

Samsung Exhibit 2001, Page 11 of 76
MRI v. Samsung - IPR2023-01201

b. Whether the invention satisfied a long-felt, but unmet 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.

17. I understand that any secondary considerations must have some relationship or nexus to the invention claimed in the patents at issue. I also understand that there is a rebuttable presumption of a nexus to the patent if a commercial product that demonstrates the secondary consideration(s) is an embodiment of the claims.

B. Prior Art

18. I understand that, as a general matter, prior art is comprised of publicly available information that was in the public domain from before the date of invention. I further understand that prior art for purposes of the patents-in-suit is defined by pre-AIA 35 U.S.C. § 102.

19. I understand that prior art may comprise a patent or printed publication in this or a foreign country that was published prior to the date of invention.

C. Priority Date

20. I understand that a patent is entitled to the filing date of an earlier filed U.S. patent application if the later application contains a reference to the first, the two applications are co-pending, and the earlier application provides written description support and enablement for the claims in the later application. I further understand that a patent is entitled to the filing date of an earlier filed foreign patent application if the U.S. patent application contains a reference to the foreign patent application and the foreign application provides written description support and enablement for the claims in the issued patent.

D. Claim Construction

21. I understand that claim terms are generally given their ordinary and customary meaning to a POSITA at the time of the invention.

22. I understand that to determine how a POSITA would have understood disputed claim language, the Board first looks to the "intrinsic evidence," including the words of the claims themselves, the patent specification and the prosecution history. I am further informed that other claims of the patents at issue, both asserted and unasserted, can be valuable sources of information as to the meaning of a claim term. Because terms are normally used consistently throughout the patent, the usage of a term in one claim can illuminate the meaning of the same term in other claims.

23. I understand that "extrinsic evidence," such as my expert testimony and dictionaries, may also be consulted in construing the claim terms, but is less significant than the patent and prosecution history in determining the meaning of claim language.

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

24. I understand that the '117 patent is 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.

25. I have been asked to assume that the relevant date for conducting my analysis is January 8, 2007.

26. 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.

27. 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.

28. I am aware that Petitioner has provided its own definition of a POSITA as a person that would have had the following qualifications: at least a 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.

29. I believe Petitioner'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.

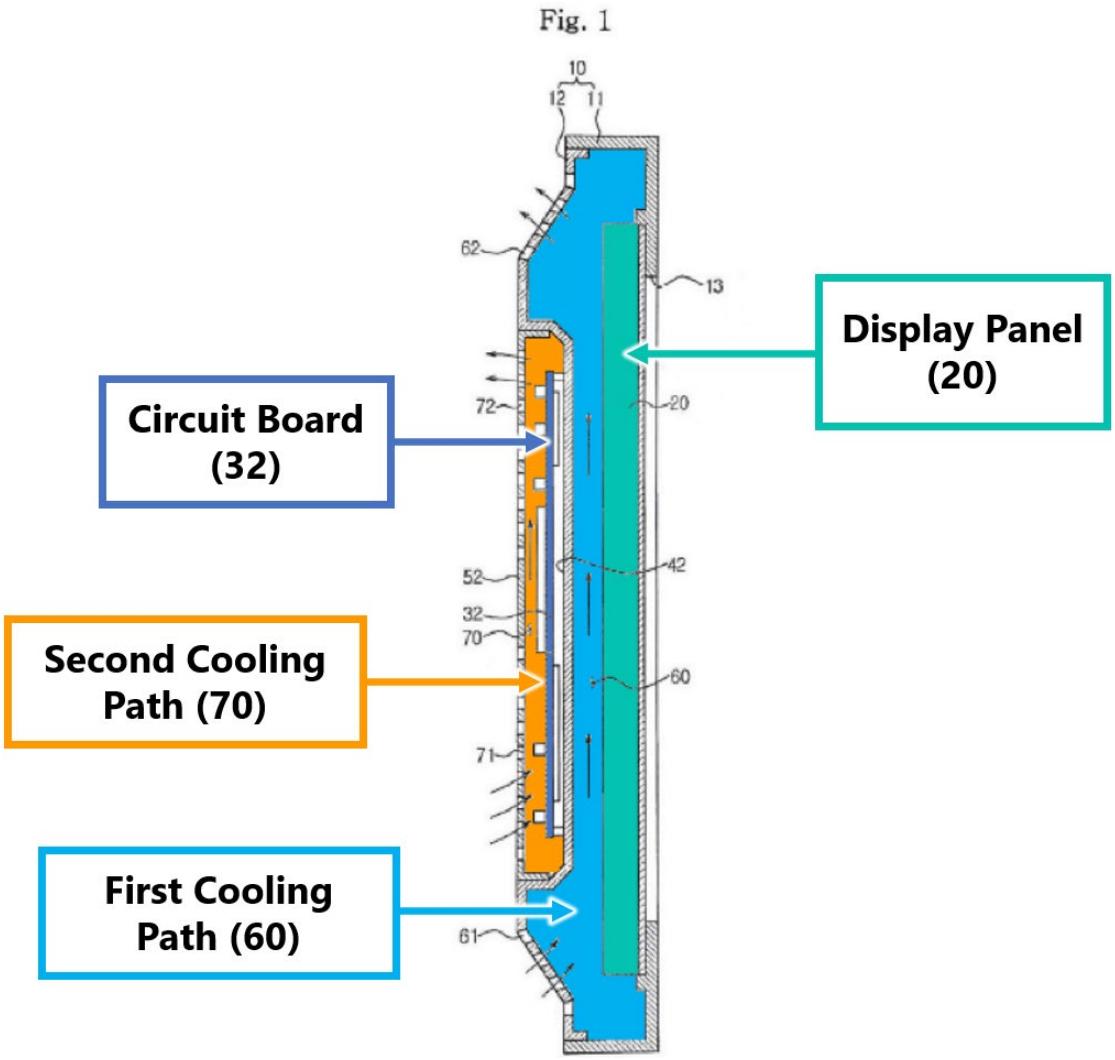
30. Based on my qualifications outlined above, I qualify as at least a POSITA under both parties' definitions, as of the effective filing dates for the Challenged Claims and today.

VII. OVERVIEW OF THE ASSERTED PATENT

31. The '117 patent (Ex. 1001), titled "Panel type display device," issued from U.S. Application Ser. No. 13/403,559 filed on February 23, 2012. I understand that Korean Application No. 10-2007-0002081, which contains a written description of the claims of the '117 patent, was filed on January 8, 2007.

32. The '117 patent relates to a panel type display device with a particular configuration of components that allows for thermal management of the display device. Ex. 1001 ('117 patent) at Abstract. The device may include a liquid crystal display panel or a plasma display panel. *Id.* at 2:62. The display device includes a first cooling path for cooling the display panel and a second cooling path for cooling the circuit board. *Id.* at Abstract. The circuit board(s) are mounted on a rear surface

of the case. *E.g.*, *id.* at claim 1. The first and second cooling paths are separated from each other. *Id.* Figure 1 of the '117 patent, below, shows the first cooling path 60 and the second cooling path 70.



Ex. 1001 ('117 patent) at Fig. 1 (annotated).

33. MRI challenges claims 1, 2, and 5 of the '117 patent. Claims 2 and 5 are dependent claims that depend, directly or indirectly, from claim 1. Claim 1 claims:

1[pre] A panel display device comprising:

1[a] a case;

1[b] a display panel mounted in an interior of the case;

1[c] at least one circuit board which controls the display panel;

1[d] a first cooling fluid path which cools the display panel; and

1[e] a second cooling fluid path which cools the circuit board,

1[f] wherein the first and second cooling fluid paths are separated from each other, and

1[g] wherein the case includes a circuit board mounting part provided on a rear surface of the case and partitioned from a space in which the display panel is mounted such that the circuit board is received in the circuit board mounting part, the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the case, and the second cooling fluid path includes an internal space of the circuit board mounting part.

34. Claim 2 depends on claim 1, includes all elements of claim 1, and further claims "wherein the case includes front and rear cases coupled to each other, and the rear case includes a circuit board mounting part provided on an outer surface of the rear case such that the circuit board is mounted in the circuit board mounting part."

35. Claim 5 depends on claim 2, includes all elements of claims 1 and 2, and further claims "wherein the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the rear case, and the second cooling fluid path includes an internal space of the circuit board mounting part."

Samsung Exhibit 2001, Page 18 of 76
MRI v. Samsung - IPR2023-01201

VIII. CLAIM CONSTRUCTION

36. I am informed and understand that the first step in determining whether a claim is infringed is to determine what the claim language means through the claim construction process.

37. Below, I provide my opinions regarding the proper construction of the "display panel" and "circuit board mounting part" terms of the '117 patent.

38. For all other terms, I have applied the plain and ordinary meaning of the term as it would be commonly understood by one skilled in the art at the time of the invention.

A. Disputed Claim Terms of the '117 Patent

1. "display panel" ('117 patent, claim 1)

39. The term "display panel" appears in Claim 1 of the '117 patent, which is incorporated into Claims 2 and 5 as a result of dependence.

40. While it is my opinion that MRI's proposed construction of "display panel" improperly narrows the scope of the ordinary meaning of that term, the construction of this term does not impact my opinions set forth in this declaration regarding the validity of the challenged claims.

2. "circuit board mounting part" ('117 patent, claims 1, 2, 5)

41. The term "circuit board mounting part" appears in Claims 1, 2, and 5 of the '117 patent.

42. I understand that MRI argues that this term should be construed as functional language under 35 U.S.C. § 112, ¶ 6, and that MRI has set forth specific structure in the specification of the '117 patent for "circuit board mounting part." Petition at 23-25. I also understand that the specification of the '117 patent provides that:

> In FIG. 2, the circuit board mounting parts 41,42 and 43 are recessed from rear to front of the rear case 12. However, the present invention is not limited thereto but may be implemented in Such a manner that circuit boards are mounted to protrude from an outer Surface of a rear case, and respectively covered with covers.

Ex. 1001 ('117 patent) at 3:60-65.

43. I understand that MRI has limited the alleged structure to Column 3, lines 3-12 and 60-65, and the structure illustrated in Figures 1-2 of the '117 patent. *See* Ex. 2006 (Joint Chart Setting Forth Parties Post-Hearing Claim Construction) at 4. I also understand that Samsung has proposed the following function in the event the Court holds this term to be a means-plus-function term: "to provide an area for mounting the circuit board." *Id.* Samsung identifies the following structure in the event this term is held a means-plus-function term: the structure recited in Column 3, lines 3-12 and 60-65, and/or the structures illustrated in Figures 1-2, and equivalents thereof. *Id.* To the extent this term needs construction, Samsung's proposed construction is aligned with how a POSITA would understand the term.

A POSITA would have understood that "part" in "circuit board mounting part" refers to a "portion" or "region" or "area" of the rear case. In the context of the claims, a POSITA would have understood that "circuit board mounting part" would not be a separate component but a location on the rear case. I have reviewed these modified proposed constructions and both parties' supplemental briefing, and they do not affect my analysis below because the primary dispute between the parties' construction is still whether the circuit board mounting part needs to be recessed.

IX. BACKGROUND OF THE TECHNOLOGY

44. 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).

45. 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 (Willem den Boer, Active Matrix Liquid Crystal Displays: Fundamentals and Applications (2005)) at 49.

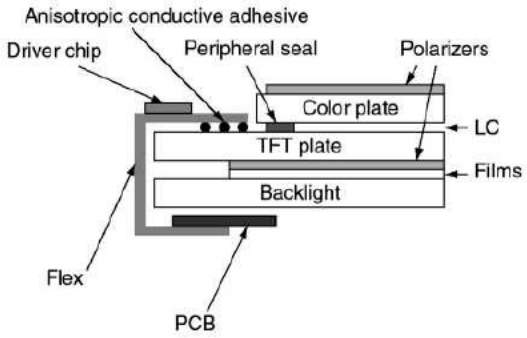


Figure 3.2: Cross section of an edge of a TFT LCD.

Id. at Fig. 3.2.

46. 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:

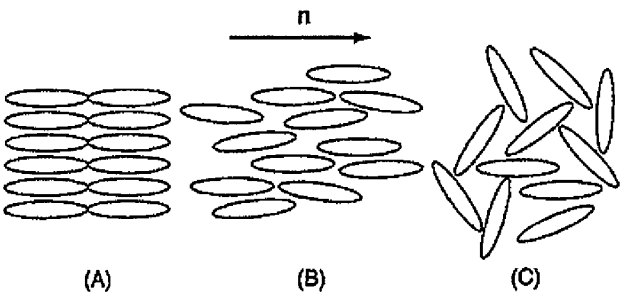


Figure 1.4: Orientation of LC molecules in (A) smectic, (B) nematic, and (C) isotropic phase.

Id. at Fig. 1.4.

47. Due to the temperature sensitivities of the liquid crystal, temperature control is an important feature of any display, but inherently difficult because of the necessarily close proximity of heat generating elements with the devices. Ex. 1009 (Karppanen '116) at 2:24-26 ("present solutions have the problem of temperature control caused by the integration of electronics controlling the display . . .").

48. As the LCD technology developed, there was considerable effort in the field to optimize temperature control in LCD panels. Various temperature control solutions were developed, many of which were targeted to specific applications of the displays. *See, e.g.*, Ex. 1011 (Takahashi) (addressing temperature control issues specific to wall-embedded devices).

X. OVERVIEW OF THE ASSERTED ART

49. The Petition and Meinhart Declaration cite a number of references that MRI alleged are prior art to the Asserted Patents. I address each of those references below.

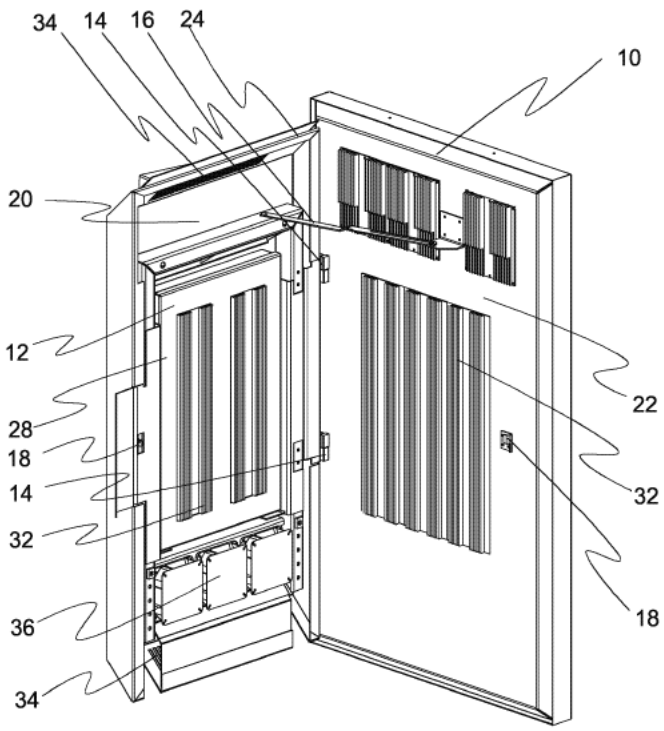
A. Karppanen ’116

50. International Patent Publication No. 2007/116116 A1 (“Karppanen ’116”) (Ex. 1009), was filed as a PCT Application on April 11, 2006, and published on October 18, 2007.

51. Karppanen ’116 relates to an “electronic information board comprising a frame, a flat display element for presenting information and electronic equipment for controlling the display element.” Ex. 1009 (Karppanen ’116) at 1:3-5.

52. As shown below in Figure 1 of Karppanen ’116, “an electronic information board according to the invention is shown as an example, as depicted obliquely from behind. The information board has a closed display casing 10, to the back wall 22 of which a cover 24 opening on hinges 14 has been connected. The cover is trough-shaped, i.e., it has a flat bottom and edges turned to an angle from the plane of the bottom. A closed device casing 12 has been fastened to the bottom of the cover.” *Id.* at 6:16-19.

Samsung Exhibit 2001, Page 24 of 76
MRI v. Samsung - IPR2023-01201



Id. at Fig. 1.

53. Within the display casing is a "display element 26 . . . and the electronic equipment needed in the control of the display element have been placed inside the device casing." *Id.* at 6:21-24. Figure 1 of Karppanen '116 also includes a "closed display casing 10, to the back wall 22 of which a cover 24 opening on hinges 14 has been connected." *Id.* at 6:17-19.

> "In the first edge of the cover 24 pointed downward and the second edge pointed upward there are ventilator slots 34, which enable the movement of air from the outside of the device to the cooling space and from the cooling space back to the outside of the device. When required, the ventilator slots can be provided with filters in order to prevent the access of impurities to the ventilation space."

Id. at 7:16-21. Further,

> "In the cover 24 there are cooling fans 36, by which the circulation of air through the cooling space is regulated. The temperature and speed of flow of the air in the cooling space and thereby the transfer of heat from the cooling elements to the air is thus regulated with an air flow achieved by means of cooling fans."

Id. at 7:21-25.

54. Figure 2 of Karppanen '116, which is a cross-sectional drawing of an electronic information board according to the invention, is shown below:

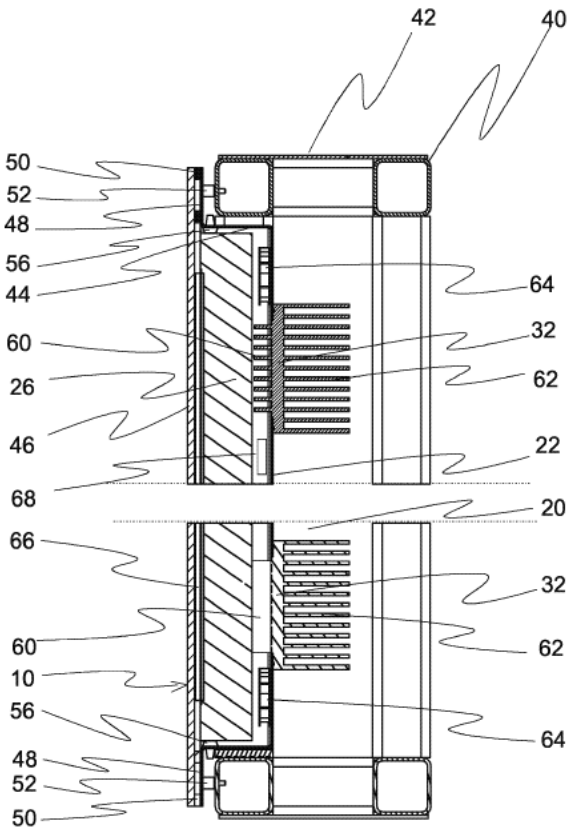


Fig. 2

Id. at Fig. 2.

55. According to Karppanen ’116,

> “[t]he temperature of the display casing is measured by temperature sensors (not shown), and the measurement data is transmitted to a control unit located in the device casing. On the basis of the measurement results, the control unit regulates, according to need, the operation of the cooling fans 68 and the fans 64 in the display casing as well as the operation of the cooling fans 36 in the cooling space for achieving a suitable operating temperature in the display casing.”

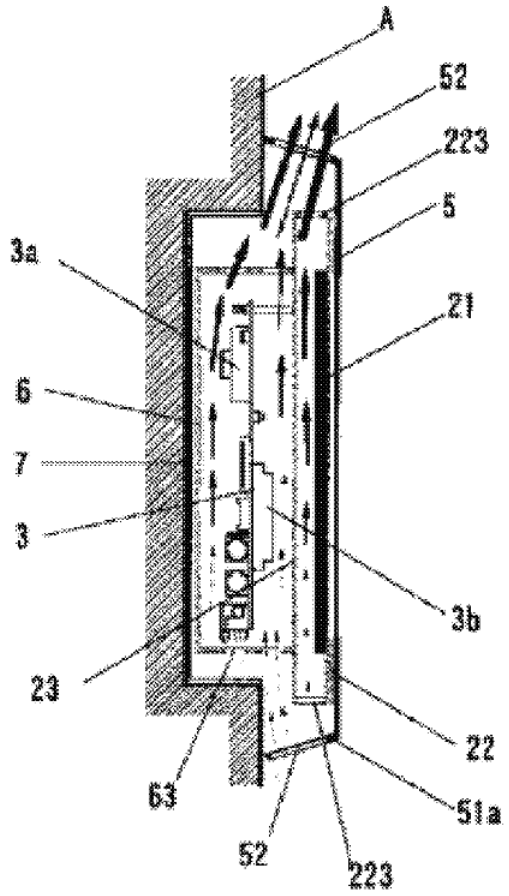
Id. at 9:30-36. Karppanen ’116 also discloses a “control system can be made for controlling the temperatures of the device casing individually, or it can be integrated as a part of the temperature control system of the display casing.” *Id.* at 10:28-30.

B. Takahashi

56. Japanese Patent Publication No. 2003-075858 (“Takahashi”) (Ex. 1010) (translated at Ex. 1011), was filed on August 31, 2001, and published on March 12, 2003.

57. Takahashi relates to “a wall-embedded liquid crystal panel unit that can release heat . . . even in the absence of ventilation on the back side of the mounting surface. Ex. 1011 (Takahashi) at [0007]. Figure 4 of Takahashi provides an overview of the basic structure claimed by the patent application.

[Figure 4]



Id. at Fig. 4.

58. The display device contemplated by Takahashi is protected by a front cover 5, which protrudes outside of mounting surface A (the wall) and has a liquid crystal panel 2 fixed to it. *Id.* at [0015]. At the rear, the panel unit body is configured with a rear cover 6. *Id.*

59. The device also includes a plurality of ventilation openings 52 on the top and bottom for releasing heat generated from the interior components. *Id.* at [0015]. Heat is radiated and dissipated externally from the bottom ventilation

Samsung Exhibit 2001, Page 28 of 76
MRI v. Samsung - IPR2023-01201

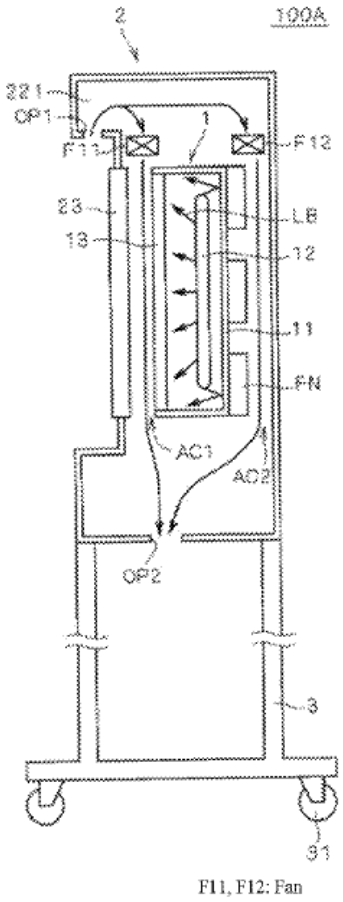
openings 52 through the top ventilation openings 52. *Id.* at [0026]. The ventilation openings are placed in such a manner that they are located on the surface of front cover 5 that is slanted and protruding outwards from the wall in order to more efficiently dissipate heat. *Id.* at Fig. 4.

C. Nagayama

60. Japanese Patent Publication No. 2006-163217A ("Nagayama") (Ex. 1012) (translated at Ex. 1013), was filed on December 10, 2004, and published on June 22, 2006.

61. Nagayama generally relates to "an outdoor display device using a flat panel type display device as a display section." Ex. 1013 (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. *Id.* at [0007]-[0008].

62. 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." *Id.* at [0010]. The device is illustrated, for example, in Figure 3 below:



Id. at Fig. 3.

63. As shown in this figure, 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. *Id.* at [0015]. 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

Samsung Exhibit 2001, Page 30 of 76
MRI v. Samsung - IPR2023-01201

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. *Id.* at [0037]-[0038]. This protects the interior components from damage.

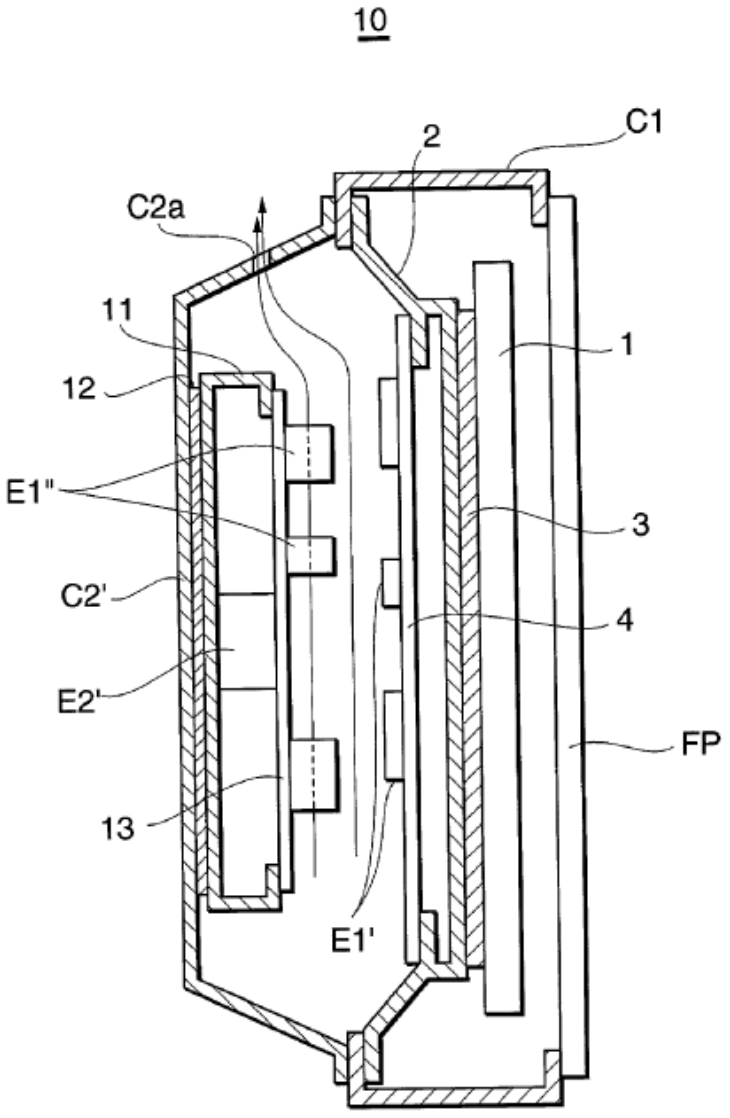
D. Kaneko

64. U.S. Patent Application Publication No. 2002/0014840 A1 ("Kaneko") (Ex. 1014), was filed on June 7, 2001, and published on February 7, 2002.

65. Kaneko relates to "a structure for dissipating heat generated in a drive unit of a plasma display panel (PDP) in a plasma display panel device." Ex. 1014 (Kaneko) at [0002]. Kaneko is directed at problems in conventional PDP devices that result from the excessive heat generated by electronic components that are mounted on one face of a single circuit board which results in insufficient heat dissipation for the electronic components. *Id.* at [0012]-[0013]. The main feature of this invention is a heat-dissipation structure of a PDP that includes a plurality of circuit boards and has electronic components that make up the drive circuit being mounted separately on the plurality of circuit boards. *Id.* at [0015]. This allows for increased space between adjacent electronic components and eliminates conventional need for exhaust fans because the spacing of the components allows for an airflow in order to dissipate heat. *Id.* at [0016]-[0018]. With this structure and the separation of heat-generating and heat-sensitive components, it is possible to place an exhaust hole or something similar above the required circuit board for

collective exhausting for more efficient heat dissipation. *Id.* at [0020]. Figures 1, 2, and 3 below illustrate the layout of this heat dissipation structure and the layout of the components on a circuit board.

FIG.1



Ex. 1014 (Kaneko) at Fig. 1.

FIG.2

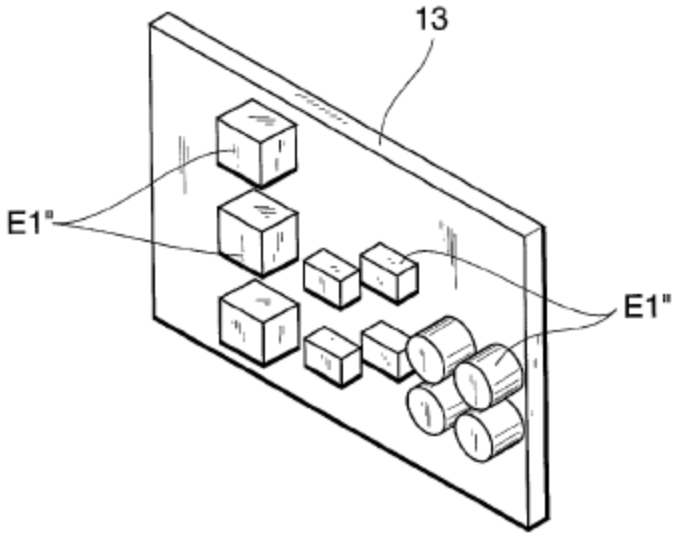
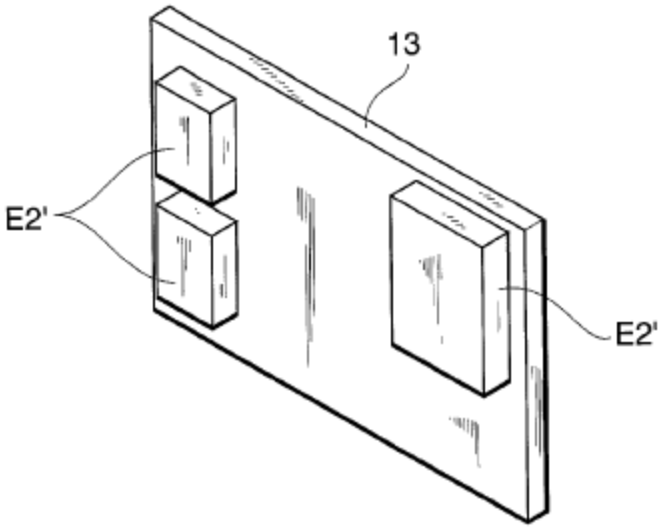


FIG.3



Id. at Figs. 2-3.

Samsung Exhibit 2001, Page 33 of 76
MRI v. Samsung - IPR2023-01201

66. As shown in Figure 1, the PDP device 10 has a circuit board 4 that makes up a drive circuit for driving the PDP 1 that is mounted on a chassis 2. *Id.* at [0052]. The circuit board 4 has mounted on its back face, an electronic component E1' which generates less heat than other electronic components. *Id.* at [0055]. A circuit board 13 is installed on an inner wall face opposing the circuit board 4. *Id.* at [0056]. The front side of circuit board 13 contains components E1" which generate a lot of heat and high heat-generating modules E2' are mounted on the opposite face of circuit board 13 to keep the components separate. *Id.* at [0057]-[0059]. Figures 2 and 3 illustrate the mounting of components on separate sides of the circuit board.

XI. VALIDITY OF THE ASSERTED PATENTS

A. GROUND 1: The Challenged Claims Are Not Obvious in Light of Karppanen ’116 in view of Takahashi

1. No Motivation to Modify Karppanen ’116

67. As a preliminary matter, it is my opinion that a POSITA would not have any motivation to modify Karppanen ’116 at all, let alone modify Karppanen ’116 using Takahashi as Dr. Meinhart has suggested. Dr. Meinhart primarily identifies that all the references generally relate to temperatures inside display devices and does not provide any specific motivations to combine Karppanen ’116 and Takahashi. Ex. 1003 (Meinhart Decl.) at ¶¶ 71-73. To the extent Dr. Meinhart

opines that a person of ordinary skill would have been motivated to combine Karppanen '116 and Takahashi, he is incorrect.

68. Takahashi purports to solve different problems than those faced in Karppanen '116. Takahashi is a wall-embedded display using a single air path and discloses techniques to dissipate heat in a limited space. The issues and challenges that face a wall-embedded display versus a more standard information board are dramatically different, and a POSITA looking to modify Karppanen '116 would not look to Takahashi for assistance. For example, a major concern of a wall-embedded display is that there is less space and not as much air flow as there is no airflow towards the part of the device mounted inside the wall. Ex. 1011 (Takahashi) at [0006]. Karppanen '116 on the other hand does not have as many spatial requirements and does not have to account for this severe lack of natural air flow. For example, Karppanen '116 discloses ventilator slots in the rear of the device, whereas Takahashi is entirely aimed at solving the problem of dissipating heat "even in the absence of ventilation on the back side of the mounting surface." Ex. 1009 (Karppanen '116) at Fig. 1; Ex. 1011 (Takahashi) at [0007]. If the device in Karppanen '116 were embedded into a wall as disclosed by Takahashi, vents would end up being covered, no heat would be discharged, and the device would overheat. A POSITA would not have been motivated to move the ventilation to a portion that

protrudes to the front, as doing so would have increased the size of the display and the non-viewable portion of the display.

69. Dr. Meinhart did not provide many specifics on how Karppanen '116 would be combined with Takahashi. One of the principal teachings of Karppanen '116 is to separate the display and circuit components into different cases so as to keep all elements cool. Ex. 1009 (Karppanen '116) at 3:23-26. Takahashi does not disclose two separate cases on opposite sides of a common cooling space, and a POSITA would not have been motivated to combine them. For example, a POSITA would not have thought to use both direct air flow (as disclosed by Takahashi), with separate display and device casings that exchange heat through heat transfer parts (e.g., heat sinks) to a common cooling space (as disclosed by Karppanen '116). Using heat sinks to transfer heat to a common cooling space would add unnecessary size, components, and complexity to a system that already vented air flowing by each of the components.

70. Similarly, a POSITA would not have wanted to mount the circuit boards to a rear cover and close that space off with a separate device casing (as disclosed by Karppanen '116) if the display were mounted flush to a wall, or metal box mounted flush to a wall, (as disclosed by Takahashi), as having such electrical components (including the power supply, *see* Ex. 1009 (Karppanen '116) at 3:32-34) in a closed off space between a wall and device casing would likely result in

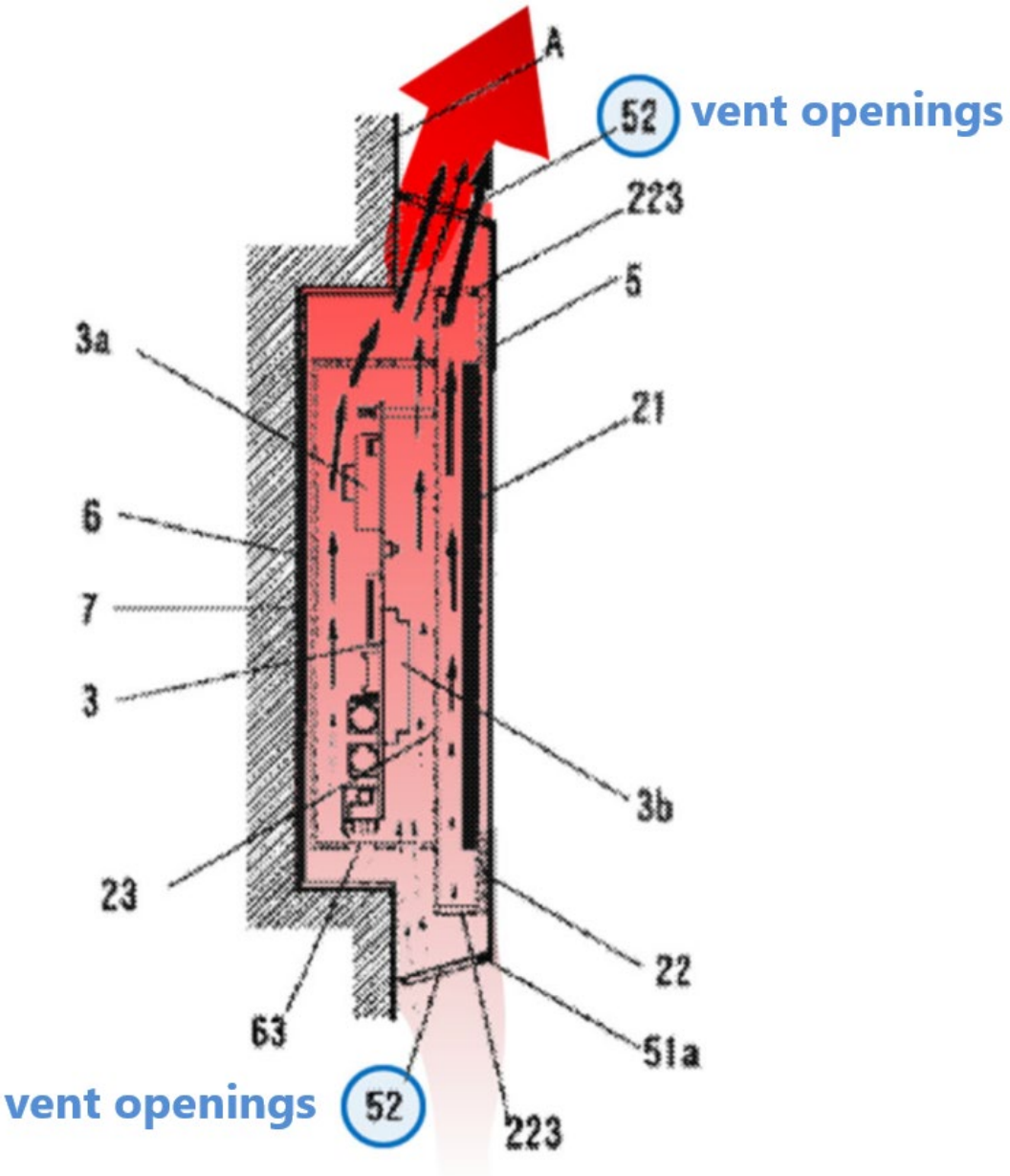
over heating of the device. Moreover, such a combination also would physically conflict. Because the circuit boards are arranged in different locations, the spacers 231 of Takahashi would physically interfere with the device casing of Karppanen '116. Based on the above, a POSITA would not have been motivated to modify, or had a reasonable expectation of success in modifying, Karppanen '116 with the teachings of Takahashi or otherwise combing the references.

71. Additional reasons why Karppanen '116 would not be modified based on or combined with Takahashi are set forth below.

2. The Combination of Karppanen '116 and Takahashi Does Not Teach Separate Cooling Paths as Required by Claim Element 1[f]

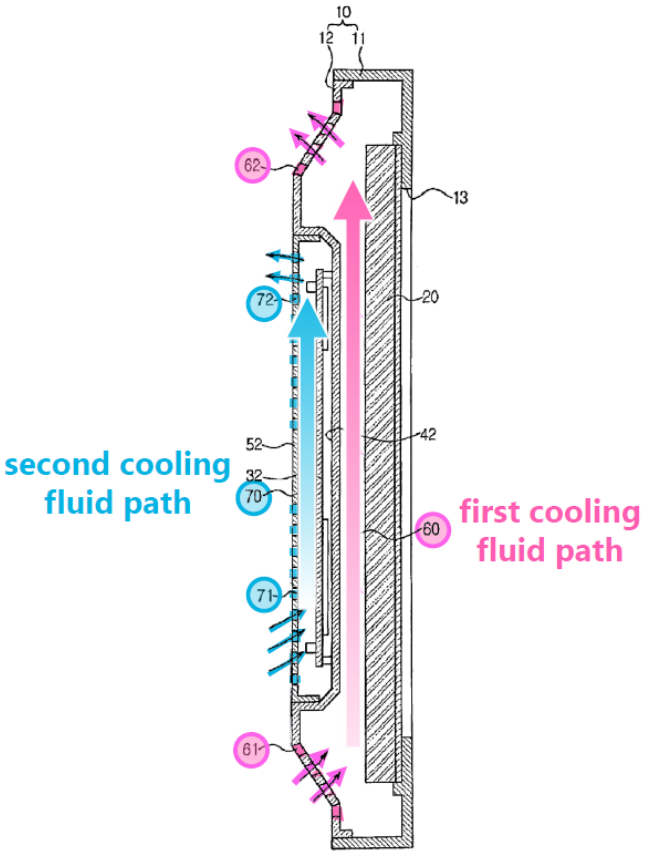
72. Dr. Meinhart alleges that Karppanen '116 discloses the "first and second cooling paths are separated from each other," and simultaneously admits that Karppanen '116 does not "expressly state that the paths are separate." Ex. 1003 (Meinhart Decl.) at ¶¶ 119, 122. The claim requires two cooling paths in one case but Dr. Meinhart's argument relies on two different cases, each having its own cooling path, which is an incorrect read of the claim. Regardless, Dr. Meinhart does not make an argument that it would have been obvious to have separate cooling paths in the device of Karppanen '116 and instead relies on Takahashi for element 1[f].

73. Contrary to Dr. Meinhart's opinions, the rear surface liquid crystal panel cover 23 dividing the interior space of the device in Takahashi does not create two separate cooling paths. *See* Ex. 1003 (Meinhart Decl.) at ¶ 124. The flow of air defines the cooling paths and Takahashi's Figure 4 shows that all the air flows in through the same vent opening, and out through the same vent opening:



Ex. 1011 (Takahashi) at Fig. 4 (annotated). As shown in this figure, all of the air in the device enters through vents 52 at the bottom and exits through vents 52 at the top. *See also*, Ex. 1011 (Takahashi) at [0025]-[0027].

74. To the extent this constitutes first and second cooling paths, which I dispute, such paths are certainly not separated from each other, as required by the claims, as all the air has one shared entry and one shared exit. The '117 patent explains that the claimed cooling fluid paths each have their own entry and exit and do not mix.



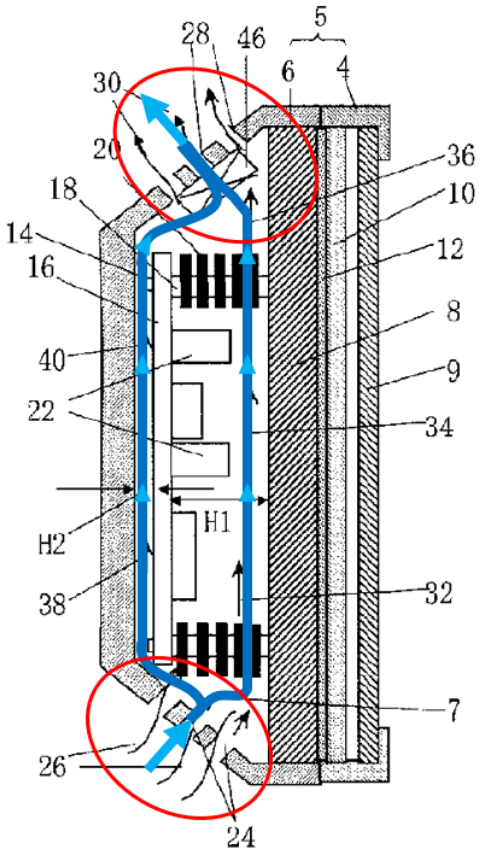
Ex. 1001 (’117 patent) at Fig. 1 (annotated). The specification states that “[a]ir flowing in through the air inlets 61 cools the display panel 20 while rising along the first cooling fluid path 60 and is then exhausted through the upper air outlets 62.” *Id.* at 3:35-38; s*ee also id.* at 3:32-33, 4:12-14 (stating that “the first and second cooling fluid paths 60 and 70[0] are separated from each other”).

75. A POSITA would have appreciated that air within a display carries heat from separate components and if the air mixes, it would effectively create a heat sink inside the display device. This would lead to increases in temperatures throughout the device and would damage the components, including the display panel. Similarly, if the paths are not separated, heat from one air stream could be transferred to another element, increasing the temperature of that element and potentially damaging it.

76. A POSITA would have understood that the disclosures of the ’117 patent were aimed at solving this problem. The ’117 patent explains that in order to efficiently remove heat from the display device, air surrounding the display panel and air surrounding the circuit board would need to be kept separate. The specification explains that the claimed separation of the cooling paths prevents a “phenomenon in which the circuit boards are heated by the heat of the display panel or the display panel is heated by the heat of the circuit boards.” Ex. 1001 (’117 patent) at 4:16-22.

77. Further, the ’117 patent underscores that the separate cooling paths with separate inlets and outlets for each path are critical to the described invention, by distinguishing the disclosed invention from prior art with cooling paths comprising only one inlet and outlet. The ’117 patent cites Japanese Patent Unexamined Publication No. 2006-162641 (“JP ’641”) in the Background of the Invention section. The applicants noted that it is a display device that “includes a case having front and rear cases, a display panel mounted in an interior of the case, and circuit boards mounted in the interior of the case.” Ex. 1001 (’117 patent) at 1:32-51; Ex. 1002 (Prosecution History) at 261-62 (JP ’641 English Abstract), 263-77.

78. As shown in the image below, the display device in JP ’641 purports to include two cooling paths, one which travels along the display panel and one which travels along the circuit board. Air is pulled into the device through a common intake vent and exits through a common exhaust vent. Ex. 1002 (Prosecution History) at 275.



Id. at Fig. 1.

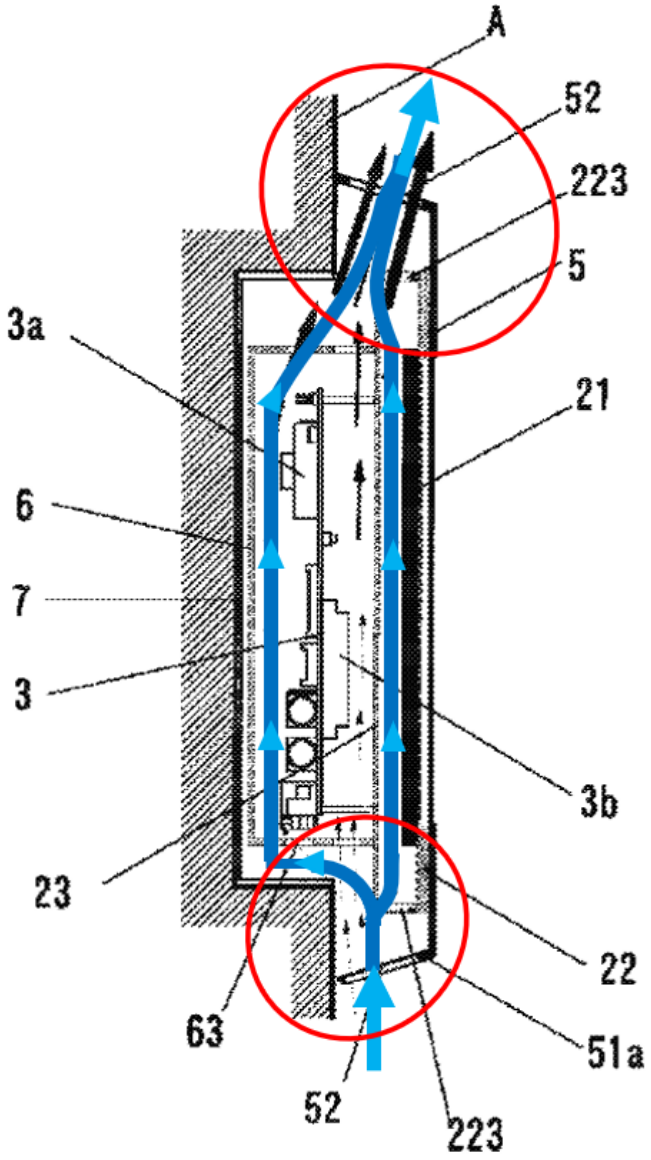
79. The '117 patent states that the type of arrangement described in JP '641 leads to "inter-heating between the display panel and the circuit boards." Ex. 1001 ('117 patent) at 1:45-49. The specification goes on to explicitly state that the claimed invention was "made to address the above-mentioned problems [of JP '641] occurring in the related art." *Id.* at 1:55-59. A POSITA would have understood that this "inter-heating" problem arises in part from the fact that the two cooling paths share the same entrance and exit. Therefore, based on reading the claims with the specification, a POSITA would have understood that the '117 patent is directed to displays in which the first and second cooling fluid do not mix.

80. MRI's reliance on Takahashi, therefore, is misplaced. There are no ***separate*** cooling paths in Takahashi's display since the air still exits through the same vents 52. Indeed, Takahashi even explicitly discloses that the "vent path" extends "through the vent openings 52 in the front cover 5," making clear that what it considers a "path" extends all the way through vents 52. Ex. 1011 (Takahashi) at [0023]; *see also id.* at [0025] ("a vent path that dissipates heat from the vent opening 52"). Air flowing to the circuit boards and liquid crystal panel enters through the same vents 52 at the bottom, and is shared inside the front cover 5. Air also flows through the same space in front cover 5 before exiting through vents 52 at the top. *See also id.* at [0027] ("heat generated in the liquid crystal panel unit through the same vent opening 52 is vented and more efficiently dissipated, so that heat generated in the panel unit is released from the vent opening 52.").

81. Dr. Meinhart attempts to add an additional limitation to the claim by stating that the claims only require the two cooling paths be "separated in the device." Ex. 1003 (Meinhart Decl.) at ¶ 125. However, even under Dr. Meinhart's improper read of the claims, Takahashi does not disclose separate cooling paths. The '117 patent contemplates air flow paths that are separate and do not mix at any point. *See, e.g.*, Ex. 1001 ('117 patent) at Fig. 1, 3:24-55. The '117 patent also explains that the cooling paths are separate at all times, not for just a portion, when it explains that air is discharged through each path. *Id.* at 3:47-55. By contrast,

Samsung Exhibit 2001, Page 43 of 76
MRI v. Samsung - IPR2023-01201

Takahashi only has air that flows in through vents 52 at the bottom and exits through vents 52 at the top, as shown by Figure 4. This necessarily means that the two cooling paths that are identified by Dr. Meinhart (to the extent they constitute two paths at all) leave through the same vents and therefore mix before leaving the device, as shown below. They are not separate.



Ex. 1011 (Takahashi) at Fig. 4 (annotated). Therefore, it is my opinion that Takahashi does not disclose first and second cooling paths that are separated from each other, therefore Karppanen '116 in view of Takahashi also does not disclose this limitation.

3. Neither Karppanen '116 Nor Takahashi Disclose the "Case" of Element 1[g] of Claim 1

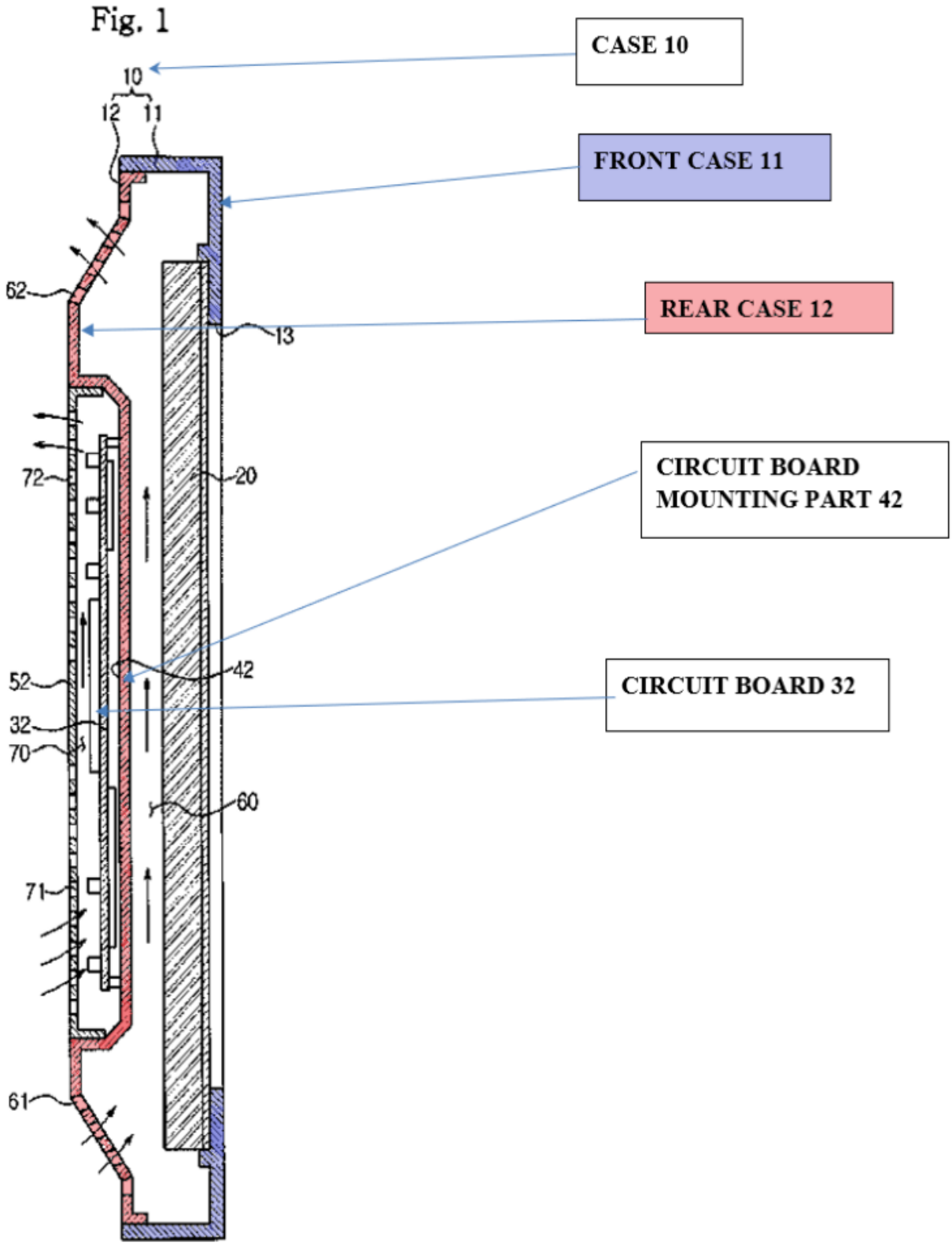
82. Dr. Meinhart alleges that Karppanen '116 "illustrates" a case that "includes a circuit board mounting part provided on a rear surface of the case and partitioned from a space in which the display panel is mounted such that the circuit board is received in the circuit board mounting part, the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the case, and the second cooling fluid path includes an internal space of the circuit board mounting part" (1[g]). Ex. 1003 (Meinhart Decl.) at ¶¶ 129-131. Dr. Meinhart alleges that "Takahashi cures this deficiency." *Id*. at ¶ 132. I disagree on both accounts.

83. To start, Dr. Meinhart's opinion on the elements from Karppanen '116 that correspond to the claimed "case" are inconsistent and unclear. When discussing claim element 1[a], Dr. Meinhart opines that both the display case 10 and the device case 12 can be the "case." Ex. 1003 (Meinhart Decl.) at ¶ 87. However, Dr. Meinhart focuses only on display case 10 when discussing his opinions on claim element 1[b], "a display panel mounted on an interior of the case." *Id.* at ¶¶ 91-92.

Dr. Meinhart then also opines that the device case 12 that allegedly meets the "case" limitation is instead the circuit board mounting part in claim element 1[g]. *Id.* at ¶¶ 129-131. It is therefore not readily apparent which structure(s) in Karppanen '116 teach the "case" element of 1[g].

84. To the extent Dr. Meinhart's opinion is that display case 10 is the "case" claimed in element 1[g], Dr. Meinhart is mistaken. Display case 10 does not meet every element of 1[g]. At a basic level, display case 10 does not include a circuit board mounting part provided on a rear surface of the case, as required by claim 1.

85. A POSITA reading the '117 patent would have understood that element 1[g] requires that parts of the case have circuit boards mounted to the case's rear surface. This is depicted in Figure 1 of the '117 patent:



Ex. 1001 ('117 patent) at Fig. 1 (annotated).

86. Karppanen ’116’s display case 10 does not have any circuit boards mounted to its rear surface, nor does it have a circuit board mounted part provided on its rear surface. To the contrary, Karppanen ’116 discloses that circuit boards are to be provided on the other side of the unit, in the completely different device case 12, and the circuit boards are set off by a common cooling space. *See, e.g.* Ex. 1009 (Karppanen ’116) at 6:21-24 (“The 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.”); 3:36-37 (“. . .there is a common cooling space between the display casing and the device casing,”); 7:9-10 (“In the closed position, there remains a cooling space 20 between the display casing and the device casing . . . .”). This is illustrated, for example, in Figure 2 of Karppanen ’116.

Samsung Exhibit 2001, Page 48 of 76
MRI v. Samsung - IPR2023-01201

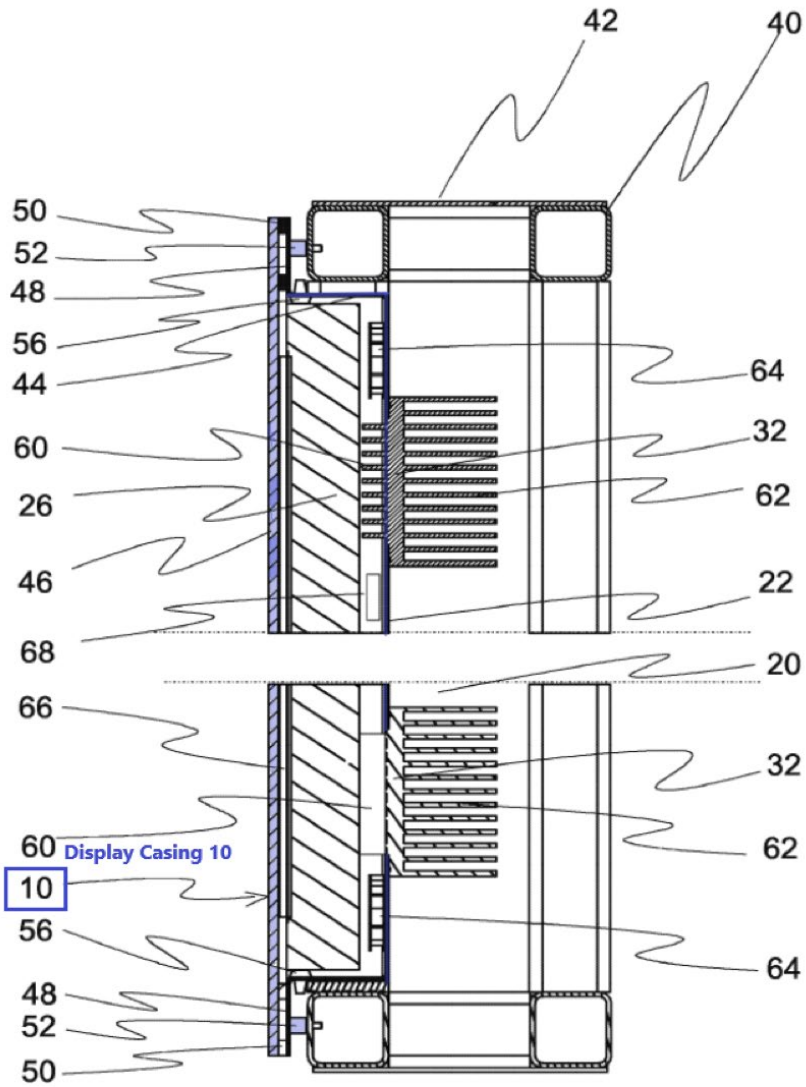
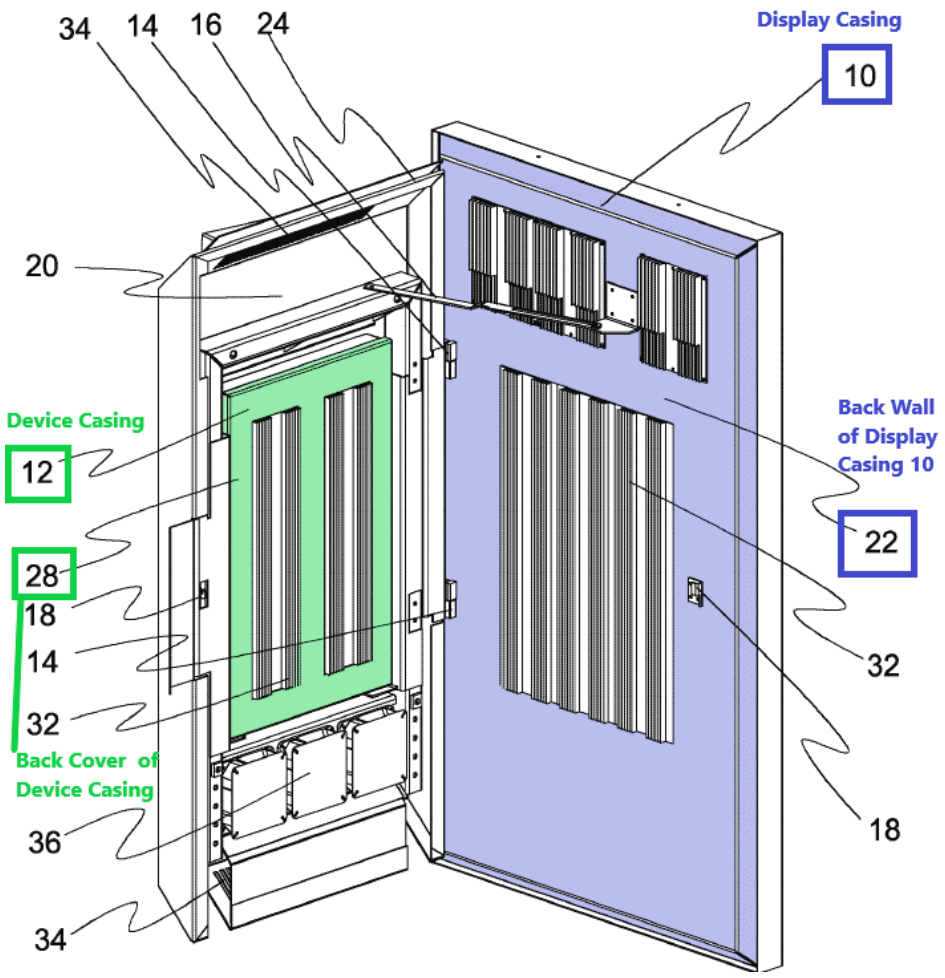


Fig. 2

Ex. 1009 (Karppanen '116) at Fig. 2 (annotated). As seen here, there are no circuit boards mounted to the rear surface of the display case.

87. Moreover, Karppanen '116 discloses that "cooling elements" or "heat transfer parts" are positioned in the back of the display casing. This is shown, for example, in Figure 1.

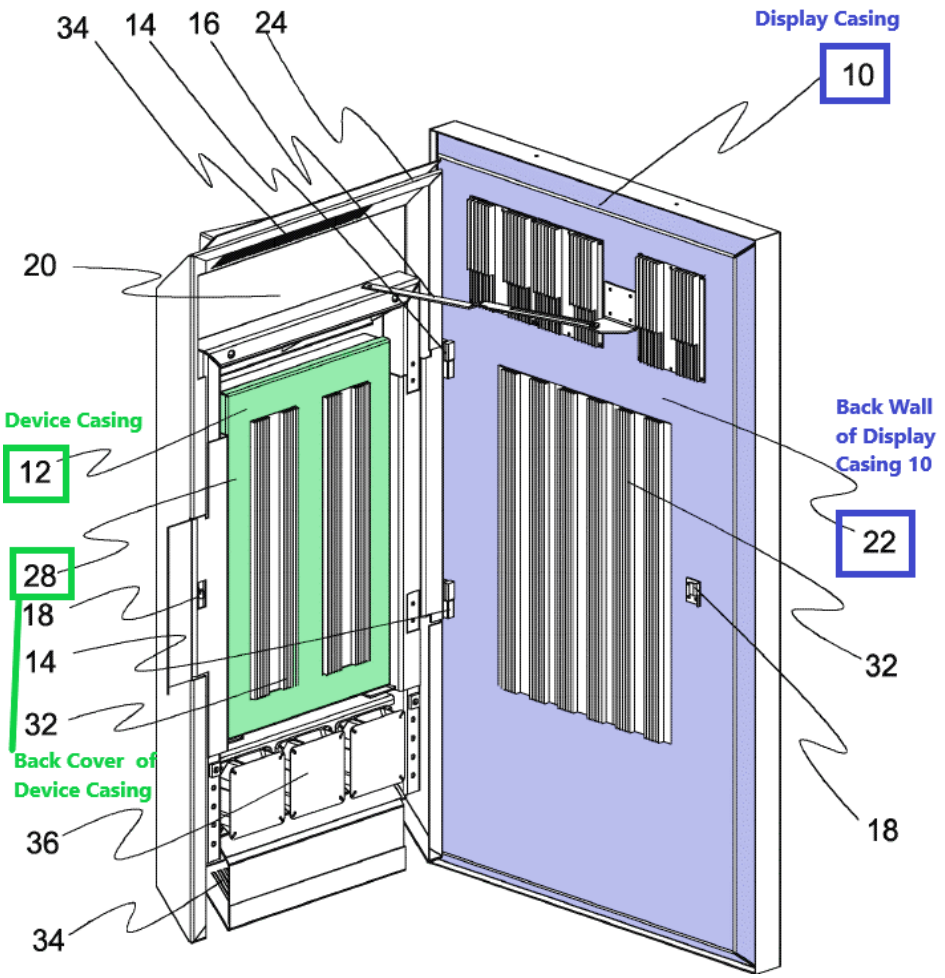


Ex. 1009 (Karppanen '116) at Fig. 1 (annotated).

88. Specifically, Karppanen '116 states that "the basic idea of the invention is that the display element and the electronics required for controlling the display are located separately from each other for facilitating the arrangements for temperature control and cooling of the information board." Ex. 1009 (Karppanen '116) at 3:23-26. Mounting circuit boards over the cooling elements and heat transfer parts (e.g., heat sinks) would transfer heat between the circuit boards and display panel, which is counter to the stated goals of Karppanen '116.

89. In sum, a POSITA would have understood from these disclosures in Karppanen '116 that circuit boards are not mounted to the rear surface of the display casing 10, and thus there is no case with a circuit board mounting part proved on the rear surface of the case.

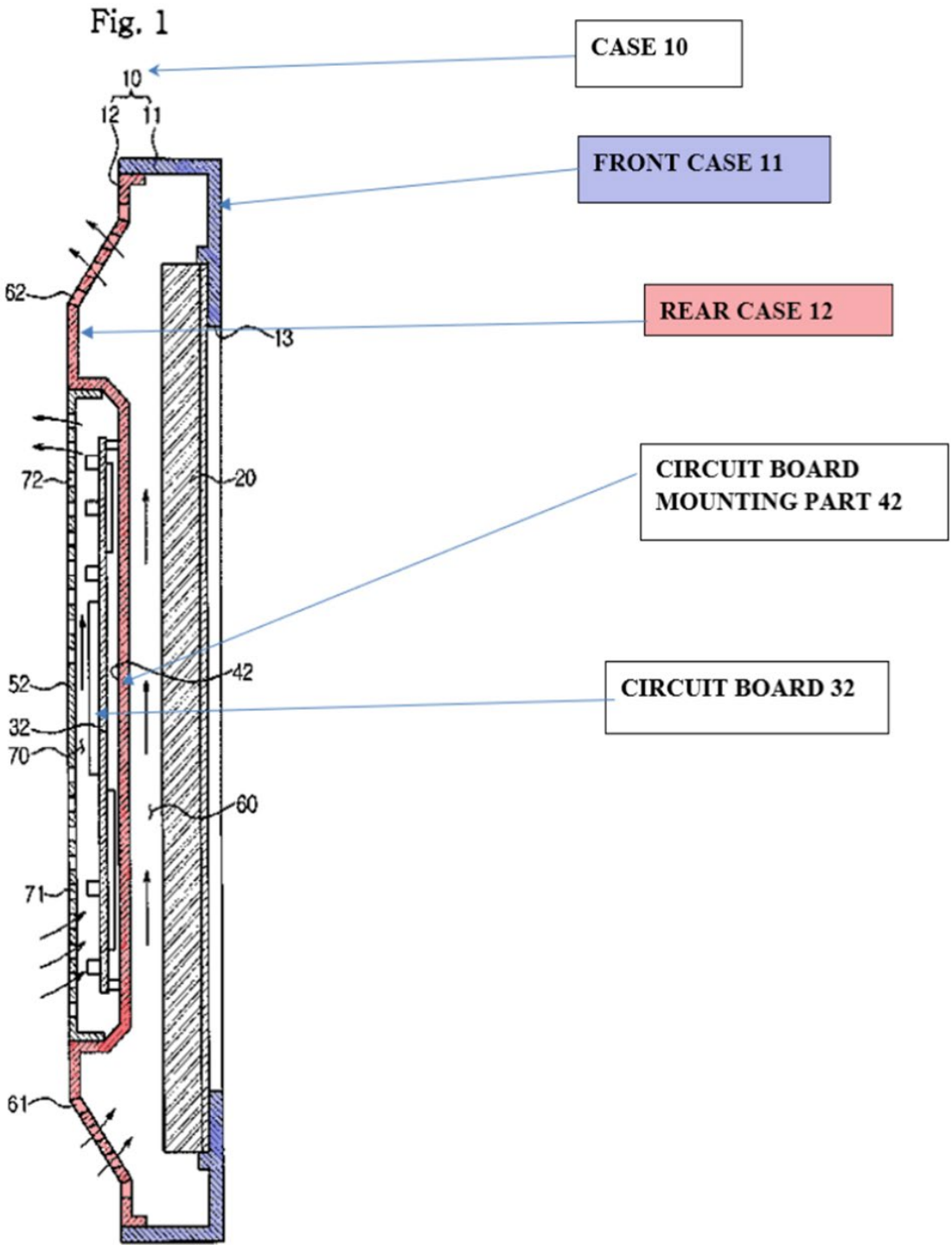
90. Dr. Meinhart's opinions are wrong for other reasons too. For example, Dr. Meinhart's opinion that the device case 12 is the claimed circuit board mounting part provided on the rear surface of the case because device case 12 is "attached to the rear surface (back wall 22) of display case 10 using hinges 14 and locking means 18" also incorrect. Ex. 1003 (Meinhart Decl.) at ¶ 130. Karppanen '116's device case 12 is not a part of the display case 10, let alone a "rear surface" of the display case 10. This can be seen below in Figure 1 of Karppanen '116.



Ex. 1009 (Karppanen '116) at Fig. 1 (annotated).

91. Dr. Meinhart's opinions here effectively require a rewriting of the claim. Claim 1 recites "the case ***includes*** a circuit board mounting part provided ***on a rear surface of the case.***" The plain meaning of the claim requires the circuit board mounting part to be a ***part*** of the claimed case itself, not just a separate compartment or component that can be attached to the rear surface of the case like Karppanen '116's device case 12. The specification supports this read as well, as it illustrates the circuit board mounting part 42 as part of the rear surface of the case.

92.



Ex. 1001 ('117 patent) at Fig. 1 (annotated); *see also, e.g. id.* at 2:58-61, 3:3-23.

93. Karppanen '116's device case 12 is not a part of display case 10 as evidenced by requiring hinges and locking mechanisms to attach device case 12 to

display case 10, nor is it provided on the rear surface of display case 10. Ex. 1003 (Meinhart Decl.) at ¶ 130; Ex. 1009 (Karppanen '116) at 6:21-24. For the same reason, device case 12 is also not provided on the rear surface of display case 10, as required by the claims. Dr. Meinhart effectively reads the claim as: "wherein the ~~case~~ **device** includes a circuit board mounting part ~~provided on~~ **coupled to** a rear surface of the case," which is contrary to a POSITA's interpretation.

94. Dr. Meinhart admits that under MRI's construction of "circuit board mounting part," which requires the circuit board to be recessed or otherwise adhering to the structure in Ex. 1001 ('117 patent) at 3:3-65, Karppanen '116 does not explicitly teach this limitation. Ex. 1003 (Meinhart Decl.) at ¶ 132. Instead Dr. Meinhart relies on Takahashi. *Id.*

95. Despite claiming that Takahashi cures this deficiency, Dr. Meinhart does not specifically point to a structure in Takahashi that corresponds to the claimed circuit board mounting part and merely cites to figures without annotations and a quote from Takahashi discussing the "partition within the panel unit body." *Id.* at ¶ 133. Dr. Meinhart's approach fails for this reason alone.

96. To the extent Dr. Meinhart has adequately identified a "case" as claimed in claim 1, a POSITA would not have been motivated to combine Karppanen '116 with Takahashi as described in further detail below.

4. Karppanen ’116 in view of Takahashi does not disclose “wherein the case includes front and rear cases coupled to each other, and the rear case includes a circuit board mounting part provided on an outer surface of the rear case such that the circuit board is mounted in the circuit board mounting part” of Claim 2

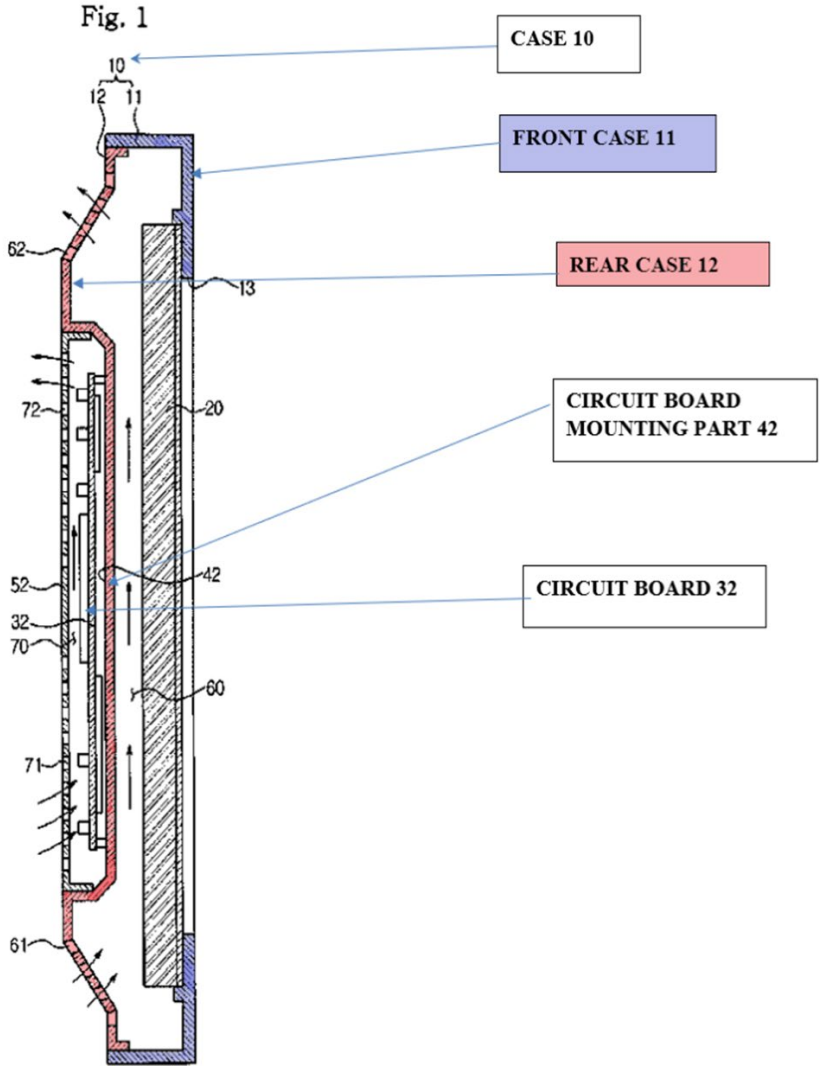
97. Karppanen ’116 does not disclose or teach “the rear case includes a circuit board mounting part provided on an outer surface of the rear case such that the circuit board is mounted in the circuit board mounting part.”

98. As an initial matter, Dr. Meinhart’s inconsistent position on “case” from claim 1 makes his opinions on claim 2 illogical and incorrect. Dr. Meinhart suggests that the “case” now includes both the front display casing 10 and the device casing 12 disclosed by Karppanen ’116 and that these two cases are coupled together by hinges 14 and locking means 18. Ex. 1003 (Meinhart Decl.) at ¶¶ 145-146. Dr. Meinhart describes that Karppanen ’116’s device case 12 and display case 10 are turned against each other in a closed position. *Id.* at ¶ 145. Dr. Meinhart then explains that device case 12 has a back cover 28 and that this back cover constitutes an “outer surface of the rear case. *Id.* at ¶¶ 149-150. Further, Dr. Meinhart equates Karppanen ’116’s “electronics” inside device case 12 to the circuit board in the claims. *Id.* at ¶ 151.

99. As explained above, “the case” identified by Dr. Meinhart with regard to claim 1 is display casing 10. *See* ¶ 83, *supra*. This display casing is the case that, with regard to claim 1, he contends the display element is mounted in, and the case

whose rear surface attaches to the device casing. A POSITA would also understand that display case 10 to be the closest equivalent of the "case" in the '117 patent as it encloses the display. So, for the purposes of claim 2, the "case" should only be display case 10. This is shown by claim 2, which depends from claim 1, and refers to claim 1's case by reciting "wherein ***the*** case . . . ."

100. Indeed, the '117 patent explains and illustrates how the entire case of claim 1 can be made up of a front case and rear case coupled together.



Ex. 1001 ('117 patent), Fig. 1 (annotated); *see also, e.g. id.* at 2:58-61 ("The case 10 includes a front case 11 coupled to the display panel 20 at a front thereof and having an opening 13 formed at a screen portion, and a rear case 12 of which an edge portion is coupled to the front case 11 at a rear of the display panel 20.").

101. Dr. Meinhart's identification of display casing 10 as the case claimed by claim 1, and subsequent identification of the device case as a "rear case" of claim 2, is incorrect because the device casing is not included in the display casing as required by the claim. Ex. 1001 ('117 patent), claim 2 ("wherein the case includes front and rear cases coupled to each other"). Once again, Dr. Meinhart appears to be rewriting the claims from "wherein the case includes front and rear cases coupled to each other" to "wherein the ~~**case**~~ **device** includes **a** ~~**front and**~~ rear case~~**s**~~ coupled to ~~**each other**~~ **the case**."

102. A proper application of the claim language to Dr. Meinhart's alleged case (the display case), might be that the display case includes a front plate 46 and back wall 22 coupled together with edge parts 44 and fastening parts. *See, e.g.*, Ex. 1009 (Karppanen '116) at 7:31-34. But as explained above with regard to claim 1, the back wall 22 of the display casing 10 does not have any circuit boards mounted to its rear (or outer) surface, and thus does not include a circuit board mounting part provided on its rear (or outer) surface.

103. Also as explained above with regard to claim 1, to the extent Dr. Meinhart can contend that Karppanen '116's device casing is the rear case, he still provides no explanation for why circuit boards would be mounted to the outer surface of cover 28. As I explained above, a POSITA would not have understood Karppanen '116 to disclose such an arrangement, but rather the opposite arrangement where circuit boards are mounted to the inner surface of cover 24, which Dr. Meinhart opines is ***not*** part of the device case at all. Ex. 1003 (Meinhart Decl.) at ¶150 ("cover 24 is not part of the device case, but is a separate cover for it").

104. Dr. Meinhart also admits that Karppanen '116 does not expressly disclose this limitation and that Takahashi is required to remedy this deficiency. *Id.* at ¶ 152. However, Dr. Meinhart's position on "case" from Takahashi is equally inconsistent. In his analysis of claim 1, Dr. Meinhart did not specifically identify any case nor did he identify a circuit board mounting part that is included as a part of the case. *Id.* at ¶ 133. Additionally, as explained above, a POSITA would not have been motivated to combine Karppanen '116 with Takahashi.

105. For these reasons, it is my opinion that Karppanen '116 in view of Takahashi does not disclose Claim 2 of the '117 patent.

5. Claim 5

106. It is my opinion that Karppanen '116 fails to teach or suggest all the limitations of claim 5 for the same reasons as provided with respect to claims 1-2. Moreover, Karppanen '116 also does not disclose or render obvious "wherein the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the rear case, and the second cooling fluid path includes an internal space of the circuit board mounting part" as required in claim 5.

107. I disagree with Dr. Meinhart's opinion that Karppanen '116 discloses "wherein the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the rear case, and the second cooling fluid path includes an internal space of the circuit board mounting part."

108. For this limitation, Dr. Meinhart reiterates his arguments from limitations in claims 1 and 2 and suggests that the first cooling path is the space between the rear surface of display element 26 and inner surface of the cover 28 of the device case 12, wherein the device case 12 is the rear case and the front case is the display case 10. Ex. 1003 (Meinhart Decl.) at ¶¶ 158-160. Dr. Meinhart then claims that the second cooling fluid path is inside device casing 12. *Id.* at ¶¶ 158-59.

109. As I explained above with regard to claims 1-2, Karppanen '116 does not disclose a circuit board mounting part provided on rear surface of the case (or

the outer surface of the rear case), and thus does not disclose the claimed cooling fluid paths. Dr. Meinhart does not opine that Takahashi discloses the additional elements of claim 5, therefore Karppanen '116 in view of Takashi does not disclose Claim 5 of the '117 patent.

B. GROUND 2: The Challenged Claims Are Not Obvious in Light of Nagayama in View of Kaneko

110. Dr. Meinhart opines that Nagayama in combination with Kaneko renders obvious claims 1, 2, and 5 of the '117 patent. For the reasons provided below, I disagree.

1. No Motivation to Combine Nagayama with Kaneko

111. I disagree with Dr. Meinhart's opinion that a POSITA would have been motivated to combine Nagayama with Kaneko. A POSITA would not have been motivated to combine Nagayama with Kaneko because these inventions are unrelated, having different objectives. Kaneko is related to a specific structure for only dissipating heat generated in a drive unit of a plasma display panel whereas Nagayama relates to cooling and mitigating temperature increases from the display panel and protecting outdoor displays. The device box in Nagayama contains a housing 11 that houses the backlight 12, a drive circuit and other electronic components of the liquid crystal panel. Ex. 1013 (Nagayama) at [0015]. This housing is sealed with "packings, fillers, etc. so that there is no gap." *Id.* at [0037]. Additionally, there can be "a support structure with cushioning material sandwiched

between the housing . . . and the inner wall of the device box 2" in order to protect the display and its components. *Id.* at [0038].

112. Modifying Nagayama's structure to incorporate the heat dissipation elements taught by Kaneko would not make sense physically and would be counter to the objectives of Nagayama. Kaneko teaches separating the heat generating components and the heat sensitive components onto multiple circuit boards and then placing an exhaust hole or exhaust fan above the circuit boards. Ex. 1014 (Kaneko) at ¶¶ [0015]-[0020]. Modifying Nagayama based on Kaneko would explicitly contradict Nagayama's objective of protecting the liquid crystal panel and backlight from dust in the air, which causes reduced illumination from the backlight, by completely sealing the housing and leaving no gaps. *See* Ex. 1013 (Nagayama) at ¶ [0037] ("In this case, direct air cooling such as blowing wind on the back surface of the liquid crystal panel 13 or blowing wind on the backlight 12 is not employed because static electricity induced by the backlight 12, etc. makes it easier for dust in the air to adsorb to the fluorescent light, and reduces the illuminance of the backlight 12. . ."). Adding these holes or fans could also potentially damage the device in Nagayama. Further, using multiple circuit boards as taught by Kaneko would only result in taking up more space and more components to protect.

113. Additionally, Kaneko on its own does not disclose many of the main features claimed in the '117 patent. Kaneko does not include a first cooling path as

there is no space behind the PDP 1 for air to flow. Kaneko also does not disclose a second cooling fluid path that includes an internal space of the circuit board mounting part. Instead, as seen in Figures 1, 4, and 6, Kaneko allows air to flow between circuit boards, and not an internal space created by a circuit board mounting part.

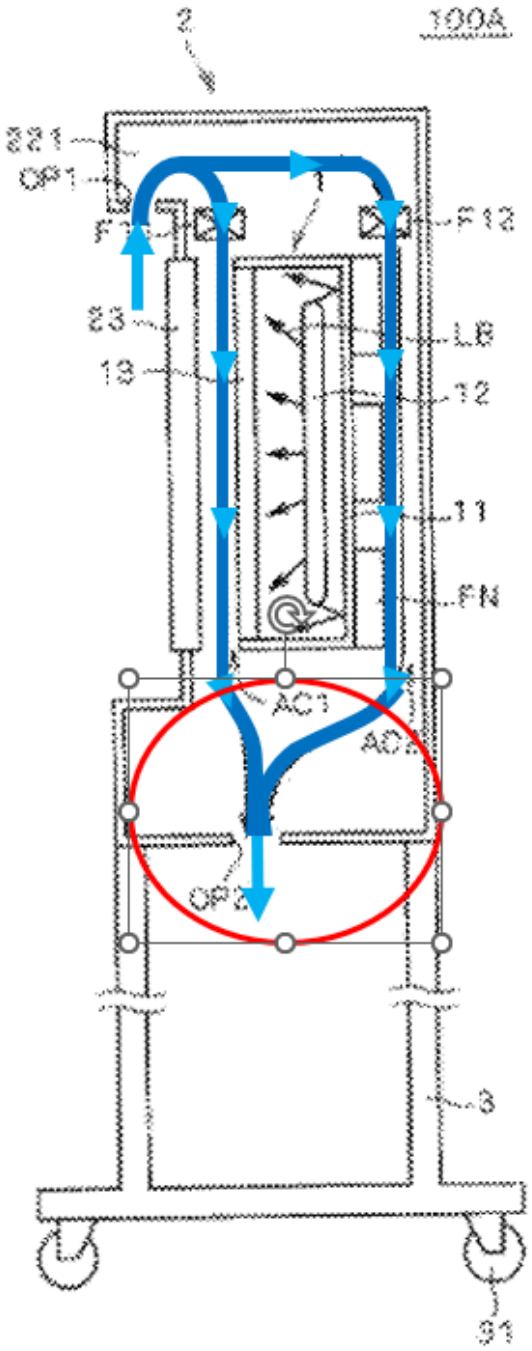
114. A POSITA would not look to Kaneko when attempting to modify Nagayama and as such, there would have been no motivation to combine the two references.

2. Nagayama in view of Kaneko does not disclose "wherein the first and second cooling fluid paths are separated from each other" (1[f])

115. Dr. Meinhart opines that Nagayama (and thus Nagayama in view of Kaneko) discloses "wherein the first and second cooling fluid paths are separated from each other." I disagree. As explained below, Nagayama does not disclose this limitation. Moreover, Dr. Meinhart does not rely on an any aspects of Kaneko in his analysis of this limitation.

116. According to Dr. Meinhart, Nagayama's design includes two cooling fluid paths as illustrated in Figure 3. Ex. 1003 (Meinhart Decl.) at ¶ 203. Dr. Meinhart identifies AC1 as the first cooling fluid path and AC2 as the second cooling fluid path. *Id*. I disagree with this interpretation of Nagayama. As shown

in Figure 3, both AC1 and AC2 include air flow that enters through opening OP1, and mixes together before being exhausted at opening OP2.



Ex. 1013 (Nagayama) at Fig. 3.

117. A POSITA would have understood that AC1 and AC2, to the extent they even constitute two cooling fluid paths, are not separated from each other. As explained above, the '117 patent should be understood to be directed to display devices with two fluid cooling paths that do not mix. *See* Section XI.A.2, above. Dr. Meinhart, in his proposed combination of Karppanen '116 and Takahashi, alleged that the air flow paths need only be separate inside the device. *See* Ex. 1003 (Meinhart Decl.) at ¶ 125. However, even when applying Dr. Meinhart's own self-serving read of the claim, Nagayama does not disclose separate cooling paths. Paths AC1 and AC2 clearly mix at OP1 before entering the alleged separate paths and then mix again before exiting the device through the single outlet OP2. Ex. 1013 (Nagayama) at Fig. 3.

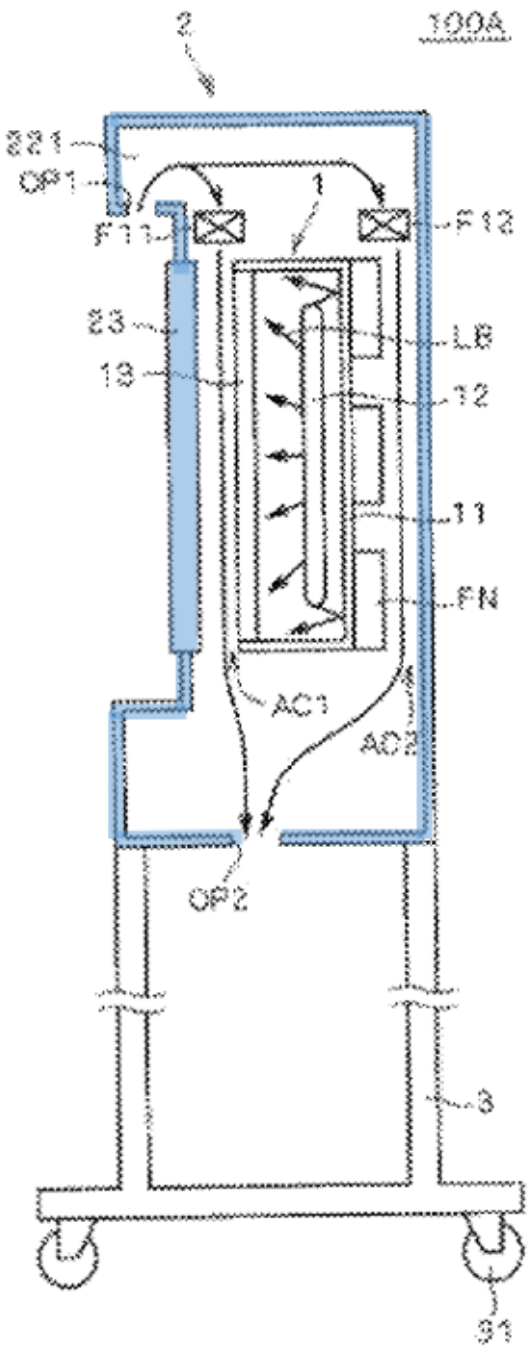
118. Dr. Meinhart also opines that a POSITA would have been motivated to modify Nagayama to include separate cooling paths. Ex. 1003 (Meinhart Decl.) at ¶ 205. However Dr. Meinhart does not explain why it would be obvious to modify Nagayama and instead recites very high level and unspecific language about a POSITA having a reasonable expectation of success. *Id.*

119. Because Dr. Meinhart has not identified any separate cooling paths in Nagayama (or the combination of Nagayama with Kaneko), it is my opinion that Dr. Meinhart's proposed combination does not disclose this limitation.

3. Nagayama in view of Kaneko does not disclose "the case includes a circuit board mounting part provided on a rear surface of the case and partitioned from a space in which the display panel is mounted such that the circuit board is received in the circuit board mounting part" (1[g])

120. Dr. Meinhart opines that this limitation of claim 1 is disclosed by the combination of Nagayama in view of Kaneko. Ex. 1003 (Meinhart Decl.) at ¶ 208. For a number of reasons set forth below, I disagree.

121. As with my earlier analysis of Karppanen '116 and Takahashi, the analysis of this claim limitation starts with the claimed "case." In his report, Dr. Meinhart is inconsistent regarding what he identifies as the case. Regarding element 1[a], Dr. Meinhart alleges that Nagayama's device box (2) is the claimed case. *Id.* at ¶ 173. Based on this interpretation, Nagayama cannot disclose element 1[g] because Nagayama discloses that the drive circuits are located in the housing, not on the rear surface of the device box (2). Ex. 1013 (Nagayama) at Figs. 3-6, ¶ [0037]. This automatically disqualifies the circuit board from being mounted on a "rear surface of the case" as the back wall of the housing is not a rear surface of the case.



Ex. 1013 (Nagayama) at Fig. 3 (device box 2 highlighted in blue).

122. As with Karppanen '116 and Takahashi, there are no circuit boards mounted to the rear surface of Nagayama's device box (2) (the alleged "case") and thus the case does not include a circuit board mounting part provided on the rear

Samsung Exhibit 2001, Page 66 of 76
MRI v. Samsung - IPR2023-01201

surface of the case, or cooling paths that include internal space of the circuit board mounting part, all required by the claim. This alone is fatal to Dr. Meinhart's opinion and Dr. Meinhart admits as much by stating "Nagayama does not explicitly disclose a circuit board mounting part" and instead Dr. Meinhart relies on Kaneko. Ex. 1003 (Meinhart Decl.) at ¶ 210. However, Dr. Meinhart provides no explanation as to how Nagayama and Kaneko would have been combined to have circuit board mounting part included on the rear surface of device box 2. Additionally, Dr. Meinhart suggests a POSITA would have been motivated to combine Nagayama and Kaneko to save space but there are no apparent space savings from this combination. Even if Dr. Meinhart used the housing 11 as the "case" for the purposes of this claim, mounting a circuit board on a rear surface of the case would not change the size of the display or the housing. It would only cause structural problems of the circuit board protruding into the alleged cooling path as discussed below.

123. To the extent MRI's proposed construction for "circuit board mounting part" is adopted, any circuit board mounting part identified by Dr. Meinhart is not recessed. To the extent Dr. Meinhart contends that it would be obvious to have a recessed circuit board mounting part, I also disagree. With the layout disclosed by Nagayama, recessing the circuit boards would not provide any added benefit and would instead provide problems, as the recess would require a portion of the housing

Samsung Exhibit 2001, Page 67 of 76
MRI v. Samsung - IPR2023-01201

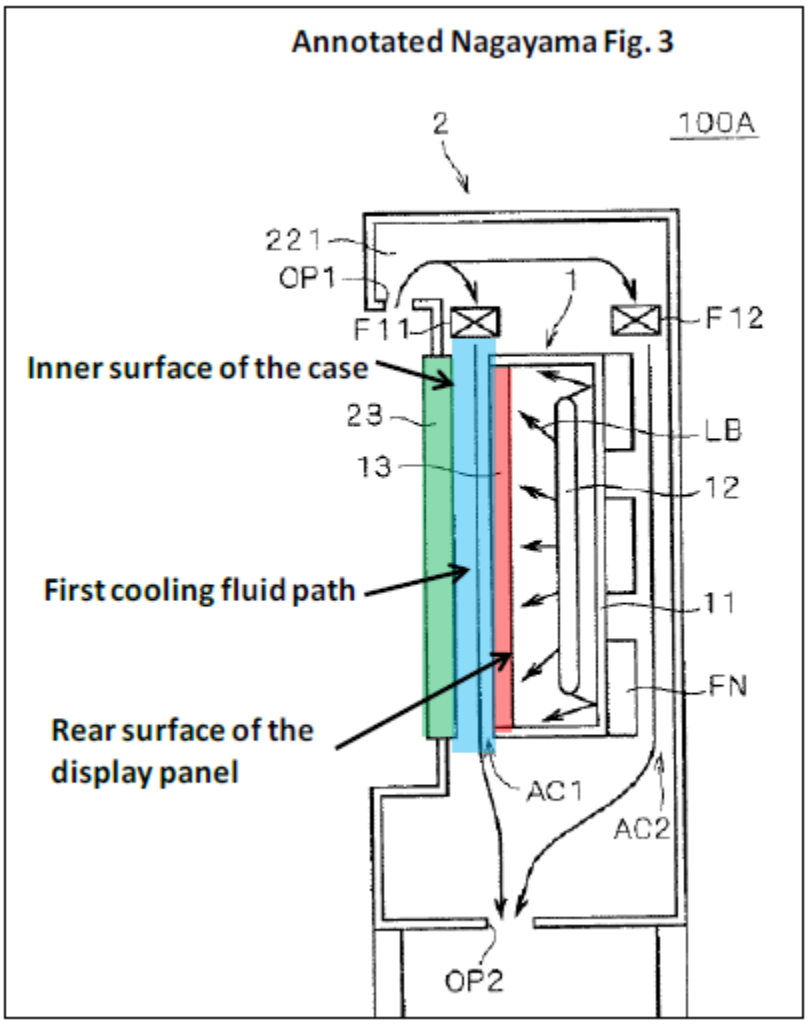
to protrude into the alleged cooling path identified by Dr. Meinhart. Additionally, the protruded section of the housing would interfere with the mounting of the fins FN.

124. To the extent MRI's construction for "display panel" is adopted, I disagree with that interpretation of the claims and with MRI's position that cooling the backlight of the display panel does not constitute cooling the display panel. Regardless, should MRI prevail with such an argument, Nagayama in view of Kaneko would not disclose this limitation for the same reason.

125. Further, Dr. Meinhart's proposed combination of Kaneko with Nagayama is not one that a POSITA would have been motivated to perform or have a reasonable expectation of success in combining. Kaneko uses multiple circuit boards and mounts circuit board components separately, which would effectively take up more space in the already small space of the housing 11 in Nagayama. A POSITA would also have understood that adopting Kaneko's exhaust holes or exhaust fans above the circuit boards for heat dissipation would contradict Nagayama's goal of keeping dust and air away from the liquid crystal panel and from inside the housing. It is also unclear if or how such a combination would have achieved mounting circuit boards to the rear surface of the case (the device box) or partitioned the circuit boards from the display panel, at least under Samsung's proposed construction of the term.

4. Nagayama does not disclose "the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the case, and the second cooling fluid path includes an internal space of the circuit board mounting part" (1h)

126. Dr. Meinhart's analysis is incorrect for another reason too: namely, the first cooling path identified by Dr. Meinhart does not include a space between the *rear surface of the display* panel and an inner surface of the case as required by claim 1 of the '117 patent. Ex. 1003 (Meinhart Decl.) at ¶¶ 215-216. This is true under both parties' proposed constructions of "display panel." Dr. Meinhart incorrectly interprets this language to allow the space between the *rear* surface of the display panel and an inner surface of the case to include the space between the *front* of the display panel and the front protection panel as shown in Dr. Meinhart's annotated version of Fig. 3 below.



Id. at ¶ 215.

127. A POSITA reading the '117 patent would not have understood the claim language to refer to the space identified by Dr. Meinhart. To the contrary, a POSITA would have understood this language to refer to the space behind the display panel, not in front of it as alleged by Dr. Meinhart. *See, e.g.*, Ex. 1001 ('117 patent) at Fig. 1, 3:24-33 ("the first cooling fluid path 60 is formed by a space between a rear surface of the display panel 20 and an inner surface of the rear case

12"). Dr. Meinhart's interpretation of the claims is incorrect and nonsensical, as reading the claim limitation as including space in any direction (both behind or in front of the display panel) would effectively render that limitation meaningless. Because Dr. Meinhart fails to properly identify a first cooling fluid path that includes a space between the *rear surface of the display* panel and an inner surface of the case, he is incorrect in asserting that claim one is rendered obvious by his proposed combination.

128. In sum, Nagayama in view of Kaneko does not disclose "the case includes a circuit board mounting part provided on a rear surface of the case and partitioned from a space in which the display panel is mounted such that the circuit board is received in the circuit board mounting part, the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the case, and the second cooling fluid path includes an internal space of the circuit board mounting part."

5. Nagayama does not disclose "wherein the case includes front and rear cases coupled to each other, and the rear case includes a circuit board mounting part provided on an outer surface of the rear case such that the circuit board is mounted in the circuit board mounting part" (Claim 2)

129. It is my opinion that Nagayama in view of Kaneko fails to teach or suggest all the limitations of claim 2 for the same reasons as provided with respect

to claim 1. Moreover, Nagayama in view of Kaneko also does not disclose or render obvious additional limitations recited in claim 2.

130. Dr. Meinhart opines that Nagayama (and thus Nagayama in view of Kaneko) discloses Claim 2 of the '117 patent. I disagree. As explained below, Nagayama does not disclose this limitation and Dr. Meinhart does not rely on any aspects of Kaneko in his analysis of this claim.

131. Dr. Meinhart argues that the back surface of the device box is the rear case and the front surface of the device box is the front case and they are coupled together. Even so, once again, Dr. Meinhart is opining that device box 2 is the claimed case. However, to the extent Dr. Meinhart suggests housing 11 is a "case," any suggestion that the housing 11 satisfies any portion of the claimed case again reflects a fundamental misreading of the claim, as there is no circuit board mounted to the outside surface of the rear case.

132. Focusing on what Dr. Meinhart has identified as the claimed case (or rear case in relation to claim 2), it is clear that this limitation is not disclosed by Nagayama. Just as circuit boards are not mounted to the back of the device box (e.g., the rear surface of the case in claim 1), circuit boards are not mounted to the outer surface of the back of the display box 2 (e.g., the outer surface of the rear case in claim 2). To the contrary, Nagayama discloses that drive circuits are located in the housing 11, which itself is inside device box 2. Ex. 1013 (Nagayama) at Figs.

3-6, [0037]. A POSITA would have thus understood that any circuit boards were located inside the case, not mounted on an outer surface of the rear case (the top and rear surface of device box 2, as identified by Dr. Meinhart). Thus, even to the extent the "back surface of the device box" is the rear case, there is no circuit board mounting part provided on its outer surface. Even if the housing was considered a case, there is no indication that the circuit board is mounted to an outer surface of the housing, since that is where the fins FN are located.

133. Paragraph 224 of Dr. Meinhart's declaration is conclusory and does not provide specific reasons why mounting the circuit board to an outer surface would be an obvious design choice. In fact, Nagayama says that it is desirable that drive circuits are inside a housing "with packings, fillers, etc. so there is no gap" and to "adopt a support structure with a cushioning material sandwiched between the housing . . . and the inner wall of the device box 2 in order to mitigate shocks caused by a fall []of the display. *See* Ex. 1013 (Nagayama) at [0037]-[0038]. Mounting to a rear surface (outside device box 2), facing away from the display panel would only jeopardize the safety of the circuit board components and would run counter to the reasoning provided in Nagayama.

134. Dr. Meinhart does not rely on Kaneko in his analysis of claim 2.

135. Therefore, it is my opinion that the combination of Nagayama and Kaneko does not disclose Claim 2 of the '117 patent.

6. Nagayama in view of Kaneko does not disclose "wherein the first cooling fluid path includes a space between a rear surface of the display panel and an inner surface of the rear case, and the second cooling fluid path includes an internal space of the circuit board mounting part." (Claim 5)

136. It is my opinion that Nagayama in view of Kaneko fails to teach or suggest all the limitations of claim 5 for the same reasons as provided with respect to claim 1-2. Moreover, Nagayama in view of Kaneko also does not disclose or render obvious additional limitations recited in claim 5.

137. For the reasons discussed above with regard to claims 1 and 2, Nagayama does not disclose this limitation. As explained in greater detail above with regard to claim 1, Nagayama does not disclose the first cooling path claimed by the '117 patent, as Dr. Meinhart only identifies a cooling path in *front* of the display when the claim requires that first cooling path to be *behind* the display pane. Dr. Meinhart's interpretation of the claim to allow for cooling paths in front of the display panel eviscerates the claim language and renders the limitation meaningless.

138. Similarly, as explained in greater detail above with regard to claims 1-2, Nagayama does not disclose the claimed circuit board mounting part, or any of the limitations that refer to the claimed circuit board mounting part. My analysis of those limitations is incorporated herein. Because Nagayama does not disclose the claimed circuit board mounting part, it also does not disclose a second cooling fluid path includes an internal space of the circuit board mounting part.

139. Once again, Dr. Meinhart's opinions with regard to obviousness are cursory and conclusory, with no actual modifications proposed, and no explanation of motivation to combine or reasonable expectation of success. Similarly, to the extent that Dr. Meinhart even opines that Nagayama could be combined with Kaneko to disclose a first cooling path, I disagree. Not only does Nagayama not disclose the first cooling path for the reasons described above, Kaneko does not describe one either, as Kaneko leaves no space for air to flow behind the display panel and the inner surface of a rear case. Since neither reference discloses the claimed first cooling path, the combination also does not.

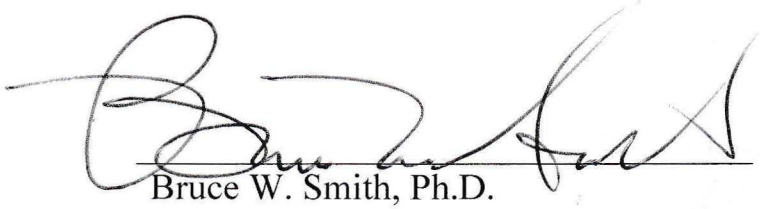
XII. CONCLUSION

140. Based on the above, it is my opinion that none of the Challenged Claims are invalid in view of the art identified by Dr. Meinhart.

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.

Samsung Exhibit 2001, Page 76 of 76
MRI v. Samsung - IPR2023-01201