

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.; AND
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner

v.

Polaris PowerLED Technologies, LLC
Patent Owner.

~~Case No. IPR2023-00484~~
~~U.S. Patent No. 8,217,887~~

DECLARATION OF MILTIADIS HATALIS, PH.D.,
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 8,217,887

Petitioner Samsung Ex-1002, 1

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LIST OF EXHIBITS¹

Ex-1001	U.S. Patent No. 8,217,887
Ex-1002	Declaration of Dr. Hatalis
Ex-1003	Curriculum Vitae of Dr. Hatalis
Ex-1004	Prosecution History of U.S. Patent No. 8,217,887
Ex-1005	Japanese Published Patent Application 2006-18200 to Seo, with certified translation (“Seo”)
Ex-1006	U.S. Patent Publication No. 2007/0279369 (“Yao”)
Ex-1007	U.S. Patent Publication No. 2008/0180414 to Fung (“Fung”)
Ex-1008	U.S. Patent No. 7,952,556 to Honbo (“Honbo”)
Ex-1009	U.S. Patent No. 8,847,874 to Price (“Price”)
Ex-1010	U.S. Publication No. 2002/0113192 to Antila (“Antila”)
Ex-1011	U.S. Patent No. 7,595,784 to Yamamoto (“Yamamoto”)
Ex-1012	Symmetric Current-Balancing Circuit for LED Backlight With Dimming
Ex-1013	LED Backlighting of LCDs in Mobile Appliances
Ex-1014	Multistring LED Backlight Driving System for LCD Panels With Color Sequential Display and Area Control
Ex-1015	U.S. Patent Publication No. 2006/014,600 to Baba (“Baba”)
Ex-1016	Technological Trends of LED Backlight Units
~~Ex-1017~~	~~Sequential-Color Voltage-Adaptable RGB-LED Backlight Driving System with Local Dimming Control for LCD Panels~~

¹ Four-digit pin citations that begin with 0 are to the page stamps added by Samsung in the bottom right corner of the exhibits. All other pin citations are to

original page, column, paragraph, and/or line numbers.

Ex-1017	Sequential-Color Voltage-Adaptable RGB-LED Backlight Driving System with Local Dimming Control for LCD Panels
Ex-1018	U.S. Patent Publication No. 2009/0160878 to Kwong (“Kwong”)
Ex-1019	U.S. Patent Publication No. 2008/0248837 to Kunkel (“Kunkel”)
Ex-1020	Claim Mapping Table
Ex-1021	U.S. Patent Publication No. 2007/0035706 to Margulis (“Margulis”)
Ex-1022	U.S. Patent Publication No. 2007/0153548 to HAMADA (“HAMADA”)
Ex-1023	Late-News Paper:18.1-inch XGA TFT-LCD with Wide Color Reproduction using High Power LED-Backlighting
Ex-1024	U.S. Patent Publication No. 2007/0211014 to Kim (“Kim”)
Ex-1025	David Sorlien , Powering LED arrays in backlight applications
Ex-1026	Harald Ries, Ines Leike, Optimized additive mixing of colored light-emitting diode sources
Ex-1027	B. Ackermann, V. Schulz, C. Martiny, A. Hilgers, X. Zhu, Control of LEDs
Ex-1028	Man Ochiai Holcomb, Regina Mueller-Mach, The LED Lightbulb: Are we there yet? Progress and Challenges for Solid State Illumination
Ex-1029	Huaxia Wu, Qibin Feng, Guoqiang Lv, A Novel LCD Backlight with Mixed White and Colorful LEDs
Ex-1030	U.S. Patent Publication No. 2008/0088769 to KIM (“KIM”)

I. INTRODUCTION

1. I have been retained as an independent expert witness on behalf of Samsung ~~Electronics~~Display Co., Ltd., Samsung Electronics, Co., Ltd., and Samsung Electronics America, Inc., and Samsung Display Co., Ltd. (collectively, “~~Petitioner~~”) request Samsung”) in the above-captioned inter partes review (“IPR”) of claims 1-21 of relating to U.S. Patent No. 8,217,887 (“the ’887 Patent”) (Ex--1001), currently assigned to Polaris PowerLED Technologies, LLC (“Patent Owner”).1001).

2. I understand that Samsung is petitioning for IPR of claims 1-21 of the ’887 patent relates and requests that the United States Patent and Trademark Office (“PTO”) cancel those claims.

3. In preparing this Declaration, I have reviewed the ’887 patent and considered the documents identified below in light of the general knowledge in the relevant art. In forming my opinions, I relied upon my education, knowledge, and experience, and considered the level of ordinary skill in the art as discussed below.

4. I am being compensated for my work in this matter at my standard consulting rate, which is \$400 per hour, plus actual expenses. My compensation is not dependent in any way upon the outcome of this matter.

II. BACKGROUND AND QUALIFICATIONS

5. My complete qualifications and professional experience are described in my academic curriculum vitae, a copy of which is provided as Exhibit 1003.

The following is a brief summary of my relevant qualifications and professional experience.

6. I am currently a Professor in the Department of Electrical and Computer Engineering at Lehigh University. I hold a B.S. degree in physics from Aristotle University, Greece, an M.S. degree in electrical engineering from SUNY Buffalo, and a Ph.D. (1987) in electrical engineering from Carnegie Mellon University. In 1987, I joined Lehigh University as an assistant professor in the Department of Electrical & Computer Engineering. I served as an associate professor at Lehigh University from 1991 to techniques for 1995, and have been a full professor at Lehigh University since 1995. From 1988 to 1993, I served as associate director of the Microelectronics Research Laboratory at Lehigh University. Since 1992, I have served as director of the Display Research Laboratory at Lehigh University. From 2010 to 2013, I served as interim director of the Sherman Fairchild Center for Solid State Studies at Lehigh University. From 2003 to 2008, I concurrently served as professor in the Department of Computer Science at Aristotle University, Greece.

7. From 1987 to 2015, I also worked as an independent consultant for a number of major technology companies in the flat panel display and semiconductor field, including IBM, Kodak, Sharp and Motorola Solutions. In 1992, I was a visiting scientist at XEROX Palo Alto Research Laboratory.

8. As discussed below, my technical expertise is in flat panel display technologies, including thin film transistor (“TFT”) and active-matrix organic light-emitting diode (“AMOLED”) technologies.

9. I am the author or co-author of 180 technical publications including three issued patents, and two book chapters, including one on AMOLED pixel electronic circuits and one on polysilicon TFT technology. As of this writing, I have a total of 4,536 citations and my h-index is 30 according to Google Scholar.

10. In 1992, I founded, and became Director of, the “Display Research Laboratory,” which was the first academic laboratory in the United States dedicated to research and development of electronic thin film materials and devices, including thin film transistors, for flat panel displays, flexible electronics and novel large area microelectronic system applications. As Director of Lehigh’s Display Research Laboratory, I have raised over \$13 million through research contracts and grants to support the laboratory's research activities. These contracts and grants were funded by the Defense Advanced Research Program Agency (DARPA), the Army Research Laboratory (ARL), the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the State of Pennsylvania, and a variety of industrial companies including Corning, IBM, Kodak, Sharp, Northrop Grumman, and others.

11. From 1987 to present I have conducted research in microelectronics, including semiconductors, electronic materials, devices and circuits for integrated circuits and integrated microsystems. My research mainly focuses on electronic thin film materials and devices, microelectronic fabrication processes, novel electronic circuits, and integrated microsystems. My research group pioneered the development of electronic materials, devices, and circuits on flexible substrates, active matrix organic light emitting diode displays, and addressable arrays for integrated sensor applications such as fingerprint sensors for biometrics and multichannel gas sensors.

12. As a faculty member, I supervised the research of twenty Ph.D. dissertations in the technical field of semiconductors/microelectronics. Upon graduating, all twenty of my Ph.D. graduate students moved either to industrial positions in the electronic or flat panel display industry, including positions at Apple, IBM, Intel, Sharp, TSMC, and Motorola, or into academic positions in the United States or abroad. I have also supervised the research of several post-doctoral researchers and research associates at Lehigh. Moreover, I have supervised a large number of graduate student Master's theses and numerous undergraduate research projects. I have been an invited lecturer at numerous universities, industrial laboratories, and conferences in the United States and overseas.

13. The list of peer-reviewed journals in which my papers were published include Thin Solid Films, Journal of the Electrochemical Society, Solid State Electronics, Journal of Applied Physics, Journal of the Society for Information Display, Journal of Materials Science, and multiple IEEE journals including the IEEE Journal of Display Technology, IEEE Transactions on Electronic Devices, IEEE Solid State Circuits, and IEEE Electron Device Letters. The technical conferences where my papers were presented have been organized by scientific societies including: Society of Information Display (SID), Materials Research Society (MRS), Electrochemical Society (ECS), and Institute of Electrical and Electronics Engineers (IEEE).

5.14. I am also a named inventor on U.S. Patent No. 8,390,536, directed at controlling backlight displays. Specifically, “controlling the intensity of light emitting diodes (LEDs) in the backlights of electronic displays.” Ex 1001, 1:6-7current to pixels in an active matrix display by adjusting voltage on the data lines and two international patents associated with the above invention, one issued in Korea and one in Japan.

~~The prior art in this Petition demonstrates that claims 1-21 of the '887 Patent involved well-known hardware and software components and predictable design choices in the art. This prior art also shows that a POSITA would have been motivated to use these components to address well-known issues relating to backlight displays. Thus, claims 1-21 of the '887 Patent would have been obvious over the prior art.~~

~~This Petition presents non-cumulative grounds of unpatentability not addressed during patent prosecution. The grounds presented in this Petition are more than reasonably likely to prevail, this Petition should be granted, a trial should be instituted, and the challenged claims should be cancelled.~~

~~I. MANDATORY NOTICES UNDER 37 C.F.R. §42.8~~

Real Parties-in-Interest: ~~Petitioner identifies the following real parties-in-interest: Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.~~

Related Matters: ~~Patent Owner has asserted the '887 Patent against Petitioner in *Polaris PowerLED Technologies, LLC v. Samsung Elecs. Co., Ltd., et al.*, No. 2:22-cv-00469.~~

Lead and Back-Up Counsel:

- ~~• Lead Counsel: William M. Fink (Reg. No. 72,332), O'Melveny & Myers LLP, 1625 Eye Street NW, Washington, DC 20006 (Telephone: 202-383-5300; Email: tfink@omm.com.)~~
- ~~• First Backup Counsel: Ben Haber (Reg. No. 67,129), O'Melveny & Myers LLP, 400 South Hope Street, 18th Floor, Los Angeles, CA 90071. (Telephone: 213-430-6000; E-Mail: bhaber@omm.com.)~~
- ~~• Backup Counsel: Kyla Butler (Reg. No. 80,082), O'Melveny & Myers LLP, 1625 Eye Street NW, Washington, DC 20006 (Telephone: 202-383-5358; Email: kbutler@omm.com.)~~

Service Information: ~~Petitioner consents to electronic service by email to ommsamsungpolarisipr@omm.com. Please address all postal and hand-delivery correspondence to lead counsel at O'Melveny & Myers LLP, 400 South Hope St., Los Angeles CA, with courtesy copies to the email address identified above.~~

~~II.—FEE AUTHORIZATION~~

~~Pursuant to 37 C.F.R. §42.15(a) and §42.103(a), the PTO is authorized to charge any and all fees to Deposit Account No. LA500639.~~

~~III.—GROUNDS FOR STANDING~~

~~Petitioner certifies that the '887 Patent is available for IPR, this Petition is timely filed, and Petitioner is not barred or estopped from requesting IPR on the grounds presented.~~

~~IV.—PRECISE RELIEF REQUESTED~~

~~Petitioner requests cancellation of Claims 1-21 of the '887 Patent under 35~~

15. U.S.C. § 403I have taught a number of different undergraduate and graduate level courses in the Electrical and Computer Engineering department at Lehigh University. These courses have generally centered on physics, technology, and the design and fabrication of solid-state devices and integrated circuits. I have also introduced several new courses which include “Introduction to VLSI Design,” “Semiconductor Material and Device Characterization,” and “Introduction to

Photovoltaic Energy Systems.” I also regularly teach the “Principles of Electrical Engineering,” “Introduction to Computer Engineering,” “Electronic Circuits,” and “Introduction to VLSI Circuits” courses.

16. As part of my research, I utilize much of the same equipment and many of the same microfabrication processes that are in use by the semiconductor or flat panel display industry including: Plasma-Enhanced Chemical Vapor Deposition (PECVD) for the deposition of amorphous silicon, silicon nitride and silicon dioxide films; sputter and e-beam deposition tools for aluminum, copper, nickel tungsten, titanium, gold, tantalum, and other metallic thin films; photolithographic tools for defining photoresist patterns on the substrates; as well as reactive ion etching or wet etching tools for removing various thin film materials from the substrates. I also utilize several tools for the characterization of the materials and structures used in microelectronic devices including: optical microscopes, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and Atomic Force Microscopy (AFM). I further utilize a variety of electrical characterization techniques and instruments for testing the electrical performance of completed electronic circuits and systems.

17. As part of my research, I pioneered a technique for crystallizing amorphous silicon. Similar techniques have been used in the manufacturing of integrated circuits and flat panel displays. In addition, my research group at

Lehigh pioneered the fabrication of electronic devices and circuits on novel flexible substrates and the development of integrated microsystems on flexible substrates, including active matrix organic light emitting diode displays, and addressable arrays for integrated sensor applications such as fingerprint sensors for biometrics and multichannel gas sensors. Many industrial and academic laboratories currently pursue similar research activities; such research flows from the accomplishments of my research group in this technical field.

18. My industrial experience includes work at the XEROX Palo Alto Research Laboratory and various consulting projects with companies in the flat-panel display or semiconductor technical fields. Those projects related to electronic materials, semiconductor devices and their application to microelectronic systems.

19. I am a member of several professional organizations including the Electron Device Society of the IEEE and the SID. I have also been the chair or co chair at numerous national and international conferences and symposiums, including several SID-sponsored Workshops on Active Matrix Liquid Crystal Displays and a Materials Research Society Symposium on Flat Panel Displays. I have co authored two book chapters, one dealing with the “Polysilicon TFT Technology” and another on the application of “Polysilicon TFTs in AMOLED Displays.” I have served as a reviewer for technical papers submitted to several

scientific journals and have also served as a reviewer for several years for the National Science Foundation Small Business Innovative Research (SBIR) program.

20. A detailed list of my publications, education and professional experience, research grants, Ph.D. dissertations for which I served as advisor, publications, and litigation cases in which I served as a technical expert, can be found in my curriculum vitae attached and submitted as Exhibit 1003.

III. INFORMATION CONSIDERED

21. In preparation for this declaration, I have considered the materials discussed in this declaration, including, for example, the '887 Patent, the references cited by the '887 Patent, the prosecution histories of the '887 Patent and applications from which it derives (including the references cited therein), various background articles and materials referenced in this declaration, and the prior art references identified in this declaration. In addition, my opinions are further based on my education, training, experience, and knowledge in the relevant field.

IV. RELEVANT LEGAL STANDARDS

22. I am not an attorney and offer no legal opinions. For the purposes of this Declaration, I have been informed about certain aspects of the law that are relevant to my analysis, as summarized below.

A. Claim Interpretation

23. I have been informed and understand that in an IPR proceeding, claims are to be interpreted according to the Phillips claim construction standard. I have been informed and understand that claim construction is a matter of law and that the final claim constructions for this proceeding will be determined by the Patent Trial and Appeal Board (“PTAB”).

B. Written Description

24. I understand that determining whether a particular patent or printed publication constitutes prior art to a challenged patent claim can require determining the effective filing date (also known as the priority date) to which the challenged claim is entitled. I understand that for a patent claim to be entitled to the benefit of the filing date of an earlier application to which the patent claims priority, the earlier application must have described the claimed invention in sufficient detail to convey with reasonable clarity to the POSITA that the inventor had possession of the claimed invention as of the earlier application’s filing date. I understand that a disclosure that merely renders the claimed invention obvious is not sufficient written description for the claim to be entitled to the benefit of the filing date of the application containing that disclosure.

C. Perspective of One of Ordinary Skill in the Art

25. I have been informed and understand that a patent is to be understood from the perspective of a hypothetical “person of ordinary skill in the art” (“POSITA”). Such an individual is considered to possess normal skills and knowledge in a particular technical field (as opposed to being a genius). I understand that in considering what the claims of a patent require, what was known prior to that patent, what a prior art reference discloses, and whether an invention is obvious or not, one must use the perspective of such a POSITA.

D. Obviousness

26. I have been informed and understand that a patent claim is obvious under 35 U.S.C. § 103, and therefore invalid, if the claimed subject matter, as a whole, would have been obvious to a POSITA as of the priority date of the patent based on one or more prior art references and/or the knowledge of a POSITA.

27. I understand that an obviousness analysis must consider (1) the scope and content of the prior art, (2) the differences between the claims and the prior art, (3) the level of ordinary skill in the pertinent art, and (4) secondary considerations, if any, of non-obviousness (such as unexpected results, commercial success, longfelt but unmet need, failure of others, copying by others, and skepticism of experts).

28. I understand that a prior art reference may be combined with other references to disclose each element of the invention under 35 U.S.C. § 103. I understand that a reference may also be combined with the knowledge of a POSITA, and that this knowledge may be used to combine multiple references. I further understand that a POSITA is presumed to know the relevant prior art. I understand that the obviousness analysis may take into account the inferences and creative steps that a POSITA would employ.

29. In determining whether a prior art reference would have been combined with other prior art or other information known to a POSITA, I understand that the following principles may be considered:

- whether the references to be combined involve non-analogous art;
- whether the references to be combined are in different fields of endeavor than the alleged invention in the Patent;
- whether the references to be combined are reasonably pertinent to the problems to which the inventions of the Patent are directed;
- whether the combination is of familiar elements according to known methods that yields predictable results;
- whether the combination involves the substitution of one known element for another that yields predictable results;

- whether the combination involves the use of a known technique to improve similar items or methods in the same way that yields predictable results;
- whether the combination involves the application of a known technique to a prior art reference that is ready for improvement, to yield predictable results
- whether the combination is “obvious to try”;
- whether the combination involves the known work in one field of endeavor prompting variations of it for use in either the same field or a different one based on design incentives or other market forces, where the variations are predictable to a POSITA;
- whether there is some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill in the art to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention;
- whether the combination requires modifications that render the prior art unsatisfactory for its intended use;
- whether the combination requires modifications that change the principle of operation of the reference;
- whether the combination is reasonably expected to be a success; and

- whether the combination possesses the requisite degree of predictability at the time the invention was made.

30. I understand that in determining whether a combination of prior art references renders a claim obvious, it is helpful to consider whether there is some teaching, suggestion, or motivation to combine the references and a reasonable expectation of success in doing so. I understand, however, that a teaching, suggestion, or motivation to combine is not required.

V. SUMMARY OF OPINIONS

6-31. Claims 1-21 of the '887 Patent are obvious on the following grounds:

- **Grounds 1 and 2:** Claims 1-5, 7, 10-11, 13-15, and 18-20 are rendered obvious over JP 2006-18200 (“Seo,” Ex-1005) alone or by Seo in view of U.S. Patent Publication No. 2008/0180414 (“Fung,” Ex-1007) (Seo-Fung).
- **Ground 3:** Claims 6, 12, and 17 are rendered obvious over Seo-Fung.
- **Ground 4:** Claims 8-9, 16, and 21 are rendered obvious over Seo-Fung in view of U.S. Patent Publication No. 2007/0279369 (“Yao,” Ex-1006).
- **Ground 5:** Claims 1-21 are rendered obvious over Seo in view of U.S. Patent No. 7,952,556 (“Honbo,” Ex-1008).

~~The Petition discusses rationales for each of the above enumerated grounds and is supported by a declaration from Dr. Hatalis Ex-1002.~~

I **H.VI. THE CHALLENGED PATENT**

7.32. The alleged invention of the '887 Patent relates to “apparatus and techniques relating to the intelligent control of a display's backlight LED strings.”

Ex-1001, Abstract. “The intensity of the back light is adjusted multiple times within the duration of a frame” which provides “additional flexibility in setting the luminosity of the display and also provides the ability to make a gradual transition between the luminosities of two successive frames.” The invention also provides for a display that is “divided into a number of tiles or sections and the backlighting for each tile is separately controlled.” This allows for improved contrast control across the display.

8.33. The '887 Patent relates to a display which includes “a pixel circuitry 102, the backlighting circuitry 104 and the display controller 106.” Ex-1001, 3:13-15. ~~15.~~ “[B]acklighting circuitry 104 includes a number of strings of light emitting diodes (LEDs) arranged across the display 100~~—~~, includ[ing] either red, blue or green LEDs” *Id.* at 1:21-23; 3:40-44. As shown in Figure 3, display controller 106 includes microcontroller 304 and microprocessor 302. *Id.* at 4:28-29.

Microprocessor 302 adjusts the luminosities of the LED strings at the frequency of the backlight control clock by changing the drive voltages and drive currents of the strings. *Id.* at 5:7-9, 5:20-22.

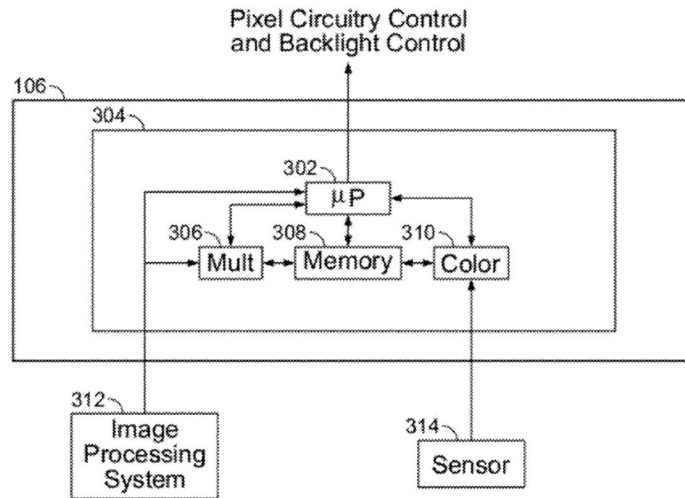


FIG. 3

34. Display controller 106 is provided with a “horizontal synchronization (HSYNC) signal to indicate the start of a scan line, and a vertical synchronization (VSYNC) signal to indicate the start of a frame.” Ex-1001,4:3-6. “The HSYNC and VSYNC signals are []clock signals.” *Id.* at 4:7-8. Figure 4 illustrates a backlight control clock “in which the backlight control clock has twice the frequency of the VSYNC signal.” *Id.* at 5:2-4. “In one embodiment, the backlight control clock has a frequency that is an integer multiple of the VSYNC signal frequency.” *Id.* at 4:60-62.

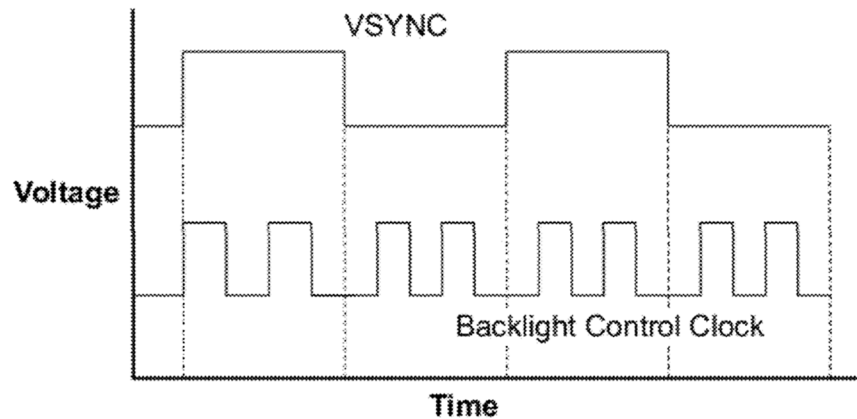


FIG. 4

35. As explained in detail below, the '887 Patent claims are obvious in view of the prior art.

III.VII. PATENT PROSECUTION HISTORY

36. I understand that the '887 file history is submitted as Ex-1004. I further understand that the '887 Patent issued from 12/018,399, filed on January 23, 2008. ~~Ex-1002 ¶¶36-39.~~

37. On April 12, 2011 the Examiner issued a non-final rejection rejecting Claims 1-22. Ex-1004, 0102-0110. Claims 1-3 and 6-12 were rejected under 35-
U.S.C.
U.S.C. 102(b) as being anticipated by Yamamoto et al. (U.S. Publication No. 2005/0231457). *Id.* at 0103. On August 12, 2011, Applicant amended Claim 1 to recite “that the first circuitry adjusts the luminosity levels of the plurality of strings of LEDs for a plurality of times within the predetermined period of time based on a

clock signal of the second circuitry.” ~~Id. at~~ Ex-1004, 0092. Applicant also amended Claim 13 to include features similar to independent Claim 1. *Id.* at 0093.

38. On November 4, 2011, the Examiner issued a final rejection rejecting Claims 1-15 and 17-22, based in part on Kojima. Ex-1004, 0069. On February 2, 2012, Applicant argued Kojima fails to disclose the feature of amended claim 1 because “Kojima’s system clock and pulse-width modulation unit clock do not correspond to the claimed ‘first clock signal’ and ‘second clock signal having a second frequency that is a multiple of the first frequency.’” *Id.* at 0066-0067. On March 13, 2012, the Examiner issued a notice of allowance. *Id.* at 0034.

39. As discussed below, the prior art Seo reference teaches the limitations the Applicant highlighted to distinguish the prior art. None of the prior art references relied upon for the grounds of unpatentability addressed in this Petition~~declaration~~ were cited during the prosecution of application 12/018,399 that led to the ’887 Patent. Indeed, to the best of ~~Petitioner’s~~my knowledge, none of Seo, Fung, Yao, or Honbo were ever considered in the prosecution of any applications in the ’887 Patent’s priority chain. Honbo, cited as a secondary reference in Ground 4 only, references a different prior art reference, “Japanese Patent Application Laid-open No. 2005-258404,” (to Yamomoto), and Yamomoto was applied during prosecution. Ex-1008, 1:51-53. But Honbo’s specific disclosures and teachings were never applied. Hence, since none of the applied prior art

references were ~~previously considered by the Examiner, 35 U.S.C. § 325(d) is not applicable to this~~
~~petition. Neither the same nor substantially the same prior art or arguments were previously presented.~~

previously considered by the Examiner. Neither the same nor substantially the same prior art or arguments were previously presented.

IV.VIII. LEVEL OF ORDINARY SKILL IN THE ART

40. One of ordinary skill in the art would have had a bachelor's degree in electrical engineering, computer engineering, computer science, or a related field, and at least two years of experience in the research, design, development, and/or testing of touch and/or proximity sensors, human-machine interaction and interfaces, and related firmware and software, or the equivalent, with additional education substituting for experience and vice versa. ~~Ex-1002 ¶40.~~

IX. TECHNOLOGY BACKGROUND

A. LED STRINGS

41. Light emitting-diode (LED) strings are rapidly substituting high-voltage light sources such as cold cathode fluorescent lamps because of its long lifetime and eco-friendly nature. See Ex-1012. LED products were first commercialized in the early 1970s. Ex-1013, 0002. Since then, the luminous flux and efficiency of LEDs have improved allowing LED efficacy to surpass standard technologies. Id.

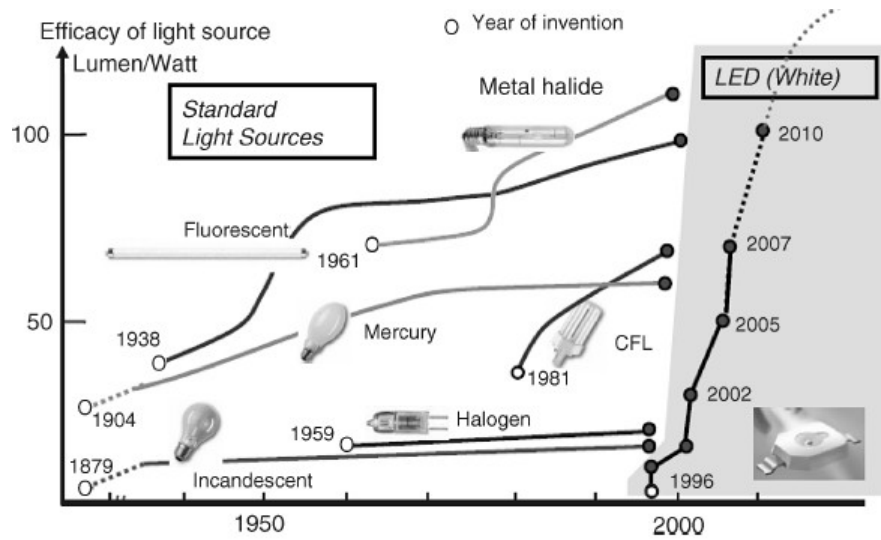


Figure 8.1 Increase of efficacy of different lamp technologies.

42. LEDs have become popular backlighting options for Liquid-crystal displays. See Ex-1025. LEDs emit well-saturated colors because they result in the creation of light inside the semiconductor. Ex-1013, 0009. “Because white light is actually a mixture of several colors, there are many ways to create it, all of which are based on additive color mixing.” *Id.* In order to have a backlight with uniform white appearance, the LEDs requires mixing, and then needs to be guided through the LCD (Liquid Crystal Display). *Id.* at 0010.

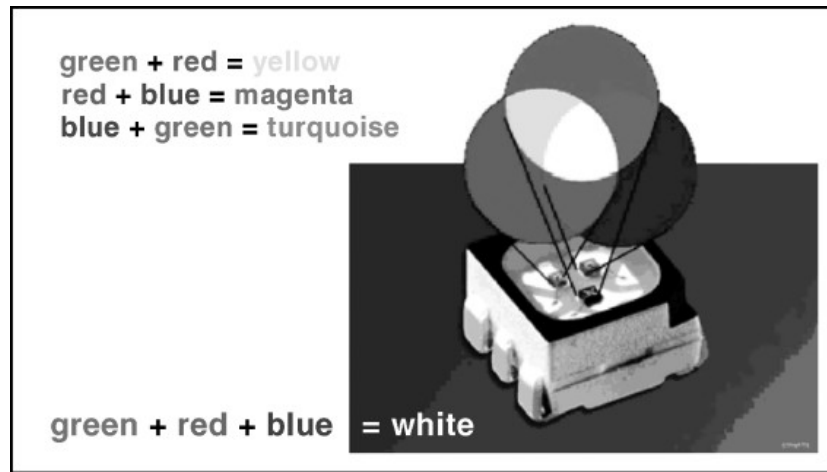
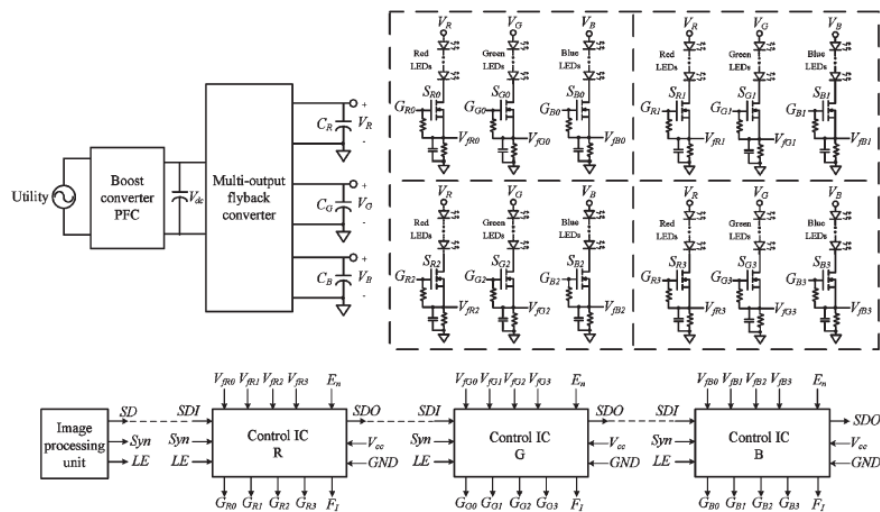


Figure 8.10 RGB color mixing to create white light. (See Plate 8).

43. A method of adjusting the brightness of three separate (i.e. red, green and blue) LED's independently was also common to result in higher color saturation. Specifically, "brightness of Red, Green and Blue LEDs can be dimmed independently by a control circuit." Ex-1023, 0001. This also allows "[t]he white color chromaticity and the brightness of the module [to] be controlled in the color reproduction area optionally without any reduction in the range of gray scale levels." *Id.* at 0003.

44. Also, using multistring LED backlights has been a common way to substitute cold cathode fluorescent lamps as backlights. Ex-1014, 0001. This is because "[i]n large-scale LCD panels, multistring LED backlights are required to provide sufficient back lighting." *Id.* LED backlights have two basic configurations: edge lit or array lit. Ex-1025, 0001. Edge-lit displays "use one or

many side-emitting LEDs along the sides of the display. *Id.* Array-lit displays “employ multiple LEDs arranged in a grid pattern directly behind the display. However, “[t]he design challenges lies in the driving series string of LEDs.” *Id.* A way to individually drive RGB LED’s is by using a converter, such as “flyback, forward, push–pull, half-bridge, or full-bridge converter.” *Id.* at 0002.

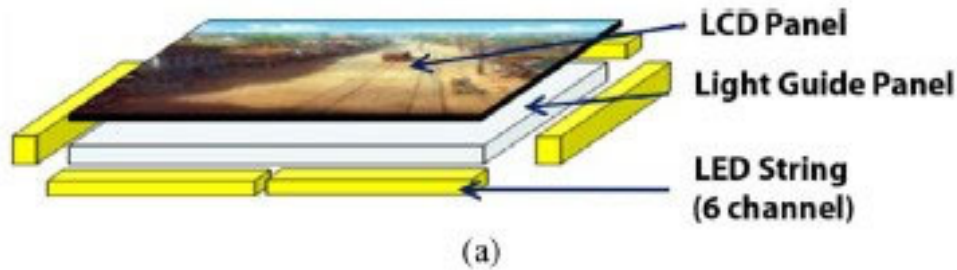


B. LCD AND DISPLAY ILLUMINATION AND BACKLIGHTING

45. With progress in the liquid-crystal display (LCD) industry, efficient and cost-effective backlight driver circuits have become popular in the power electronics industry. See Ex-1012. Shown in Fig. 1(a) is “a typical large-scale LCD backlight system called edge-type configuration.” “Six LED strings are placed in the edge of the LCD panel, and each string has multiple series-connected white LED chips.” *Id.* at 0001. This is because “brightness uniformity in LCD backlights

is the most important performance factor and maintaining the uniform current distribution between backlight sources is the primary function of the drive circuit.”

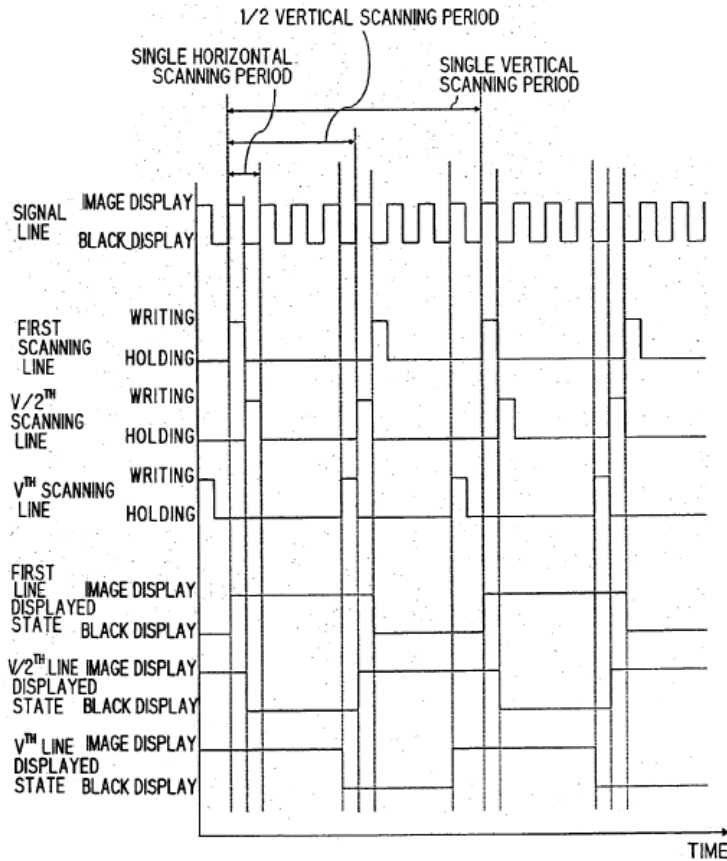
Id.



C. VERTICAL SYNCHRONIZATION SIGNALS

46. The picture quality of LCDs can be improved by adopting a blinking backlight or a high frame frequency drive. See Ex-1016. U.S. Patent Publication No. 2006/014600 filed on July 22, 2005, used a similar mechanism in a display device employing a display method in which a displayed image is maintained for one frame period corresponding to one frame. See Ex-1015. It describes the use of a display ratio control unit that “fixes a display ratio of black display to be displayed between the frames of the input image signals displayed on a liquid crystal panel with respect to one frame period based on inputted movement information.” *Id.* ¶47. The display ratio control unit also outputs the” determined display ratio to a backlight brightness control unit as black display time ratio

information” and “image signals and control signals (horizontal synchronous signals, vertical synchronous signals).” *Id.*



47. U.S. Patent Publication No. 2007/0211014 filed March 9, 2011, discusses a method of controlling backlighting of an LCD by “generating an on-time signal to activate a backlight for an LCD in synchronization with providing a frame of data to the LCD.” Ex-1024, Abstract. The method also discusses using a PWM signal and explains when the PWM signal is disabled, the bank of switches coupled to the LEDs are disengaged from the LEDs, thereby terminating the backlight. *Id.* ¶5. Also, control signals such as horizontal sync and vertical sync are

used as timing parameters for the operation of an LCD. *Id.* ¶32. Also discussed is including a timing controller circuit that “receives the data and control signal CTRL1 to generate a start-of-frame signal STY for a gate driver circuit 116 that controls the activation of a panel 105 based on biasing provided by a voltage generator 118.” *Id.* ¶36. The timing controller circuit “uses the Hsync, Vsync, and the dot clock signals (i.e., the control signals) to generate a start of- frame signal STY provided to the gate driver circuit 116 for activation of a frame of data to be displayed on the display panel.” *Id.* ¶46.

D. PULSE WIDTH-MODULATION

48. The dimming function which changes the brightness of the display is another essential feature of backlight units. In case of LED backlight systems, pulse width-modulation (PWM) dimming is preferred over analog dimming. Ex-1012, 0008. To achieve the goals of individual local dimming control, a commonly used pulse width modulation (PWM) dimming technique is adopted. It is recommended to use PWM for dimming in order to avoid color shifts. See Ex-1013. In Figure 2 is an example of an PWM dimming circuit. Ex-1017, 0002. In Figure 2 “the linear current regulators is used to provide a constant current source to LED string, and the LED brightness can then be controlled by adjusting the relative ratios of the on time and off time. Since forward current of the LED string is not changed, LED color will not vary with brightness.” *Id.*

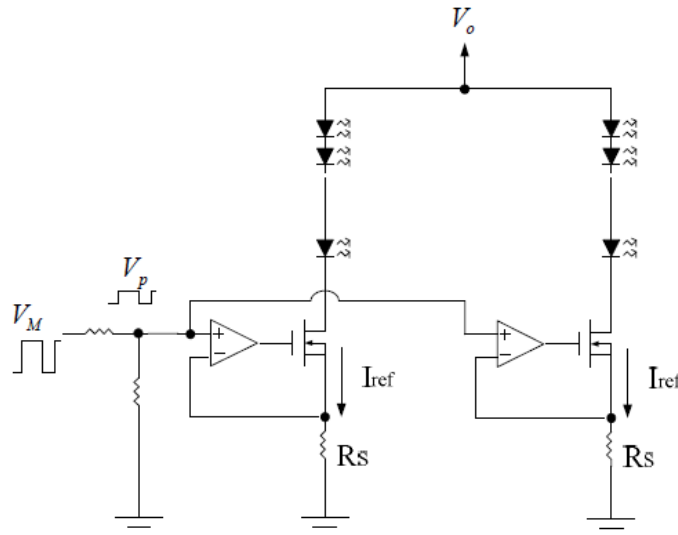


Fig. 2. The diagram of the PWM dimming circuit

49. Current driver integrated circuits use “pulse width modulation (PWM) brightness dimming instead of analog dimming due to non-uniformity issues and color shift associated with analog dimming.” Ex-1009, 1:60-63. However, PWM dimming causes high inrush currents and transients from all of the LEDs turning on and off simultaneously. *Id.* at 63-66. Thus, there was a need for a “system and method which adjusts LED sequencing time delay for the number of sequences performed, such as the number of LED strings in the backlight.” *Id.* at 2:16-19. U.S. Patent No. 8,847,874 filed September 30, 2014, relates to a method for sequential driving of information handling system display backlight LED strings. *See* Ex-1009. “The number of active LED strings of a display backlight is detected and applied to set timing of commands to the LED strings for adjusting display brightness, such as PWM commands to the strings over a cycle or time period.” *Id.* at 2:24-28.

E. AMBIENT LIGHTING SENSORS FOR DISPLAYS

50. Sensors add functionality and offer convenient features in a wide range of device. See Ex-1013. Sensors that adjust display backlighting according to ambient lighting conditions are more widely used. Id. With the help of an ambient light sensor, the brightness of white LEDs or RGB LEDs of devices can be modified to the brightness of the environment. Id. at 0011. This is because ambient light sensors causes the display backlighting to adjust accordingly to ambient light conditions. Id. at 0017.

51. U.S. Patent Publication No. 2002/0113192 filed November 6, 2001, used a similar technique and uses ambient light sensors to adjust backlights. See Ex-1010. It describes a method of measuring “white balance of the object’s ambient light and the adjustment of the luminous power of the light to be produced that comprises at least one color in relation to at least one of the other luminous efficiencies to make the luminous power correspond better to the measured white balance of ambient light.” Id. It also states that “each new ratio-corrected control coefficient (for R, G and B components) is calculated from the previous control coefficient on the basis of the ratio of the proportions of ambient light and illumination in the corresponding light component.” Id.

52. U.S. Patent Publication No. 2009/0160878 filed December 25, 2007, also uses an ambient light sensor to measure ambient light. See Ex-1018. It

explains that the ambient light sensor is “is able to measure multiple attributes of ambient light, for example: strength, brightness, color, shade, direction, or the like.” *Id.* ¶21. It also explains that the ambient light sensor may be located in different portions of a computer system. *Id.* ¶22.

53. U.S. Patent Publication No. 2008/0248837 filed May 10, 2007, teaches adjusting ambient light conditions received by light sensors that are located adjacent to backlighting LEDs. Ex-1019 ¶7.

54. U.S. Patent Publication No. 2008/0088769 teaches a method of controlling optical feedback of a backlight assembly. *See* Ex-1030. Specifically, it discusses using a color sensor to sense “mixed white light to generate output currents respectively corresponding to the increases in the amounts of red and green light and the decrease in the amount of blue light.” *Id.* ¶71. Further, “the amounts of red and green light are increased and the amount of blue light is decreased within mixed white light due to an external factor.” *Id.*

55. U.S. Patent Publication No. 2007/0035706 filed June 20, 2005, teaches using an optical sensor to detect ambient external light conditions. Ex-1021 ¶48. It also discusses using sensors that “may be positioned at various locations within the display and may either detect the LED light directly, or through a diffusion filter that is part of the flat panel display.” *Id.* ¶137. To calibrate the display “[t]he sensor feedback information is processed to determine the

characteristics of the various LED light sources with respect to brightness and color (wavelength).” *Id.* ¶138. “The LED characteristics may change with temperature as the electronics heat up and as the LEDs age which changes the PSF [Point Spread Function].” *Id.*

56. U.S. Patent Publication No. 2007/0153548 additionally discusses adjusting different colored LEDs (e.g. RGB) based on a color sensor. *See* Ex-1022. “A signal from the color sensor 70 conducts current control of an LED control portion for white balance control.” *Id.* ¶109.

V.X. PRIORITY DATE

The earliest possible priority for the ’887 Patent is January 23, 2008.

41.57. I have been informed that Petitioner takes no position on the proper priority date for each claim of the ’887 Patent. Assuming The earliest possible priority for the ’887 Patent is January 23, 2008, based on the filing date of provisional application 12/018,399. I have been asked to apply this earliest date, all prior art references asserted date for purposes of the invalidity arguments presented in this petition are prior art.² my declaration.

VI.XI. CLAIM CONSTRUCTION

Petitioner interprets the claims of the ’887 Patent according to 37 C.F.R. § 42.100(b). To resolve the particular grounds presented in this Petition, Petitioner does I do not believe that any term requires explicit construction. Ex-1002 ¶58.³

²~~Petitioner reserves the right to resolve the issues presented in this declaration. I ascribe the plain meaning to challenge the priority date in other proceedings to the extent PO attempts to swear behind the prior art relied upon in this Petition.~~

~~42.58.~~³~~Claim construction procedures have not yet begun in the related district court matter.~~

~~Petitioner reserves the right to revisit and revise these constructions in district court as necessary.~~

~~Additionally, Petitioner will request leave to submit any each claim construction order as soon as it~~

~~becomes available, so term, as that it is timely made of record in the proceeding and can be~~

~~considered plain meaning would have been understood by the Board. 37 C.F.R. §~~

~~42.100(b)-a POSITA.~~

**VII.XII. BRIEF DESCRIPTION OF THE APPLIED PRIOR
ART REFERENCES**

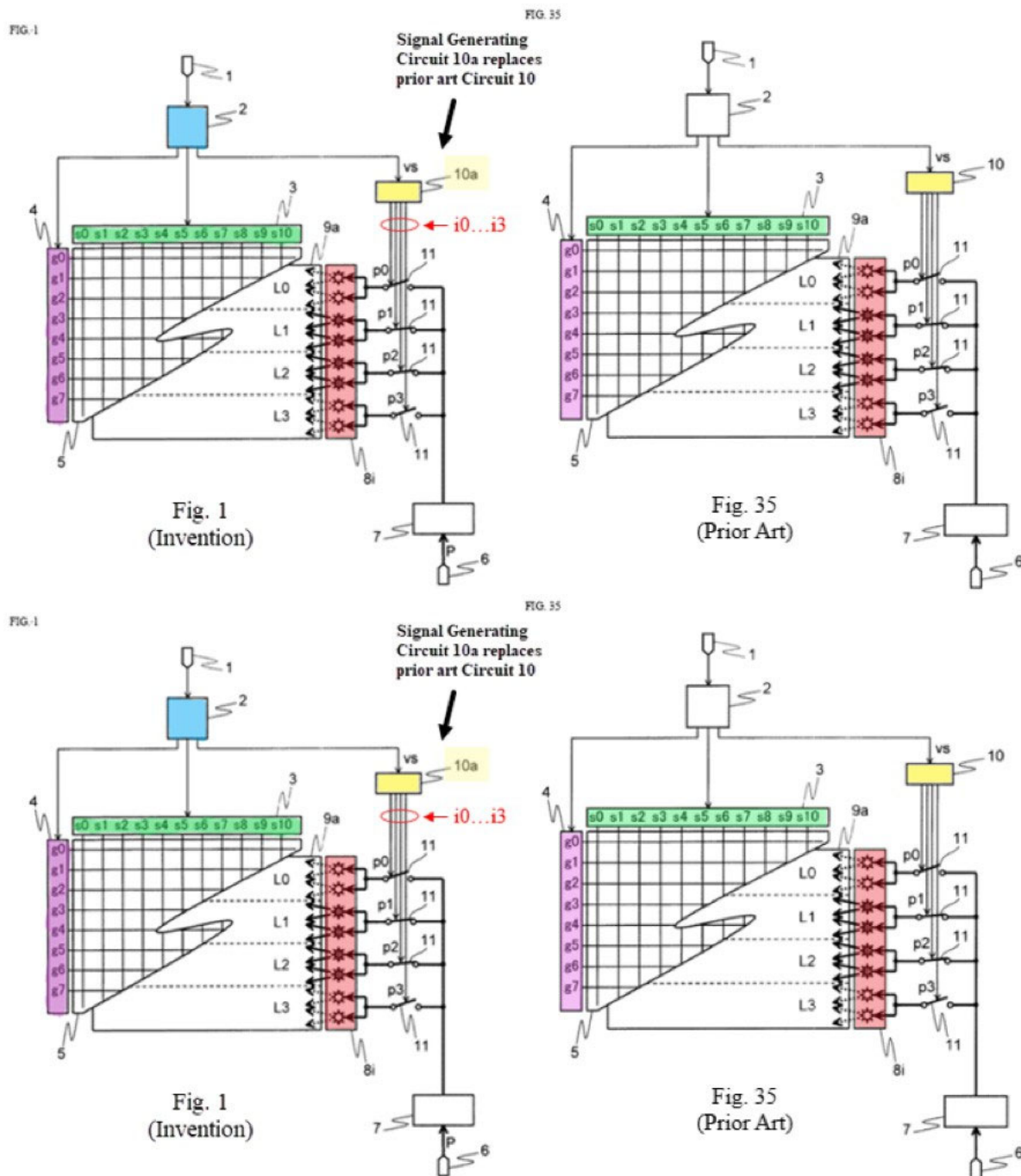
A. Seo (Ex-1005)

43.59. Seo, titled “Image Display Device,” is Japanese Patent Application 2006-18200, was filed on July 5, 2004 and published on January 19, 2006. I understand that Seo is §102(b) prior art. A certified translation is included in Ex-1005.

~~§102(b) prior art. A certified translation is included in Ex-1005. Ex-1002 ¶¶59-63.~~

44.60. Seo explains that Figure 1 is an LCD embodiment in accordance with the invention. Ex-1005 ¶111. As shown below, Seo explains further that Figure 1 is the same as prior art Figure 35 but for the replacement of signal generating circuit 10 with the “ON signal generating circuit 10a” and otherwise the same element numbering is used for both Figure 1 and 35. *Id.* ¶112.

45.61. As shown in Figure 1, Seo discloses an image display device that “modulates light based on a video signal and a lamp [light source body] 8i that illuminates the liquid crystal panel 5.” Ex-1005 ¶312, Abstract₂ (explaining that 8i is a “light source body”).



46.62. As illustrated in Figure 1 (and prior art Figure 35), “the hold type light emitting display device includes a video signal input terminal 1, a control circuit 2, a source driver 3, a gate driver 4, [] a liquid crystal panel 5,” and also generating circuit 10a. Ex-1005 ¶¶7, 112. “In addition, source lines s0, s1, s2, ..., s10 are

connected to the source driver 3, and gate lines g0, g1, g2, ..., g7 are connected to the gate driver 4.” *Id.* ¶7. Seo explains that the picture elements scanned by g0 to g7 are illuminated by the four areas L0 to L3 on light guide plate 9a of Figure 1.

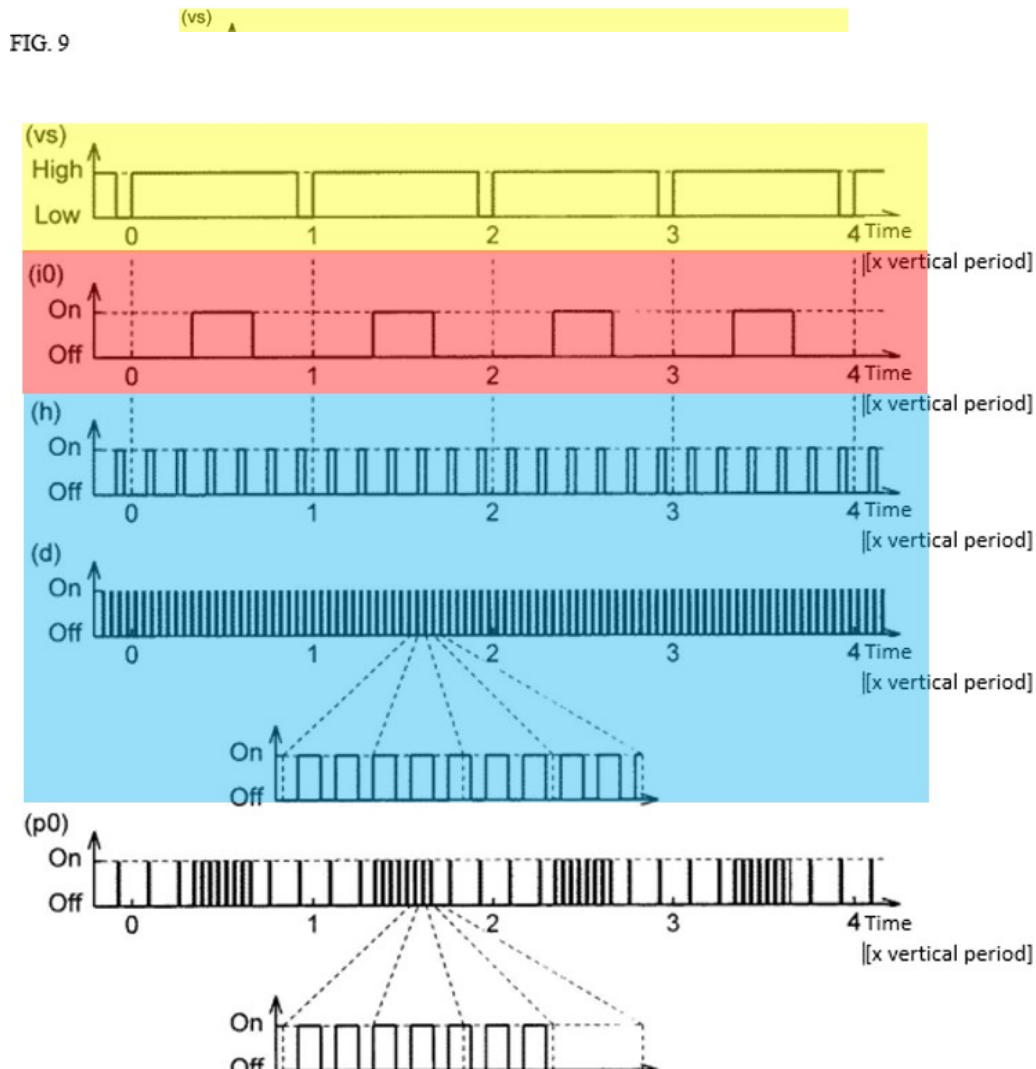
Id. ¶18.

Id. ¶18.

47.63. Seo explains that generating circuit 10a includes signal counter 202 and generates impulse signals i0 (below, red) to i3 synchronized with a vertical sync signal “vs” (below, yellow). Ex-1005 ¶113. Signal generating circuit 10a also

produces impulse signals “h” and “d” (below, blue) used for adjusting the luminosity levels of the LEDs multiple times within a single vertical sync (vs) period. *Id.* ¶154. As shown in Figure 9, ~~these signals, “h” and~~ the signal “d,” (blue) result in adjusting the luminosity of the LEDs several times within a single “vs”

FIG. 9



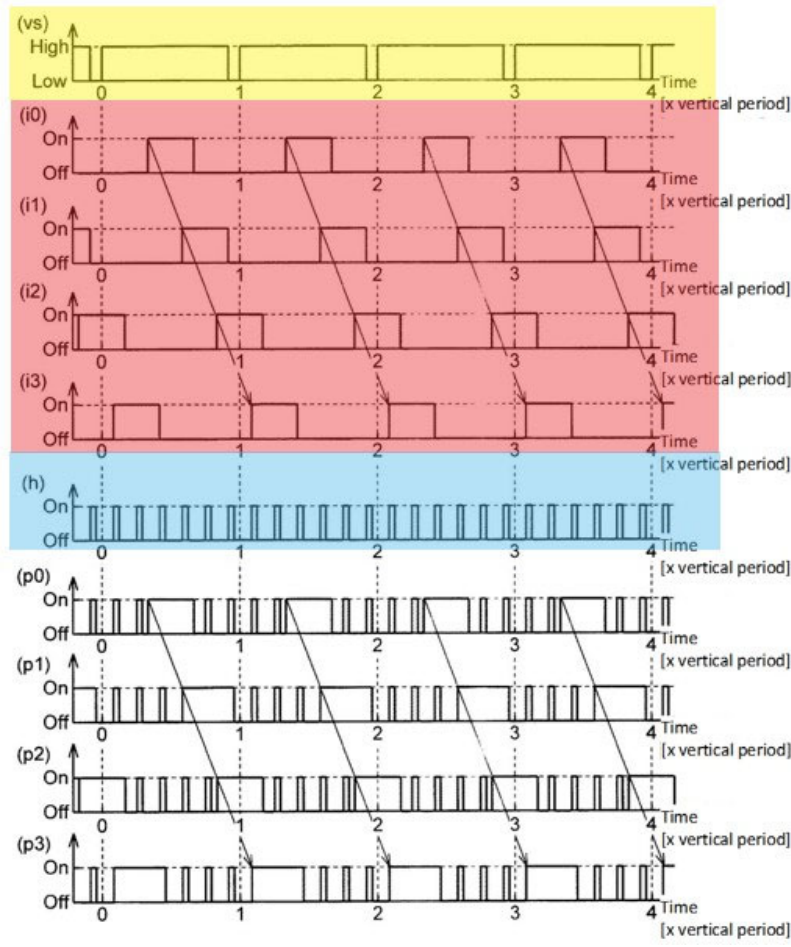
period (yellow). ~~Ex 1002~~ ¶63.⁴²

⁴Similarly, as shown in Figure 3, the signal “h,” results in adjusting the luminosity

of the LEDs several times within a single “vs” period.

² Throughout this Petition declaration, all annotations and emphasis have been added, unless otherwise noted.

FIG. 3



B. Yao (Ex-1006)

[48-64.](#) Yao, titled “Dynamic Backlight Control System,” [is](#) U.S. Patent Publication 2007/0279369, was filed on June 2, 2006 and published on December 6, 2007. [I understand that](#) Yao is 35 U.S.C. §102(e) prior art. ~~Ex-1002 ¶¶64-66.~~

[49-65.](#) As shown in Figure 2, Yao discloses that “LCD 200 is illustrated having a color filter (CF) glass layer 202, a liquid crystal layer 204, and an array glass layer 206.” Ex-1006 ¶19.

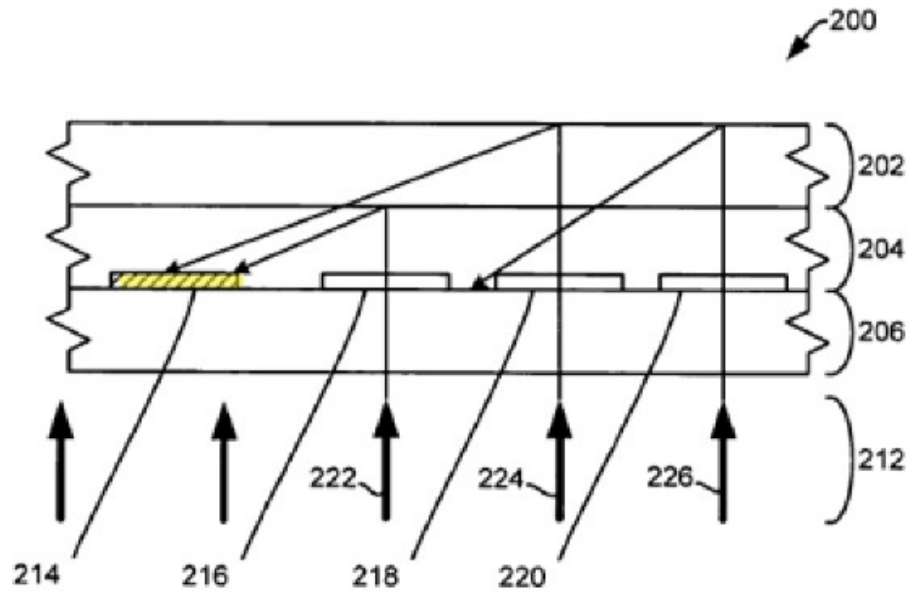


FIG. 2

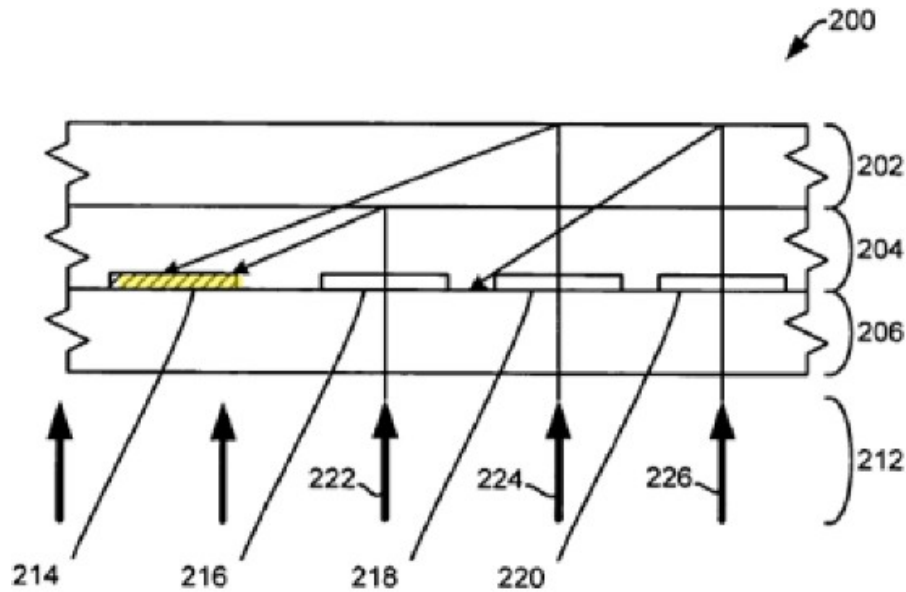


FIG. 2

[50-66](#). Yao also discloses that LCD 200 further includes “[a]n ambient light sensor 214 [yellow] is also mounted on array glass layer 206.” *Id.* Also, “backlight 212 may be utilized with an LCD to provide illumination of pixels.” *Id.* Yao explains that “embodiments provided herein may be equally applied to LED and OLED’s without departing from the present invention.” *Id.*

C. Fung (Ex-1007)

[51-67](#). Fung, titled “Method and Apparatus for Controlling Light Emitting Diode,” [is](#) U.S. Patent Publication No. 2008/0180414, was filed on January 30, 2007 and published on July 31, 2008. [I understand that](#) Fung is 35 U.S.C. §102(e) prior art. ~~Ex 1002 ¶¶ 67-69.~~

52-68. As shown in Figure 2, Fung discloses backlight unit (BLU) 110 (below, blue) coupled to a plurality of LED (Light Emitting Diode) drivers 112 (below, cream) that drive one or more strings of LEDs. Ex-1007 ¶28. Drivers 112 together with DC-DC converter 204 (below, purple) are arranged to provide a constant current power supply to LEDs 202. *Id.* ¶29.

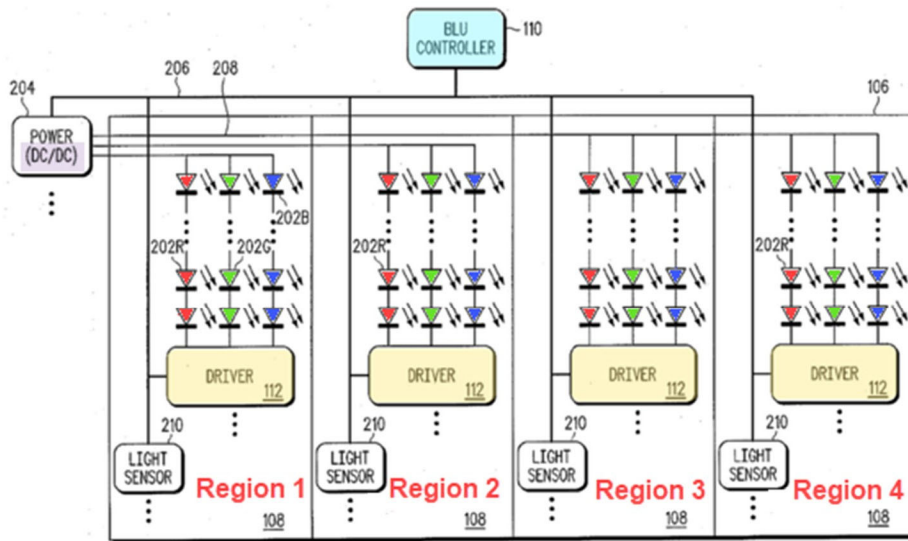


FIG. 2

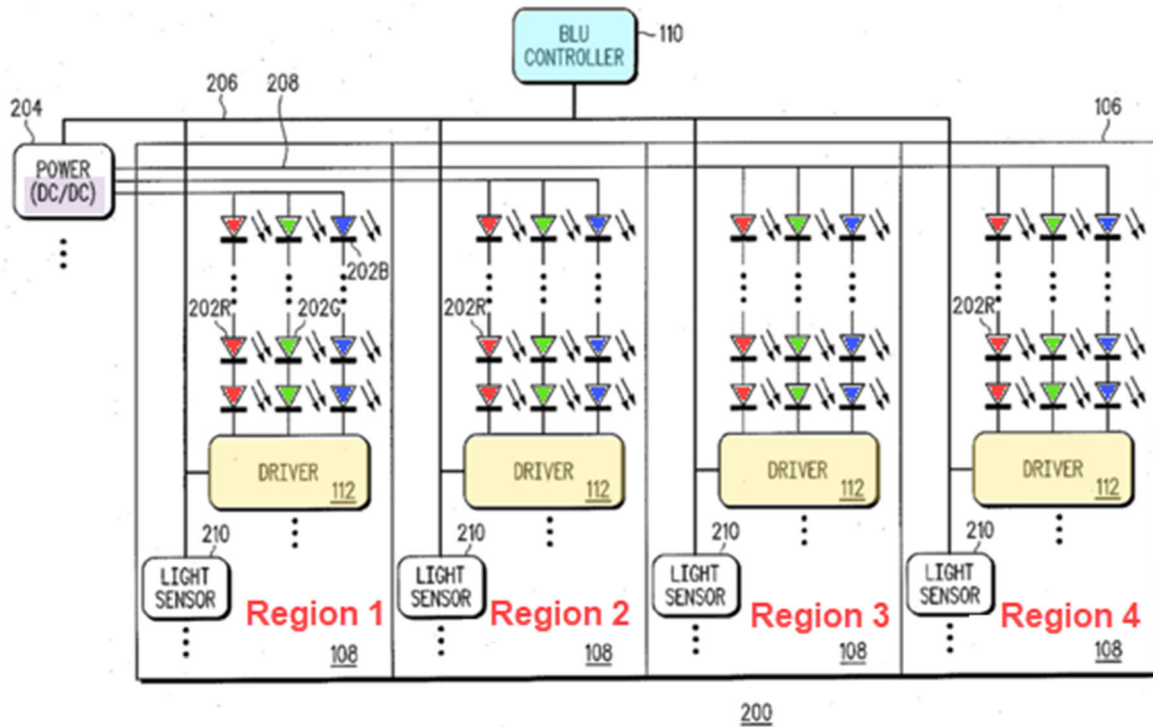


FIG. 2

[53-69](#). Fung explains that each BLU region 108, comprises, blue LEDs 202B, green LEDs 202G and red LEDs 202R. *Id.* Fung also discloses that “different combinations or colored LEDs may be used, or a single color such as white LEDs may be used.” Ex-1007 ¶20. Fung also explains “drivers 112 each receive a driving signal parameter from the BLU controller 110, which acts as a master LED driver[.]” *Id.* ¶23. Fung discloses that “[t]he driving signal parameter may be a

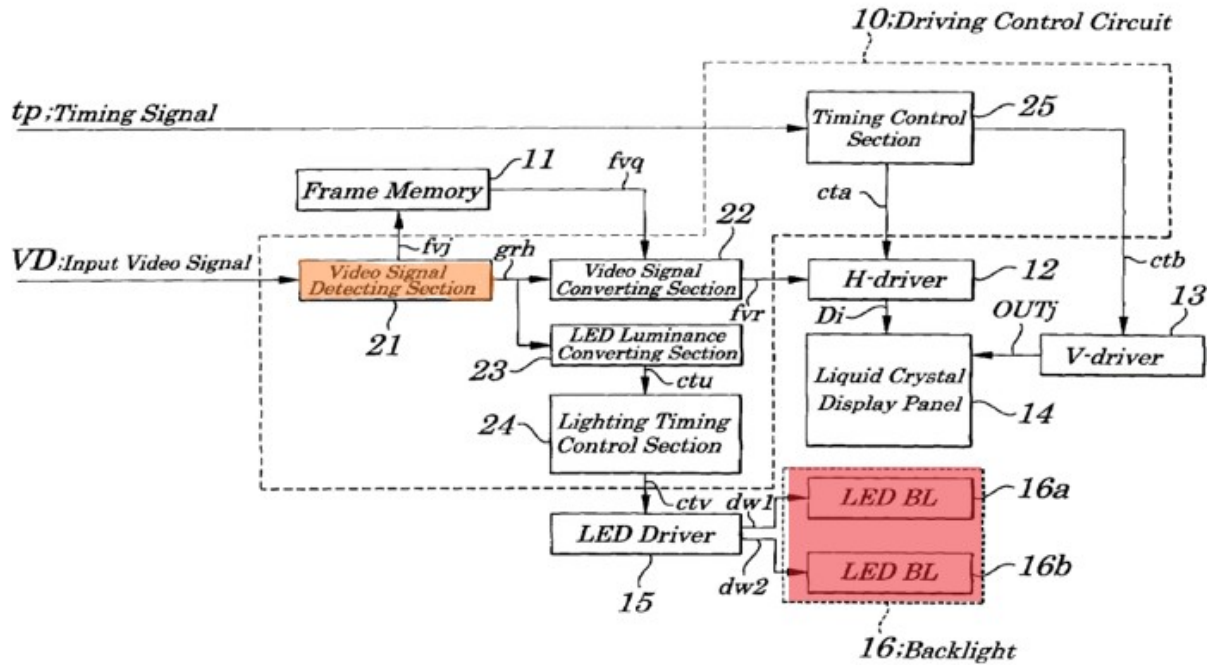
duty cycle corresponding to a master driving signal 118 from the BLU controller

110” and that the “master driving signal 118 is typically a PWM⁵³ signal.” *Id.*

⁵³~~PWM refers to Pulse-width modulation.~~

³ PWM refers to Pulse-width modulation.

FIG. 1



56-72. Driving control circuit 10 “has a video signal detecting section 21, a video signal converting section 22, an LED luminance converting section 23, a lighting timing control section 24, and a timing control section 25.” Ex-1008, Id. at 9:46-49. Video signal detecting section 21 (highlighted orange) “detects, in a manner to correspond to each of LED blocks (LED BL) 16a and 16b, the brightest gray level for each of the R, G, and B of an input video signal VD, in every frame period[.]” *Id.* at 9:51-53. As shown in Honbo’s Figure 4, backlight 16 is “divided into two portions, LED blocks 16a and 16b, in a y direction of the liquid crystal display panel 14.” *Id.* at 11:53-55.

FIG. 4

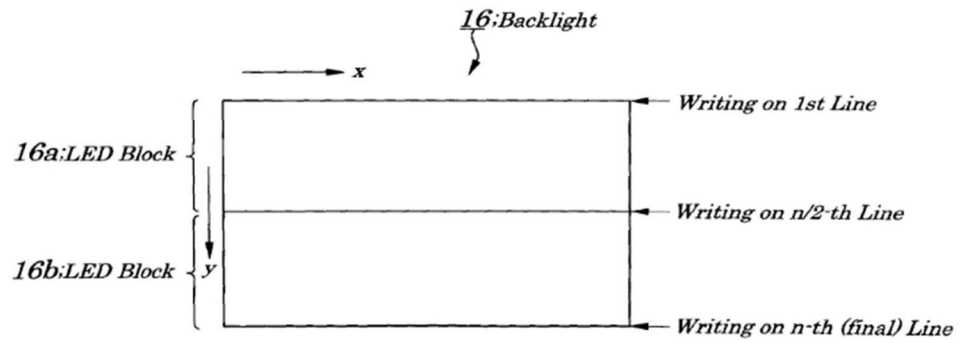
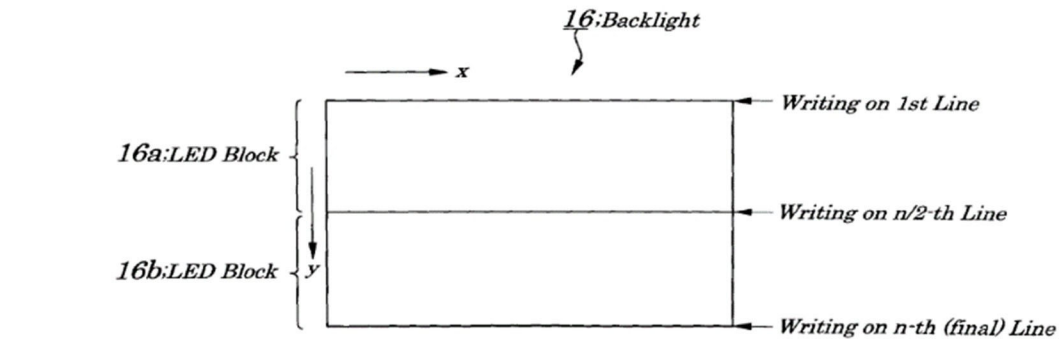


FIG. 4



VIII.XIII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS

57.73. The '887 Patent contains 21 claims, of which ~~three~~3 are independent. Claims 1, 13, and 17 are similar, with a few minor variations in some of the elements. Like claim elements in claims 1 and 13 are discussed together in the below element-by-element analysis. Exhibit 1020 is a summary table showing correspondence between challenged claims and elements. To the extent there are any meaningful differences, such differences are individually identified and discussed. As explained below, the challenged claims are disclosed and/or taught by the prior art.

A. Ground 1 and Ground 2: Claims 1-5, 7, 10-11, 13-15, and 18-20 are obvious in view of Seo alone, Ex-1005, and also Seo in view Fung, Ex-1007 (Seo-Fung)

1. A POSITA would have been motivated to combine the teachings of Seo and Fung, and would have had a reasonable expectation of success in doing so.

74. Seo alone (Ground 1), and also in view Fung (Ground 2), teaches all the limitations of Claims 1-5, 7, 10-11, 13-15, and 18-20. As set forth in more detail below, a POSITA would have been motivated to combine teachings of Fung with the teachings of Seo. Both references relate to illumination control in liquid crystal displays (LCD) using pulse width modulation (PWM). Ex-1005 ¶¶148, Abstract; Ex-1007 ¶¶2, 11; Ex-1002 ¶74; ¶148; Ex-1007 ¶¶2, 11. As explained in Section XI.D., PWM was a common technique to achieve the goals of individual local dimming control. Seo uses a “lamp 8i” to provide backlighting for its LCD. Seo further explains that its “lamp 8i” is a “light source body” ~~providing~~ “and that “the light ~~emission~~source body in the ~~image display of the~~ present invention ~~include[ing]is preferably a~~ semiconductor light emitting ~~element~~element.” Ex-1005 ¶¶100, 312. Further, Seo explains that “as a semiconductor light emitting element, for example, LEDs.” Ex-1005 ¶¶279, 312. ~~a light emitting diode is used as the light source body.”~~ *Id.* ¶101. Moreover, Seo teaches that “[a] lamp such as an LED (Light Emitting Diode) is suitable for impulse type light emission,” and explains that the LCD

backlight used in the disclosed invention is of that type. *Id.* ¶¶15-17, 111, 112. And

Fung specifically teaches that an LCD backlight may “be comprised of three arrays

of Red, Blue, and Green LEDs, the outputs of which are mixed to generate white light for backlighting the LCD.” Ex-1007 ¶2. Additionally, an “array of LEDs in each region [is] arranged into strings of serially connected LEDs.”” and that “[a]lternatively different combinations or colored LEDs may be used, or a single color such as white LEDs may be used.” *Id.* ¶20. A POSITA implementing Seo’s light source 8i would have been motivated to apply the teachings of both Seo and Fung, and use strings of LEDs to provide white light as the backlight for the LCD.

~~Ex-1002 ¶74. As explained by Fung, a POSITA would have recognized a benefit~~As explained by Fung, a POSITA would have recognized a benefit of doing so, including to “provide greater control, longer life, and uniformity of light output” and “greater control over LED brightness.” Ex-1007 ¶¶2, 3. For example, a POSITA would have understood that the two LEDs shown in Figure 1 for each of the lighting guide plate L0, L1, L2 and L3 are for illustration purposes. As per the explicit teaching of Seo, the number of LEDs “is not limited to two,” and as per the facts that more LEDs provide more light, and that commercial LED string drivers at the time were available for eight LEDs per string, a POSITA would have been motivated to use a string of LEDs that would include more than two LEDs in order to be compatible with existing drivers and achieve higher brightness. See Ex-1025.

~~of doing so, including to “provide greater control, longer life, and uniformity of light output” and “greater control over LED brightness.” *Id.*; Ex 1007 ¶¶2, 3.~~

75. And a POSITA would have had a reasonable expectation of success in doing so, since both Seo and Fung teach techniques for implementing LEDs as backlight light sources, and a POSITA would simply implement the teachings of

the respective references with predictable results that are well within the level of skill of a POSITA. ~~Ex-1002 ¶¶75~~ See Section IX.A.

2. Independent Claims 1 and 13

a. 1[Pre] - A control circuit for an electronic display comprising:

13[Pre] - A method for controlling an electronic display comprising:

76. Seo alone teaches the preambles of Claims 1 and 13 to the extent they are limiting. ~~Ex-1002 ¶¶76-77.~~

77. As shown in Figure 1, Seo discloses a control circuit as “control circuit 2” (below, blue) for a “liquid crystal display (LCD).” Ex-1005 ¶¶1, 17. Moreover, a POSITA would have controlled the display using the method of Seo in accordance with its teachings. ~~Ex-1002 ¶77.~~

FIG. 1

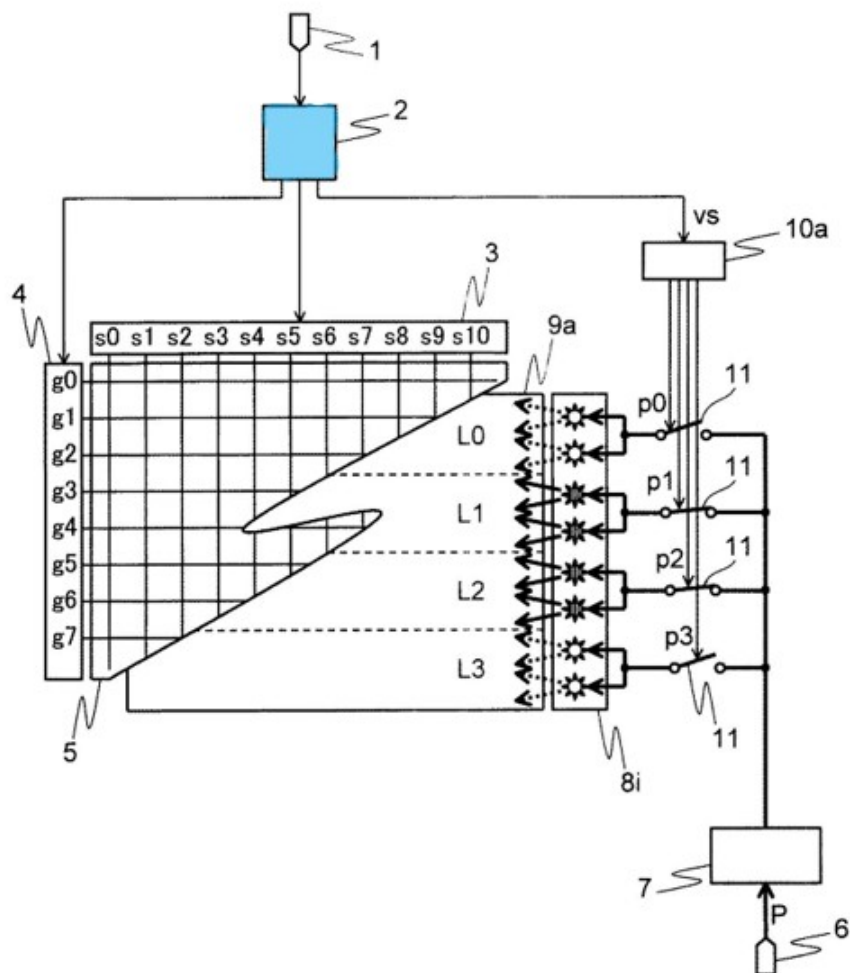
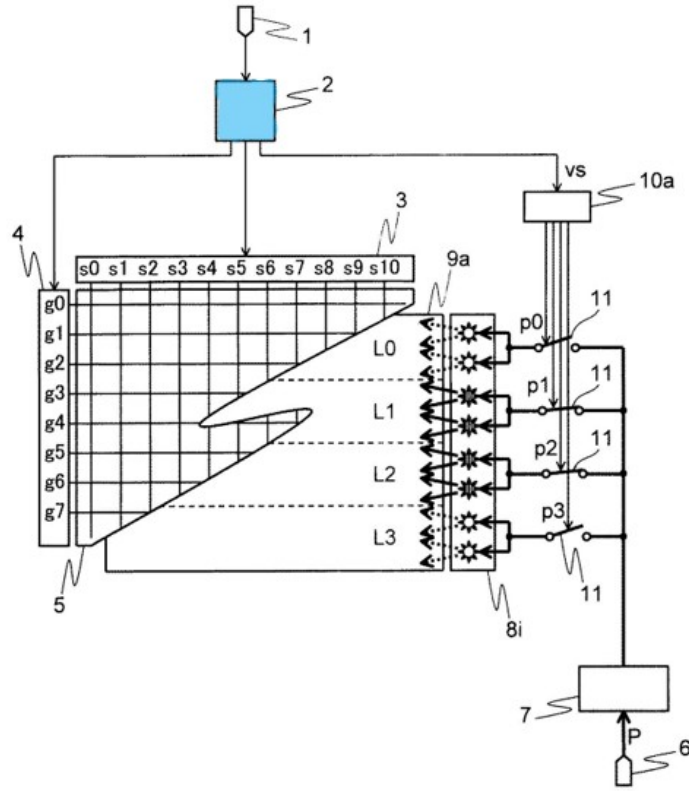


FIG. 1



a. 1[A] - a first circuitry for controlling luminosity levels of a plurality of strings of light emitting diodes (LEDs);

13[Ci] - using the clock signal for adjusting luminosity levels of a plurality of strings of light emitting diodes (LEDs) in a backlighting circuitry of the electronic display,

78. Seo alone or in view of Fung teaches elements 1[A] and 13[Ci]. ~~Ex-1002~~

~~78-84.~~

FIG.-1

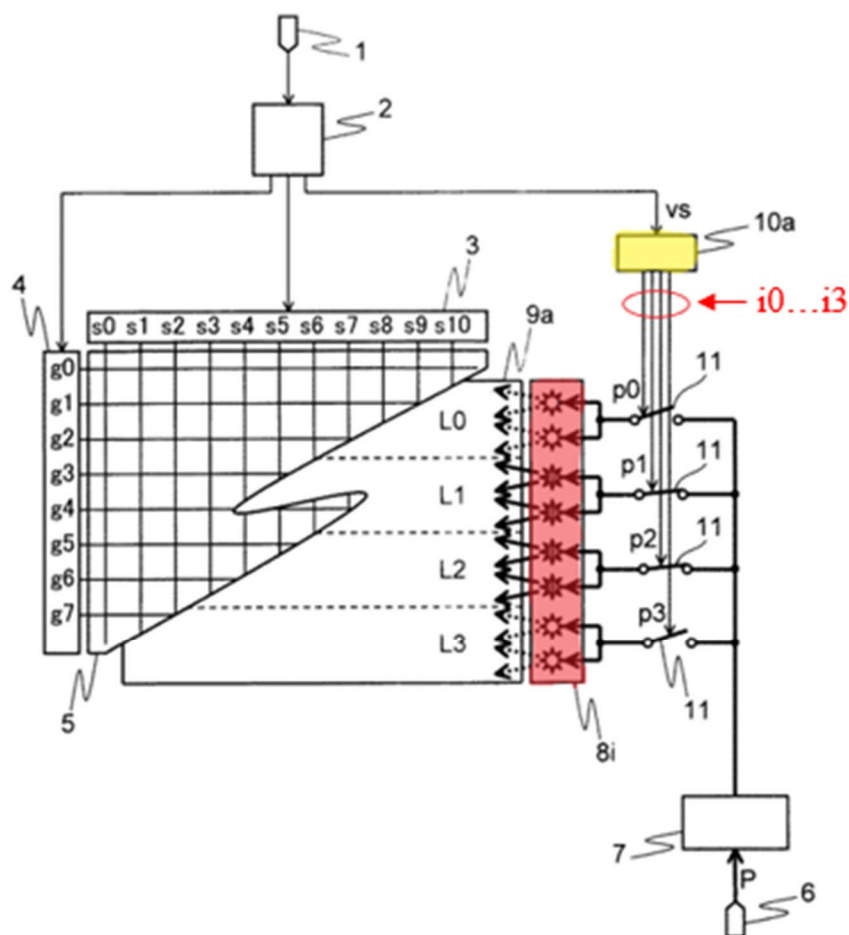
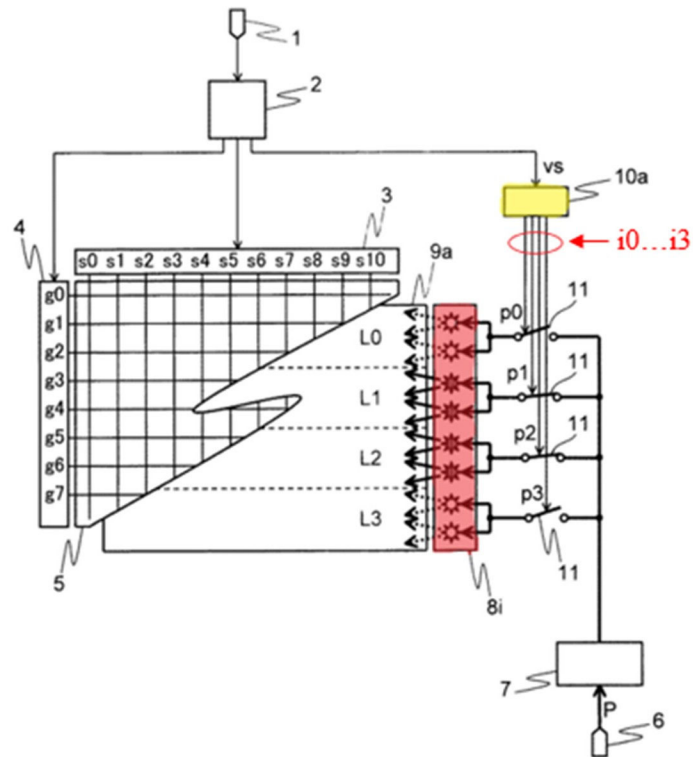


FIG.-1



80. Seo discloses various configurations of the LEDs turn ON circuit 10a.
According to the configuration disclosed in Fig. 10, which is similar to the
configuration disclosed in Fig. 2, it produces ~~three kinds of a~~ luminosity-driving
clock ~~signals: signal that includes the~~ impulse signal “i0-i3” (identified above), and
the pseudo hold pulse signal “h.” Specifically, Seo teaches that the LED turn ON
signals p0, p1, p2 and p3 are each a composite of one of the impulse signals “i0-
i3” and the signal “h” and PWM dimming signal “d.” *Id.* ¶¶ Ex-1005 ¶¶ 122, 154. As
shown in Figure 1, the

input to box 10a is “vs,” the vertical synchronization clock signal,⁶⁴ used to generate the resulting luminosity-driving clock signals “i0-i3,” “h,” and “d.” ~~Ex-1002 ¶80.~~ Seo also states that “the light emission luminance correspond[s] to the impulse signals, “i0 to i3,”” as well as “h” and “d” from circuit 10a. ~~Ex-1005~~ Id. ¶¶135-136. Moreover, ~~these signals are used to drive LEDs, creating “an impulse type~~ Seo explains that with respect to the light emitted by the LEDs “that is a mixture of the pulse component i and the pulse component h emitted by the light source body.” Id. ¶039 Seo also explains that when “a light emitting backlight” to illuminate the display pixels. Id. ¶116. diode is used as the light source body, the pulse component h and the pulse component i can be suitably emitted from the light source bodies.” Id. ¶101. As depicted in Fig. 1 and Fig. 10, Seo’s generating circuit is thus being used to control luminosity levels using impulse signals sent to the LEDs for backlighting the display pixels. ~~Ex-1002 ¶80.~~

80-81. Figure 10⁷⁵ (depicting “the turn ON signal generating circuit 10a for the LCD of invention 1,” Ex-1005 ¶113), shows that signal generating circuit 10a, ~~i.e. the first circuitry, includes at least two clocking circuits used to generate impulse signals that drive the LEDs: counter 102 and counter 202p. Ex-1005 ¶114; Ex-1002 ¶¶48, 81. Seo explains that generating circuit 10a includes “counter 202p, count period setting means 203a for the counter 202p, turn ON time setting means~~

⁶⁴i.e. the first circuitry, includes at least two clocking circuits used to generate

⁴ A POSITA would have understood that Seo's reference to "vs" is reference to a standard VSYNC signal, which a POSITA would have understood as a "clock signal." *See, e.g.* Ex-1005 ("a vertical sync signal vs.") This is confirmed by the 887 Patent itself: "The HSYNC and VSYNC signals are clock signals." Ex-1001, 4:7-8.

⁷⁵ Figure 10 is one of several signal generating circuits 10a corresponding to the Figure 1 embodiment of the invention (Ex-1005 ¶111) and, as shown below, uses the same numbering as Figure 2.

impulse signals that drive the LEDs: counter 102 and counter 202p. Ex-1005 ¶114.
Seo explains that generating circuit 10a includes “counter 202p, count period
setting means 203a for the counter 202p, turn ON time setting means 203r, [and]
turn OFF time setting means 203f[.]” ~~Ex-1005 ¶114~~Id. As shown in Figure 10,
counter 202p generates the pseudo hold pulse signal h (purple box). *Id.* Fig. 10.
Output from box 10a are signals p0-3 that drive the LEDs, which are signals based
on both i0-3 and “h.” ~~Ex-1002 ¶81.~~ And as shown, input into each of counters 101
and 202p is the vertical sync signal “vs” 101. Accordingly, these output signals are
all based on “vs.” ~~Id.~~

FIG. 10

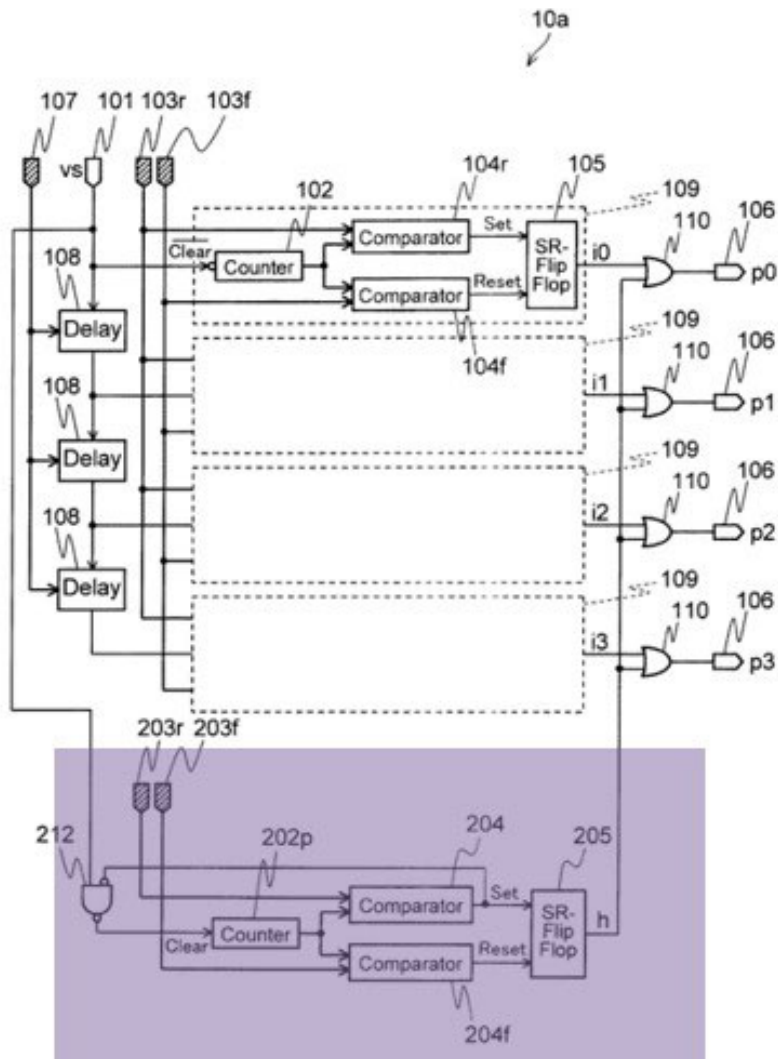
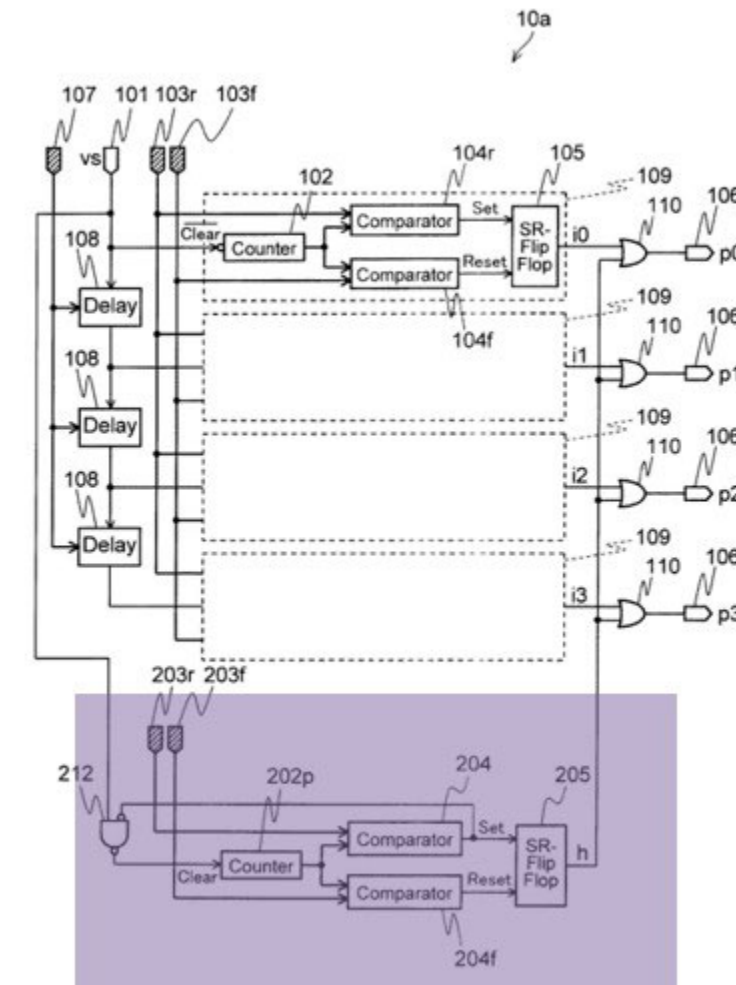


FIG. 10



Ground 1

[81-82](#). Seo teaches or suggests implementing LEDs in strings of two or more LEDs. For example, Seo's Figure 1 also discloses lamp 8i (above, red) and explains that "the plurality of lamps 8i are divided into four systems for illuminating areas L0 to L3." Ex-1005 ¶143. Seo explains that "[a] lamp such as an LED (Light Emitting Diode) is suitable for impulse type light emission." *Id.* ¶17. Moreover, there can be more areas than four areas (L0-L3), and the number of

lamps/LEDs illuminating each area “is not limited to two.” *Id.* ¶144. A POSITA would have understood that the LEDs in Seo would have been implemented as a plurality of strings of LEDs because, as shown in Figure 1, Seo’s multi-LED light sources in each zone (L0 through L3) are coupled to a power supply on one end (controlled by signals p0 to p3) and to ground on the other end⁸, and a string of LEDs would provide more uniform illumination and more control over the illumination level.⁸⁶ See Ex-1002 ¶¶41–44, 821024. Moreover, to the extent not disclosed by Seo, it would have been obvious to implement Seo’s LED’s as strings of multiple LEDs because Seo teaches multiple (two or more per zone) ⁷ LEDs illuminating each zone, and having a string of series LED’s was the common way to implement multiple LEDs in display panels at the time. See Ex-1014, Fig. 4. For example, a POSITA would have understood that a higher number of LEDs per string would produce a higher level of illumination thus resulting in a brighter display. Thus, a POSITA would have understood that the two LEDs shown per string in Figure 1 of Seo is for illustration. It would have been obvious, as per the teachings of Seo (i.e.

⁸

⁶ A POSITA would have understood that Seo’s LEDs are “strings of” LEDs as claimed because the ’887 Patent explains that “[t]ypically, each string [of LEDs] is coupled to a power supply on one end and to the ground on the other end.” Ex-

1001, 3:23-24. Thus, a POSITA would have understood that Seo's LEDs are arranged in a string, just as described by the '887 Patent. ~~Ex 1002 ¶82.~~

¶ Seo expressly teaches a plurality of light sources on each string, showing two in the figures, and also explains that more ~~per zone~~⁹ could be used. Ex-1005 ¶144 (“The number of lamps illuminating one area is not limited to two.”)

the number of lamps/LEDs illuminating each zone, and having a string of series-LED's was the common way to implement multiple area "is not limited to two."), to increase the number of LEDs in-per string in order to achieve a display panels at the time. Ex-1002 ¶82; see e.g. Ex-1009, Fig. 4 with higher brightness. Moreover, as discussed in Section XIII.A.1, commercial drivers were available at that time to drive strings having 8 LEDs per string. Thus, a POSITA would be motivated to utilize such strings.

Ground 2

82-83. Regardless, it would have been obvious to a POSITA to implement Seo's LED's as a plurality of string of LEDs in view of Fung. Ex-1002 ¶83. Fung expressly teaches that "drivers 112 may be implemented using a controller such as logic hardware or an embedded low cost microcontroller, *each driving one or more strings of LEDs.*" Ex-1007 ¶28. A POSITA would have been motivated to implement, and would have had a reasonable expectation of success in implementing, Fung's string of LEDs in Seo's LCD for the reasons explained above in Section XIII.A.1. Ex-1002 ¶83.

83-84. Specifically, Fung teaches that an LCD backlight "will be comprised of three arrays of Red, Blue, and Green LEDs, the outputs of which are mixed to generate white light for backlighting the LCD," "arranged into strings of serially connected LEDs." Ex-1007 ¶¶2, 20. Fung also teaches that "[a]lternatively different combinations or colored LEDs may be used, or a single color such as

white LEDs may be used.” *Id.* ¶20. A POSITA implementing Seo’s light source 8i

~~would have been motivated to apply the teachings of Fung, and use a string of~~

⁹~~Seo expressly teaches a plurality~~

would have been motivated to apply the teachings of light sources on each Fung, and use a string, showing two in the figures, and also explains that more could be used. Ex-1005 ¶144 (“The number of lamps illuminating one area is not limited to two.”)

RGB LEDs or single colored white LEDs to provide white light as the backlight for the LCD. ~~Ex-1002 ¶84~~A POSITA would have understood that Fung’s approach for driving the string of LEDs (i.e. via elements “power 204” and “driver 112”) is similar to Seo’s disclosed approach (i.e. via “power supply circuit 7” and “turn On signal generating circuit 10a”). Thus, implementing Fung’s disclosed LED strings in Seo would have been easy. As explained by Fung, a POSITA would have been motivated to include the benefits of doing so, such as to “provide greater control, longer life, and uniformity of light output” and “greater control over LED brightness.” *Id.*; ~~Ex-1007, ¶¶2, 3.~~

- a. **1[B] - a second circuitry for controlling a plurality of pixels for displaying a plurality of image frames of a video;**

~~84-85.~~ Seo alone teaches elements 1[B]. ~~Ex-1002 ¶¶85-87.~~

~~85-86.~~ As shown in Figure 1, Seo discloses control circuit 2 (below, blue), source driver 3 (below, green) and gate driver 4 (below, purple) ~~as a~~ which form the claimed “second circuitry” for controlling the pixels in video image frames. Ex-1005 ¶7. Seo explains that “source lines s0, s1, s2, ..., s10 are connected to the source driver 3, and gate lines g0, g1, g2, ..., g7 are connected to the gate driver 4.” *Id.* Seo also disclose that “[a] liquid crystal cell (not shown) is formed at each intersection of the source line and the gate line.” *Id.* Seo explains that “[t]he light

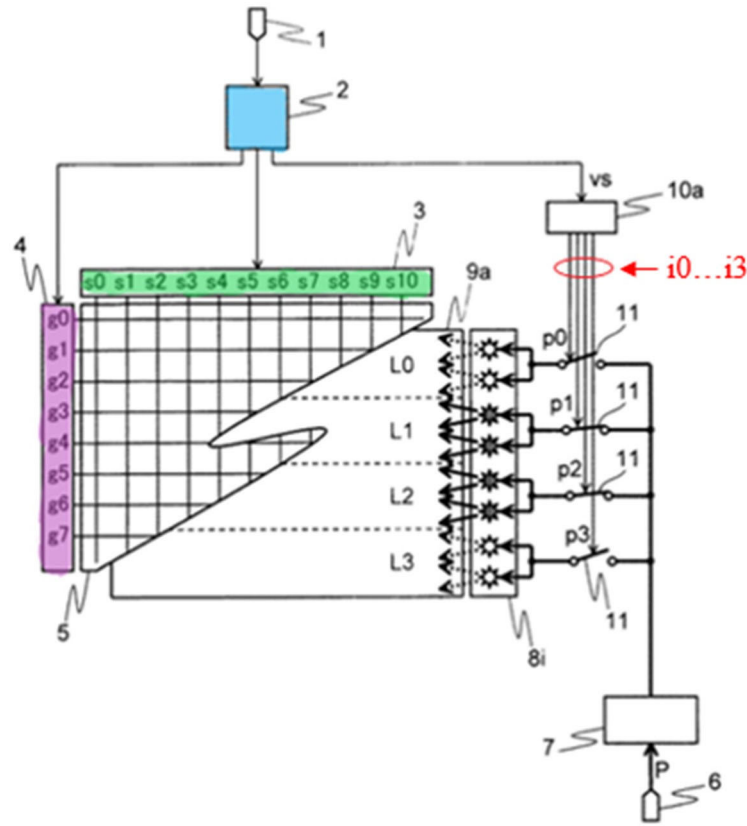
transmittance is changed according to the video signal each time the liquid crystal cell is scanned.” *Id.*

~~86.87.~~ Seo also discloses that Figure 1 includes video signal input terminal 1 and explains that the picture elements scanned by g0 to g7 are illuminated by the four areas L0 to L3 on light guide plate 9a of Figure 1. Ex-1005 ¶¶7,18. Seo states that “each picture element is updated at a frequency of once per frame.” *Id.* ¶13.

AA POSITA would have understood that the picture elements scanned by gate driver 4 and which include Seo’s disclosed liquid crystal cells formed at the intersections of gate lines and source lines are the claimed “plurality of pixels for displaying a plurality of image frames of a video.”

[illegible]

FIG. 1



- a. 1[Ci] – the second circuitry for displaying each image frame of the plurality of image frames for a predetermined period of time,

87-88. Seo alone teaches elements 1[Ci]. ~~Ex-1002 ¶¶88-89.~~

89. Seo discloses that impulse signals i0 to i3 are synchronized with the vertical sync signal “vs.” Ex-1005 ¶188. Seo also discloses that “an active-matrix type liquid crystal display device is suitable for the present invention” and explains in such a device “a plurality of picture elements are output formed” and “each gate line is sequentially selected and scanned.” Id. ¶280. A POSITA would have understood that such active-matrix liquid crystal displays hold an image frame for

a

predetermined period of time which is equal to the time that it takes to scan
all the gate lines g0 to g7 of gate driver 4. Ex 1005

~~¶188.~~ and that such predetermined time is equal to the inverse of the display's refresh rate. Seo further uses standard refresh rates for the image frames of its

video signal. For example, “the vertical frequency of the TV is also set to about 50 to 60 Hz.” *Id.* ¶30; *see also id.* ¶153. Additionally, “the impulse signals i0 to i3 are emitted in synchronization with the vertical sync signal vs, and have at most one pulse per frame. The frequency of impulse signals i0 to i3 is, for example, approximately 60 Hz for the case of displaying a NTSC video signal.” *Id.* ¶170.

~~As discussed above,~~ POSITA would have understood that a fixed-frequency refresh rate, as taught by Seo, results in an image frame being displayed for a predetermined period of time. See Ex-1002-¶891015. For example, a vertical synchronization refresh rate of 60 Hz means that the displayed image is refreshed 60 times per second. ~~Id.~~ Accordingly, the predetermined period of time that each frame is displayed would be approximately 1/60th of a second, or 16.6 milliseconds, in Seo's example using a refresh rate of 60 Hz. ~~Id.; Ex-1005.~~ ¶30.

- a. **1[Cii] – the second circuitry configured to change a displayed image frame once every cycle of a first clock signal having a first frequency; and**
- 13[B] – changing a displayed image frame on the electronic display once every cycle of the reference signal; and**

88-90. Seo alone discloses elements 1[Cii] and 13[B] for the same reason discussed in Section XII I.A.2.d; ~~Ex-1002 ¶¶90-92.~~

89-91. In Seo, the second circuitry (i.e. control circuit 2 (above, blue), source driver 3 (above, green) and gate driver 4 (above, purple)) changes a displayed image frame once every cycle of a first clock signal (vs) having a first frequency. ~~Ex-1002 ¶91.~~ For example, Seo discloses that the “vertical frequency of the TV is also set to about 50 to 60 Hz.” Ex-1005 ¶30. Also, as shown below in Figure 93, the signal “vs” (below, yellow) is the claimed “first clock” and its frequency is the “claimed first frequency” as it is used to change the displayed image ~~frame at~~ once every cycle as the scanning of all the gate lines (below, purple) is completed within each cycle as depicted in Fig. 37. Though the operation depicted in Fig. 37 is for a first frequency; prior art active matrix liquid crystal display, a POSITA would understand that Seo’s invention operates in the same way. Id., Fig. 3, Fig. 37.

FIG. 9

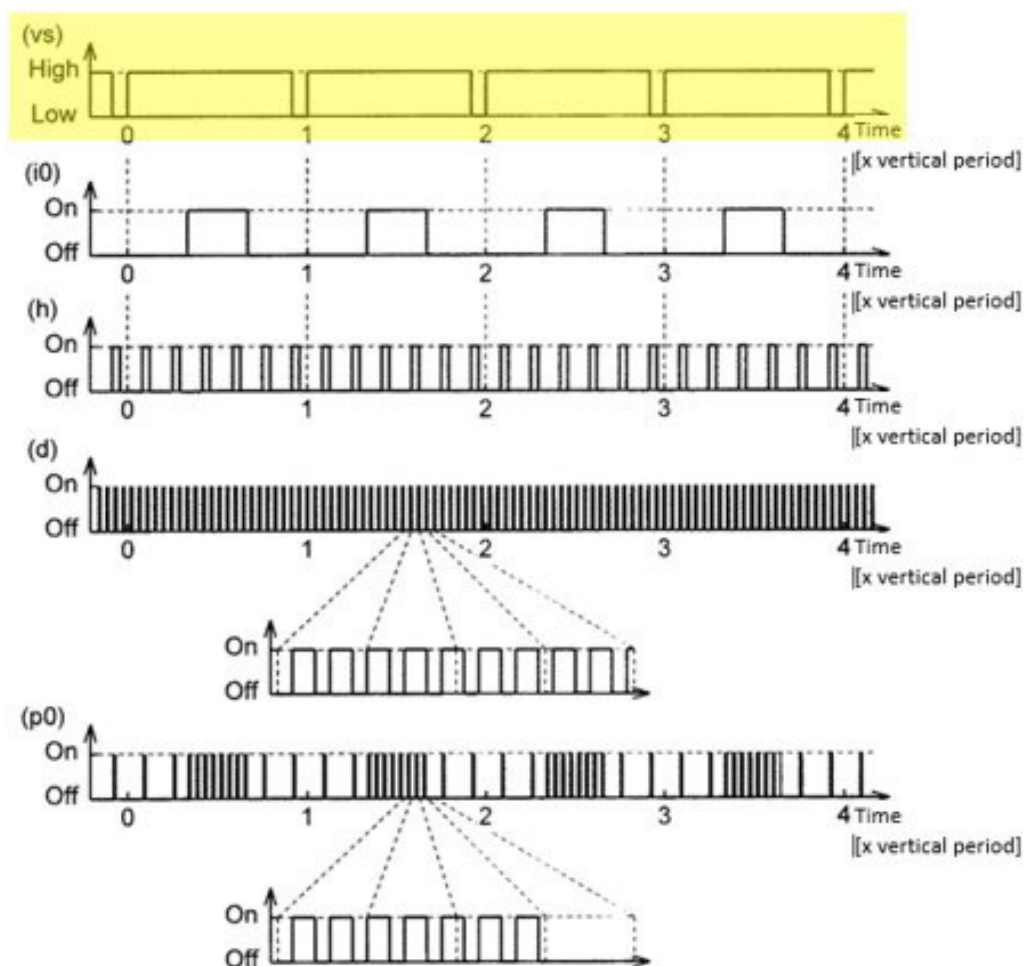


FIG. 3

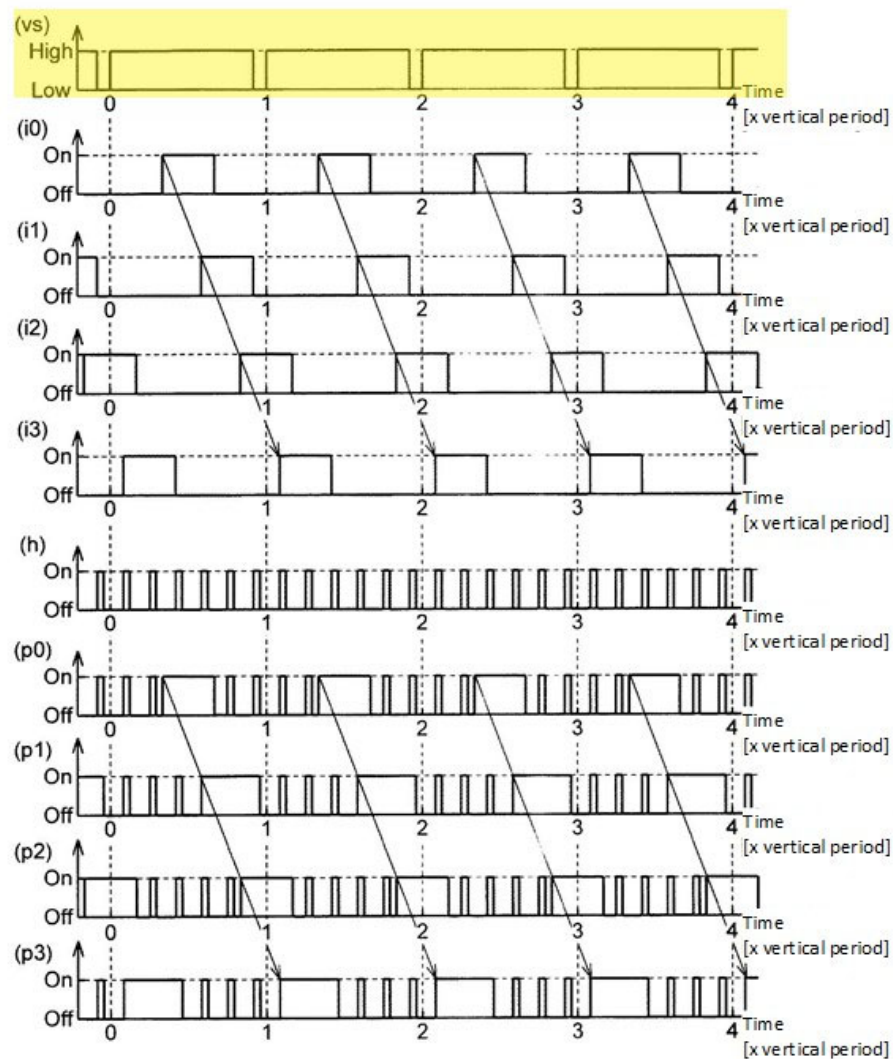
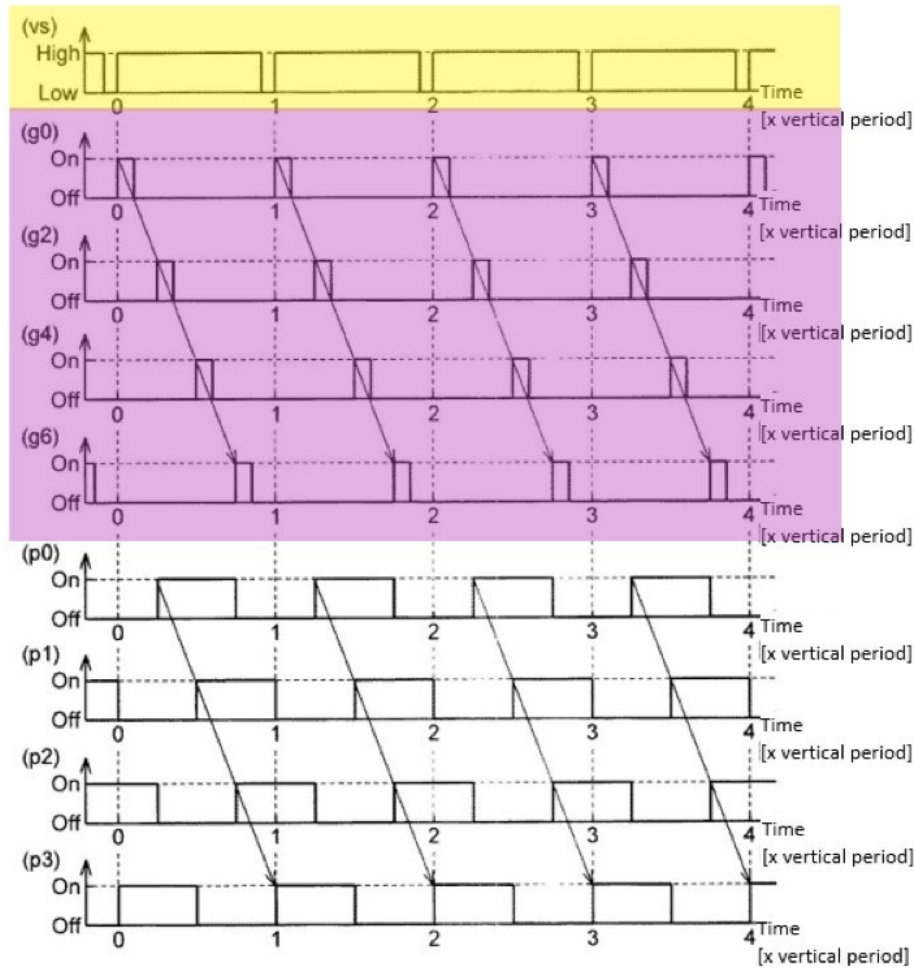


FIG. 37



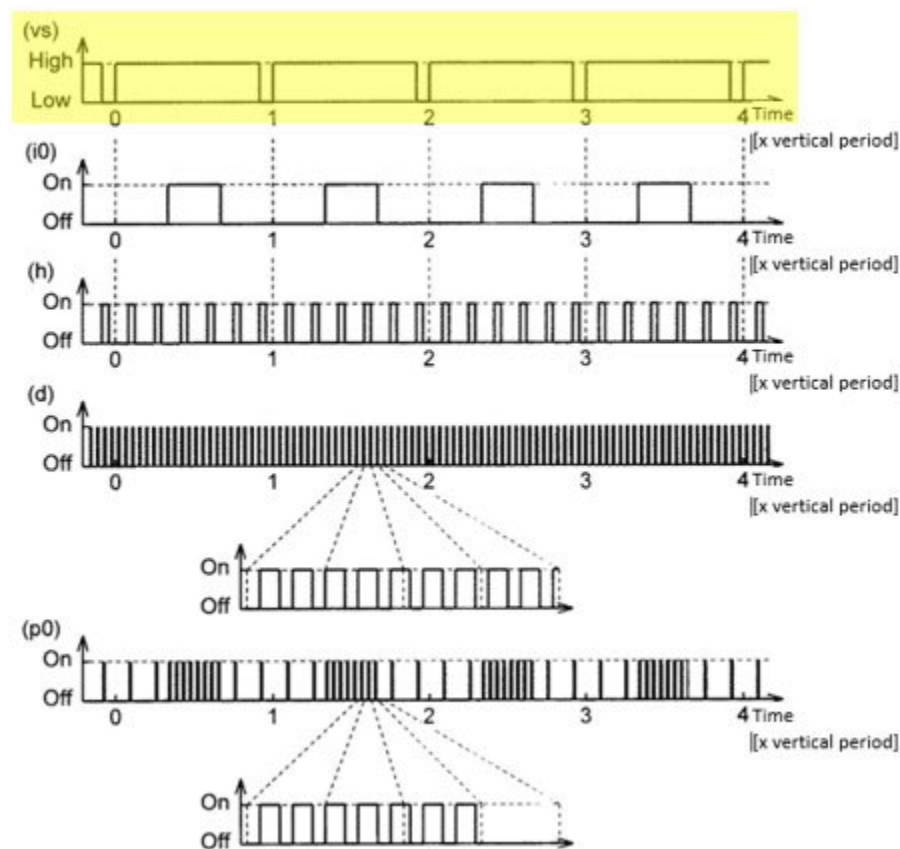
Id., Fig. 3, Fig. 37.

90.92. Further, Figure 9- also shows the signal “vs” (below, yellow) is the claimed “first clock” and its frequency is the “claimed first frequency.” Thus, a

POSITA would have understood that Seo discloses a second circuitry that changes a displayed image frame once every cycle of a first clock signal having a first frequency, the first frequency corresponding to the vs clock signal, such as 60 Hz.-

Ex-1002 ¶92.

FIG. 9



a. **1[Di]** – the first circuitry for adjusting the luminosity levels of the plurality of strings of LEDs for a plurality of times within the predetermined period of time,

13[Cii] – wherein luminosity levels of at least one of the plurality of strings of LEDs are adjusted a plurality of times based on the clock signal during display of one image frame in a sequence of image frames

[91-93](#). Seo alone teaches elements 1[Di] and 13[Cii]. ~~Ex 1002 ¶¶93-101.~~

[92-94](#). As discussed above in Section XII.A.1.b, Seo discloses adjusting luminosity levels of the plurality of strings of LEDs. Seo's generating circuit 10a

(the first circuitry) provides the impulse signals used to adjust luminosity

levels. ~~Ex-1002~~

¶94. As illustrated in Figure 4, (similarly to the prior art disclosed by Seo in Fig. 38), illuminating areas “L0 to L3 of the light guide plate 9a sequentially emit light

in the same direction as the scanning of the gate []synchronized with the vertical

sync signal vs.” Ex-1005 ¶27. As it is also illustrated in Figure 4, a number of illumination pulses are depicted as shaded areas within an image frame time period, i.e. the predetermined time (time interval 0-1, 1-2, 2-3, or 3-4 in Fig. 4).

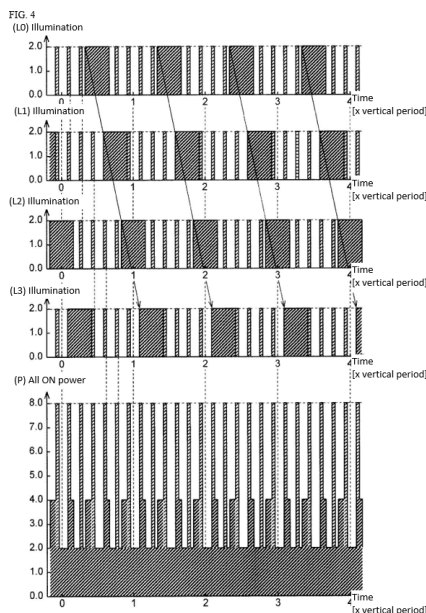
Thus, a POSITA would have understood the illuminating areas that the luminosity

levels of each of the backlight areas (L0 – L3), each illuminated by a string of

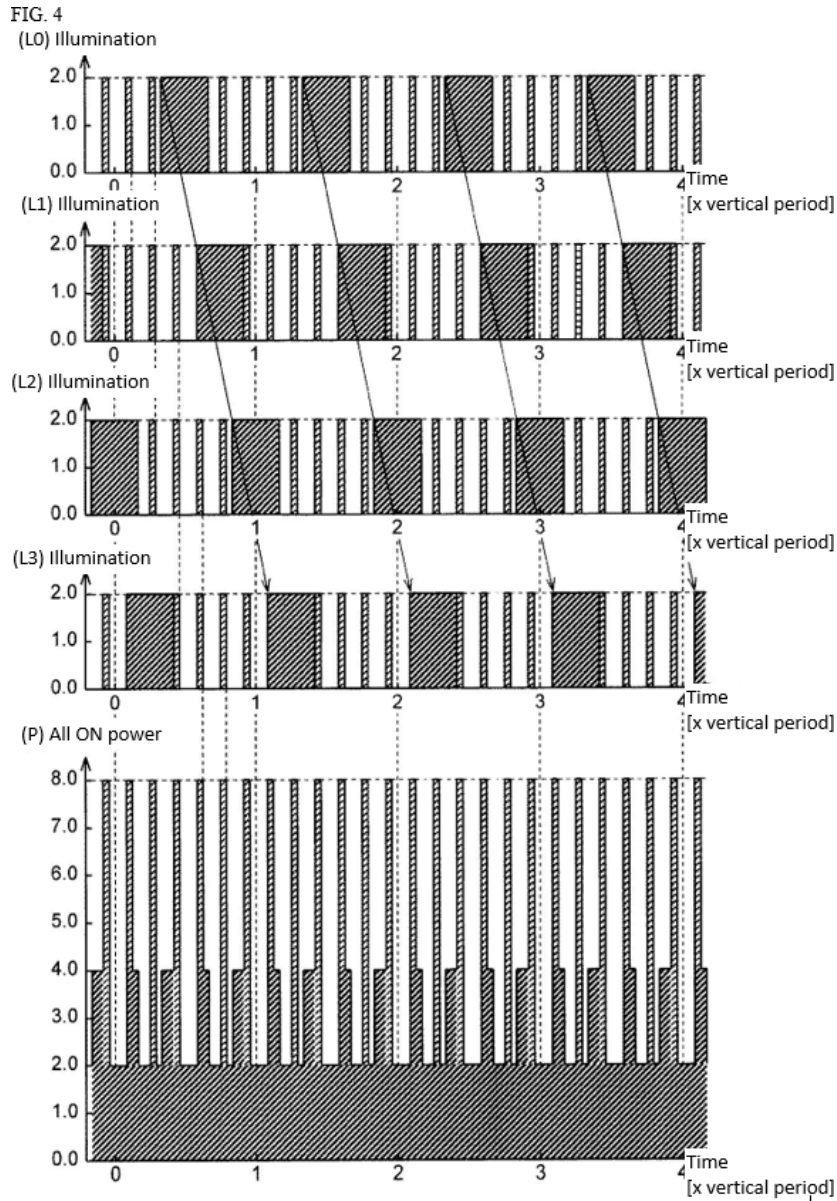
LEDs as discussed above in XIII.A.2.b, is adjusted a plurality of times within an

image frame period to emit light synchronized with the vertical sync signal “vs”

(which defines the “predetermined period of time” during which an image frame is



displayed). ~~Ex 1002 ¶94.~~



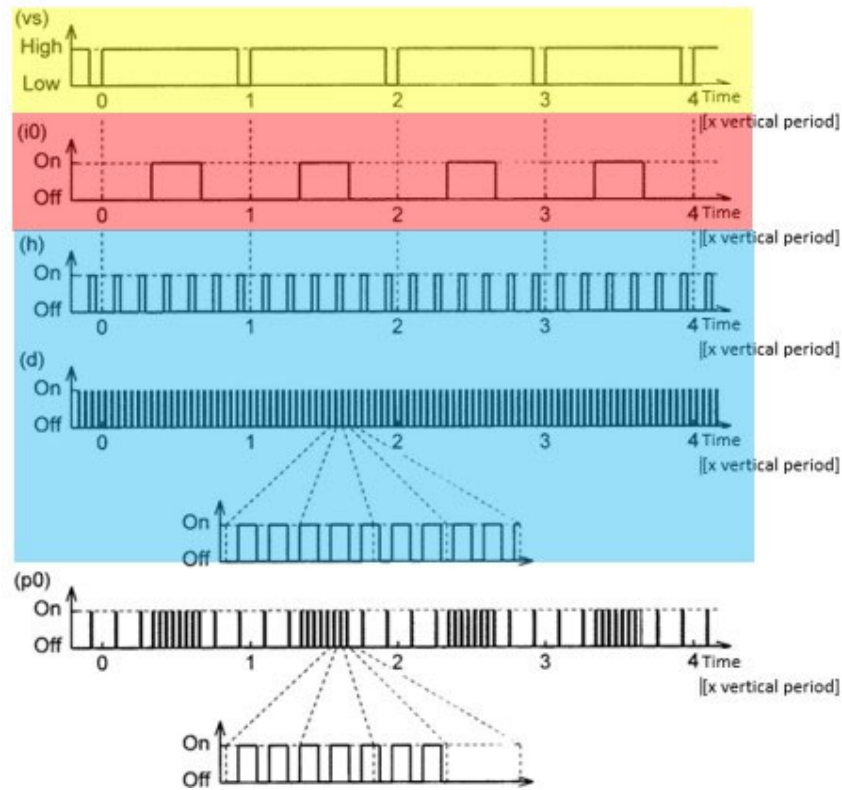
Seo's Figure 9 "illustrates operation waveforms of each part of the circuit[.]"
;" i.e., a configuration of "the turn ON signal generating circuit 10a" which produces
three luminosity driving signals used for adjusting the luminosity levels of the LEDs
multiple times within a single "vs" period, i.e. period 0-1, 1-2, 2-3 or 3-4 depicted
in Fig. 9 of the image-display signal (vs) (below, yellow), discussed in Section
XIII.A.2.e. Ex-1005 ¶¶148, 151, 154. An example of the luminosity driving As

Figure 9 depicts multiple turn ON signal pulses “p0” result by modulating the impulse signal i0 is-(below red) by the clock signals “h” and “d” (below, blue). This is also shown in Figure 9 (below, red), underneath the image display signal vs, discussed in Section

93-95. XII.A.2.e (below, yellow). Seo’s Figure 3. Seo explains that the illuminating areas are independently controlled by the corresponding “p0-p3” signals. *Id.* ¶18. The configuration of the circuit 10a disclosed by Seo in Fig. 10 (which is similar to the one disclosed in Fig. 2) produces-at least two other- luminosity-driving signals (e.g. i0 and h) used for adjusting the luminosity levels of the LEDs multiple times within a single “vs” period.~~Ex-1002~~

~~¶95.-~~

FIG. 9



94.96. Specifically, Seo discloses that the lamp turn ON signal “p0” is a signal for adjusting the luminosity levels of the lamp (LED) ~~being adjusted for a~~ plurality of times within a single “vs” period (the predetermined period of time) based on the clock signals: “signal “h” which is “referred to as pseudo hold pulse signal “h” and a “PWM dimming signal d” (below, blue). Ex-1005 ¶154.” Id. ¶137. As shown in ~~Figure 9~~Figures 3, the lamp turn ON signal “p0” is a composite of the impulse signal “i0,” and high frequency signal “h,” and PWM dimming signal “d.” Id. at., Fig. 9; ~~Ex-1002 ¶953, see also Fig. 1, Fig. 10.~~ For example, when “i0” is high (1), “~~p0~~” is equal to “~~p0~~i0,” and ~~when~~ “i0” is low (0), “h p0” is equal to “p0.” Ex-1002 ¶95.h.”

FIG. 9

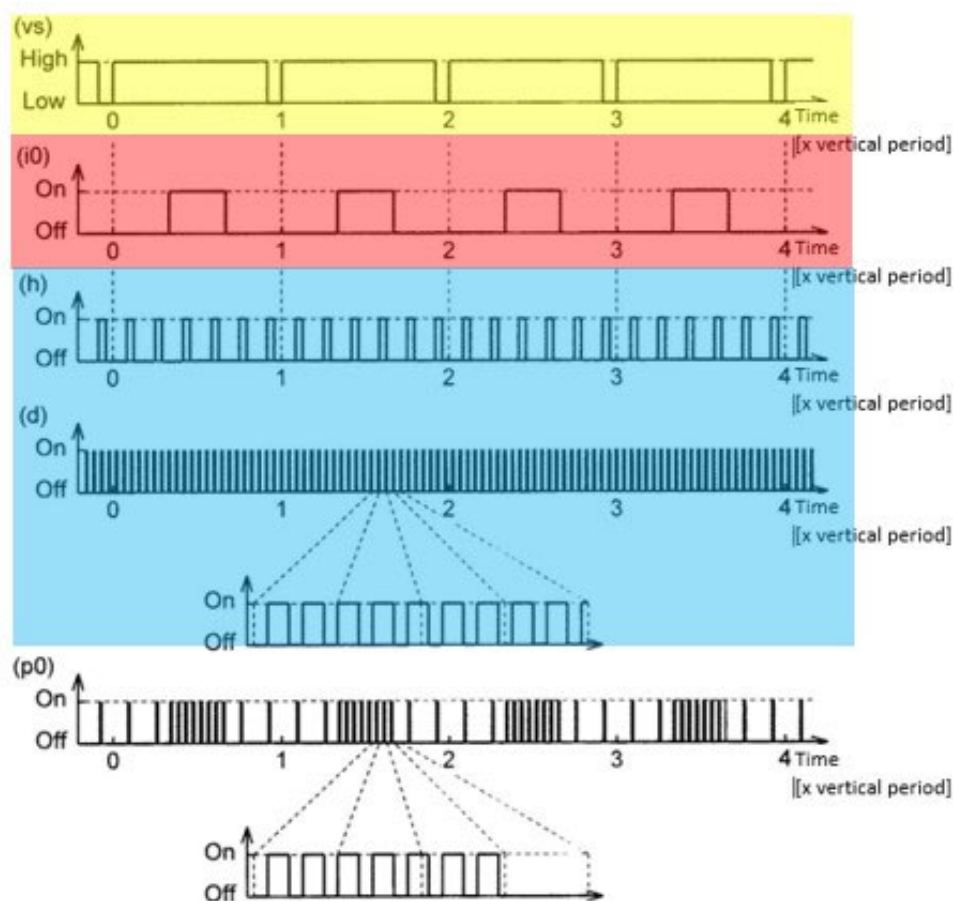
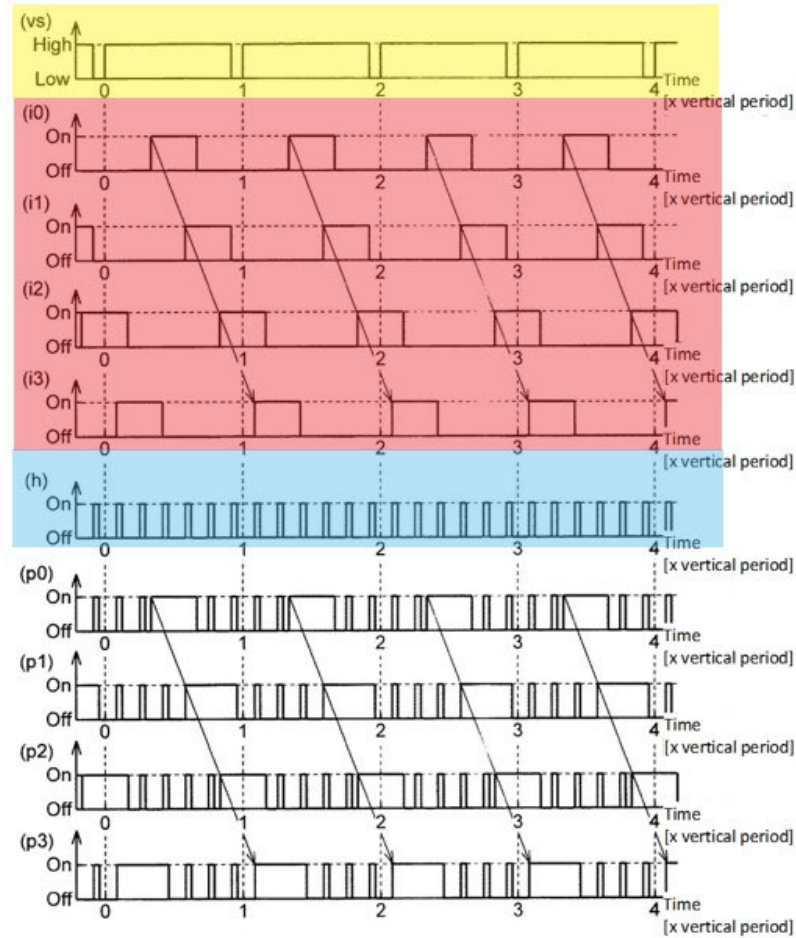


FIG. 3



95-97. Figure 9 displays “the vertical sync signal vs, impulse signal i0, pseudo hold pulse signal h, PWM dimming signal d, and lamp turn ON signal p0.” Ex-1005 ¶154. As depicted in the Figure 9 example, “h” will adjust the luminosity 6 times in a single “vs” period. And “d” is driven at an even higher frequency, so will adjust the luminosity even more times than “h” within the same “vs” time period. Ex-1005, Fig. 9. Thus, Seo discloses adjusting luminosity levels of at least one of the plurality of strings of LEDs by the lamp turn ON signal “p0,” based on clock signals (pseudo hold pulse signal “h” and PWM dimming signal “d”) a plurality of

signals (pseudo hold pulse signal “h” and PWM dimming signal “d”) a plurality of times during display of one image frame (within one “vs” time period).

96.98. Further, Figure 3 displays “illustrates operating waveforms of the vertical sync signal vs, the impulse signals i0 to i3, the high frequency signal h, and the lamp turn ON signals p0 to p3.” Ex-10021005 ¶121. As depicted in the Figure 3 example, “h” will adjust the luminosity 6 times in a single “vs” period. The combination of the signal i0 and h will then result in a signal p0 which will adjust the luminosity level of the string of LEDs illuminating the L0 tile to be adjusted 5 times. Thus, Seo discloses adjusting luminosity levels of at least one of the plurality of strings of LEDs by the lamp turn ON signal “p0,” based on the clock signal (pseudo hold pulse signal “h”) a plurality of times during display of one image frame (within one “vs” time period).

¶98.

97.99. Seo’s Figure 10 illustrates input terminal 101 of the vertical sync signal providing a signal to counter 102 and counter 202p. Counter 102 generates impulse signals “i0 - i3” and counter 202p generates pseudo hold pulse signal “h.” Ex-1005, Fig. 10. Both of these signals are combined to generate “p0 - p3”₂ and, in the Figure 10 example, these signals are all based on or synchronized to the vertical sync signal. *Id.* Seo further explains that in Figure 10, “logic gate 212 is added between the input terminal 101 of the vertical sync signal vs, the equality

comparator 204, and the counter 202p.” *Id.* ¶160. Thus “the counter 202p is cleared

by either the pulse of the vertical sync signal vs or the output of the equality comparator 204.” *Id.* Seo thus explains that the pseudo hold pulse signal “h”

~~is~~could be cleared by (and thus based on) the pulse of the vertical sync signal.~~Ex-~~
~~1002 ¶99.~~

FIG. 10

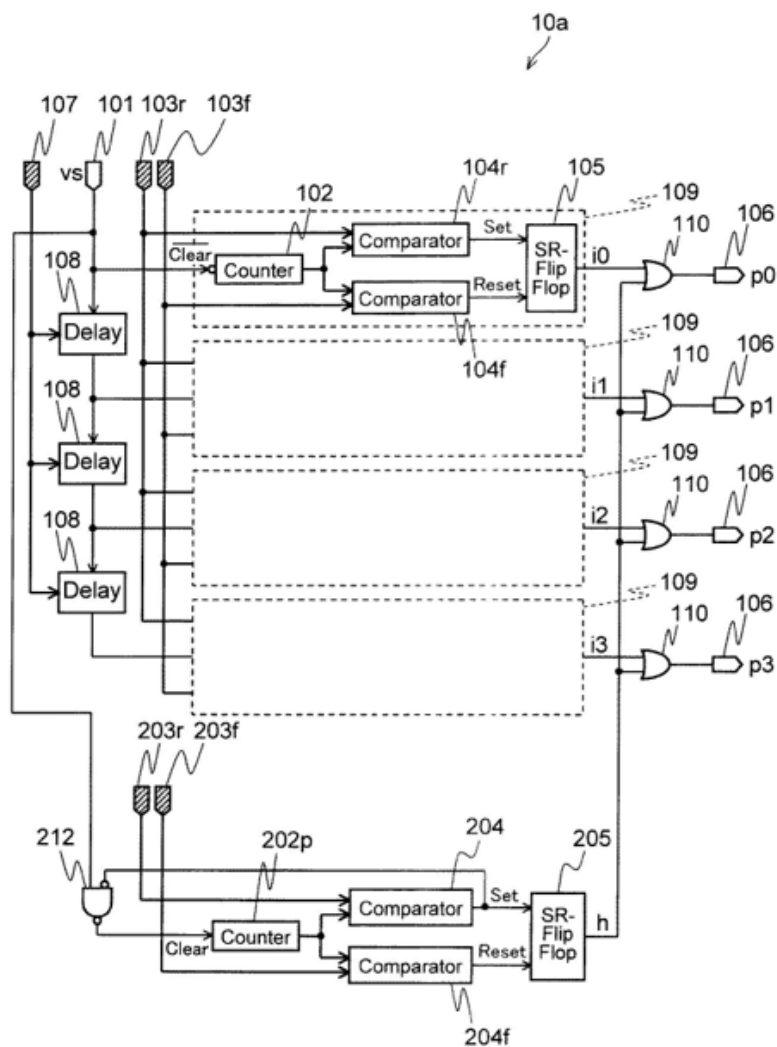
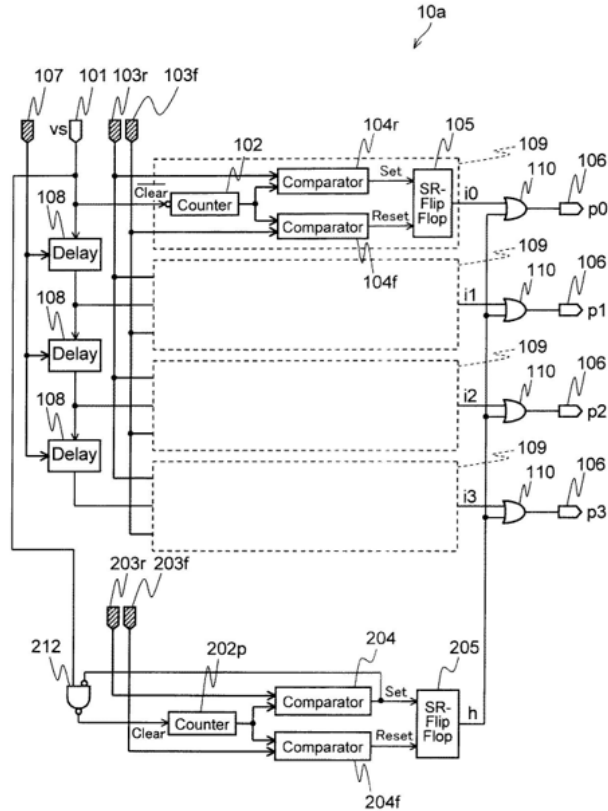


FIG. 10



98-100. Seo's Figure 6, also shows that these signals cause the luminosity of the LEDs to be adjusted several times within a single "vs" time period:

FIG. 6

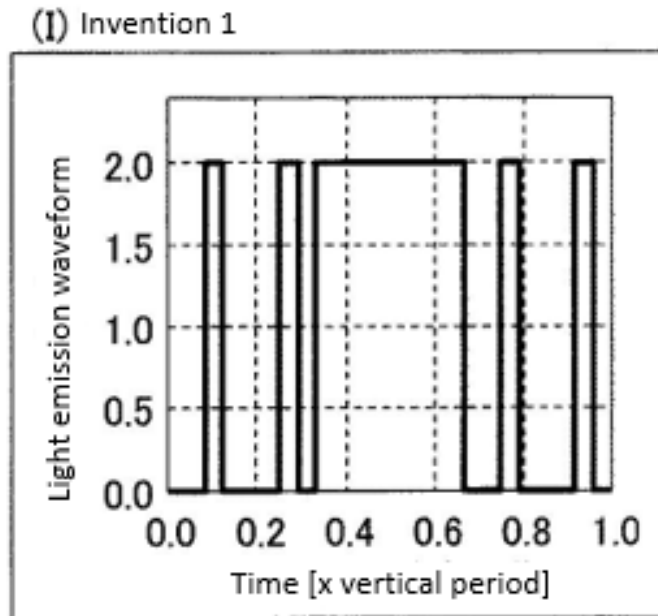
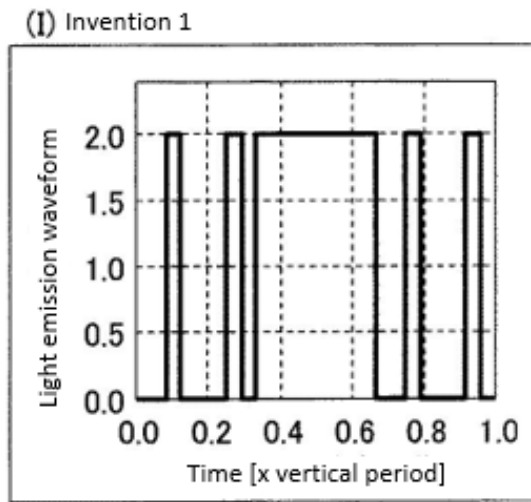


FIG. 6



99.101. Figure 6 (Part I) shows the LED light emission waveform of the L0 region as a function of the time within one “vs” time period. Ex-1005 ¶130 (“Part I of FIG. 6 has the same waveform as the light emission waveform of the area L0 illustrated in FIG. 4”). That is, Figure 6 shows the illumination caused by

the superposition of luminosity-driving signals “i0,” “h,” and “d.” ~~Ex 1002 ¶¶ 100-101.~~

As can be seen in Figure 6, the light emission (i.e., luminosity) is adjusted at least

5 times ~~during the~~ within a single “vs” time period. ~~Id.; Ex 1005, Fig. 6~~ (counting 5

discrete luminosity peaks in the figure).

- a. **1[Dii] - the first circuitry configured to adjust the luminosity levels according to a second clock signal having a second frequency that is a multiple of the first frequency and is higher than the first frequency.**

13[A] - generating a clock signal having a frequency that is a multiple of a reference frequency by multiplying a reference signal having the reference frequency, the frequency being higher than the reference frequency;

100.102. Seo alone teaches elements 1[Dii] and 13[A]. ~~Ex-1002 ¶¶102-106.~~

101.103. As shown in Figure 9 and discussed above, circuit 10a produces three luminosity-driving clock signals: impulse signal “i0,” pseudo hold pulse signal “h,” and PWM dimming signal “d.” Ex-1005 ¶154. ~~Both “pseudo hold pulse signal h” and, Fig. 9. “PWM dimming signal d” are~~ is used for adjusting the luminosity levels of the LEDs multiple times within a single “vs” time period, as explained in Section XIII.A.2.f. ~~Ex-1002 ¶103.~~

~~And both “Pseudo hold pulse signal h”~~ And “PWM dimming signal d” have a frequency that is a multiple of, and higher than “vs” (i.e. the claimed first frequency). Seo explains that the frequency of “vs” may be 60Hz. Ex-1005 ¶153.

102.104. ~~Seo further explains that the pseudo hold pulse signal “h” has a frequency of 600 Hz, which is 10 times higher than the frequency of “vs.” Id. Additionally, Seo~~ Seo further explains that the PWM dimming signal “d” has a frequency of 600 kHz, which is 10 thousand times higher than the frequency of “vs.” Id. Accordingly, both signals signal “d” is a clock signal with a frequency that is a multiple of, and higher, than

reference signal “vs.”

~~“h” and “d” are a clock signal with a frequency that is a multiple of, and higher, than reference signal “vs.” Ex 1002 ¶104.~~

FIG. 9

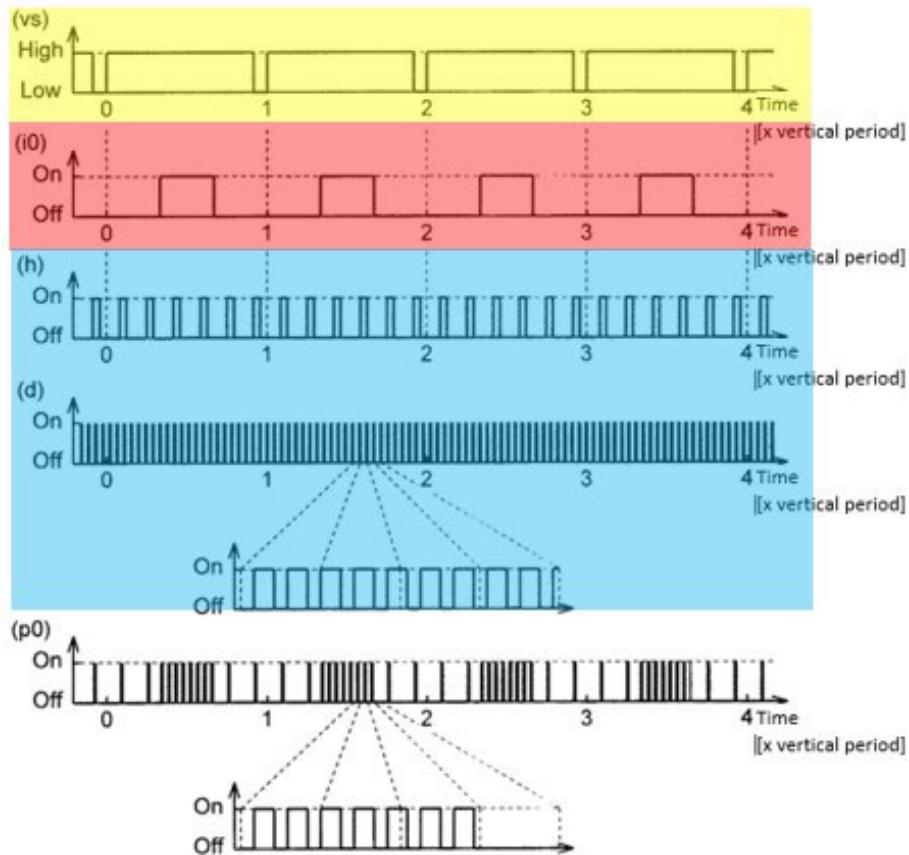
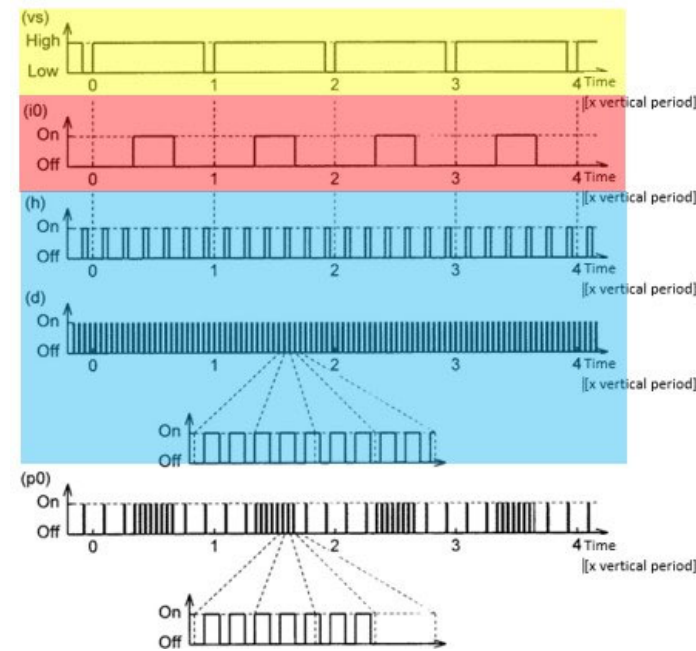
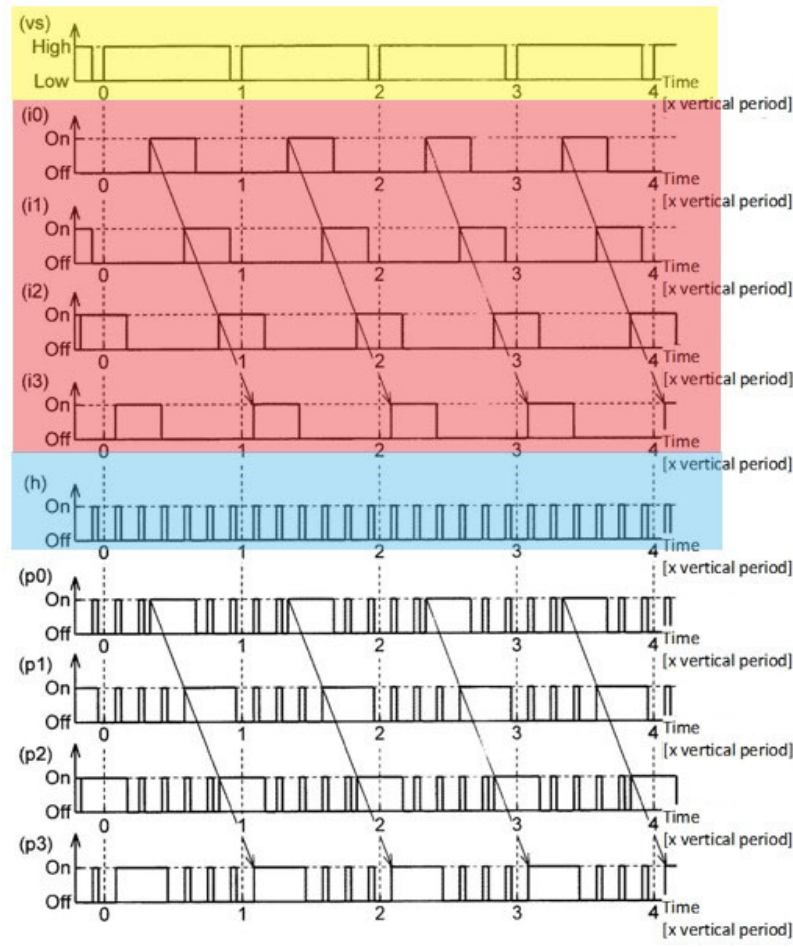


FIG. 9



105. Further, as shown in Figure 3, the “pseudo hold pulse signal h” is the claimed “second clock signal” and it is used for adjusting the luminosity levels of the LEDs multiple times within a single “vs” time period. The “Pseudo hold pulse signal h” has a frequency that is a multiple of, and higher than “vs” (i.e. the claimed first frequency). Seo teaches that “the pulse component h is preferably emitted two or more times per frame of the video signal.” Ex-1005 ¶047. Seo explains that the frequency of “vs” may be 60Hz. *Id.* ¶153. Seo further explains that the pseudo hold pulse signal “h” has a frequency of 600 Hz, which is 10 times higher than the frequency of “vs.” *Id.* Accordingly, the signal “h” is a clock signal with a frequency that is a multiple of, and higher, than reference signal “vs.”

FIG. 3



103-106. The clock signals are generated in Seo's generating circuit 10a (the claimed first circuitry). ~~Ex-1002 ¶105.~~ For example, as shown in Figure 10, generating circuit 10a includes counter 202p which generates the pseudo hold pulse signal h (purple box). Ex-1005 ¶ 114. Seo explains that the drive frequency for "h" will be "an *integer multiple* or a non-integer multiple of the vertical frequency." *Id.* ¶116.

FIG. 10

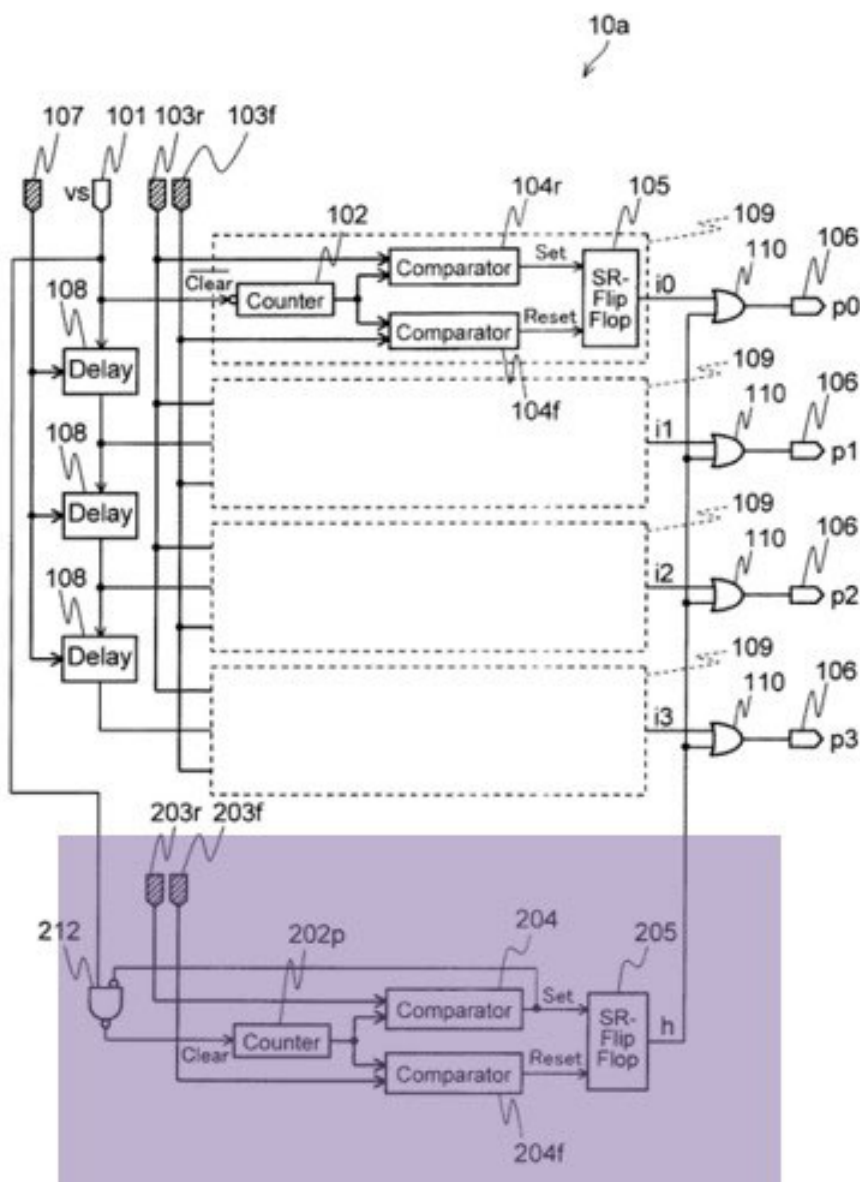
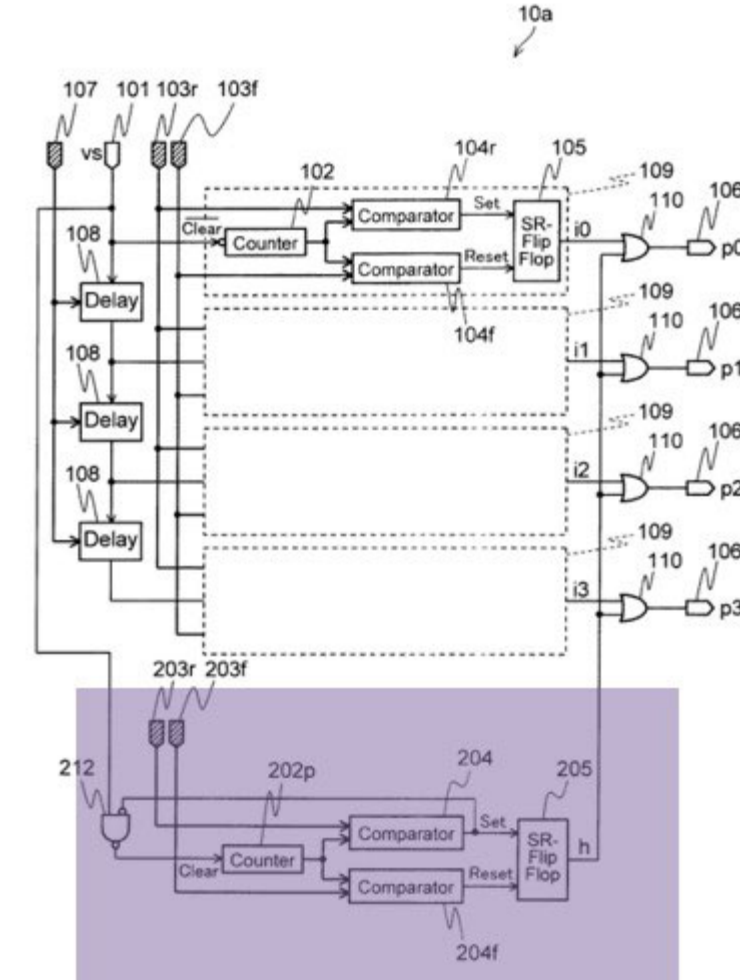


FIG. 10



3. Dependent Claims 2-5, 7, 10-11, 14, 15, and 18-20

- a. **Claim 2** - The control circuit of claim 1, wherein the predetermined period of time includes approximately 1/30 seconds.

Claim 18 - The display of claim 17, wherein the predetermined period of time includes approximately 1/30 seconds.

104.107. Seo alone teaches Claims 2 and 18.

~~105.108.~~ ~~Ex-1002 ¶¶107-108.~~ Seo explains that the vertical frequency of TV broadcasting “is defined by NTSC (National Television Standards Committee), PAL (Phase Alternation by Line) and other standards.” Ex-1005 ¶31. A POSITA would have understood that a predetermined period of time ~~e~~would include approximately 1/30 seconds because National Television System Committee (NTSC), Phase Alternating Line (PAL), and other standards that were in use at the time, included an approximately 30 Hz refresh rate. ~~Ex-1002 ¶108.~~

- b. Claim 3 - The control circuit of claim 1, wherein the plurality of times includes a number selected from a set of one, two, three, four, five, six, seven, eight, nine and ten.**

Claim 19 - The display of claim 17, wherein the plurality of times includes a number selected from a set of one, two, three, four, five, six, seven, eight, nine and ten.

~~106.109.~~ Seo alone teaches Claims 3 and 19 for the same reasons discussed in Section XII.A.1.f (Shown in Figure 93, “h” will adjust the luminosity 6 times in a single vs period ~~and~~while “i0” will adjust it a single ~~time within the same period.~~ ~~Ex-1002 ¶109.~~ period). As discussed in Section XIII.A.1.f, the combination of the signals “i0” and “h” will then result in a signal “p0” which will adjust the luminosity level of the string of LEDs illuminating the L0 tile five times. Seo discloses that “the pulse component h is preferably emitted two or more times per frame of the video signal.” Ex-1005 ¶47. Seo also discloses many other numbers of adjustments such

as “h” being 10 times “vs.” ~~Ex-1005~~*Id.* ¶153. Specifically, Seo explains that “the pseudo hold pulse signal h has a frequency exceeding the critical fusion frequency CFF, for example, a 600 Hz signal”, which is 10 times the discussed 60Hz “vs” signal. *Id.*

- c. **Claim 4 - The control circuit of claim 1, wherein the first clock signal is a VSYNC signal, and the predetermined period of time is a period of time between two successive rising edges of pulses of the VSYNC signal.**

~~107.110.~~ Seo alone teaches Claim 4. ~~Ex-1002 ¶110-111.~~ As discussed in Section XIII.A.1.e, Seo discloses “vertical sync signal vs” as the first clock signal. *See, e.g.*, Ex-1005 ¶113. A POSITA would have understood the vertical sync signal to be a the claimed “VSYNC signal,” and the period of time between two successive rising edges of its pulses as shown in the annotated Figure 9 below is the claimed “predetermined period of time.” *See* ~~Ex-1002 ¶110~~1024. As shown in Figure 9, the signal “vs” (yellow) is a first clock signal used to change the displayed image frame at a first frequency. ~~Ex-1005~~*Id.*, Fig. 9. Seo’s Figure 9 (below, inside black rectangle) discloses a predetermined period of time between two successive rising edges of pulses of the VSYNC signal. *Id.*, Fig. 9.

FIG. 9

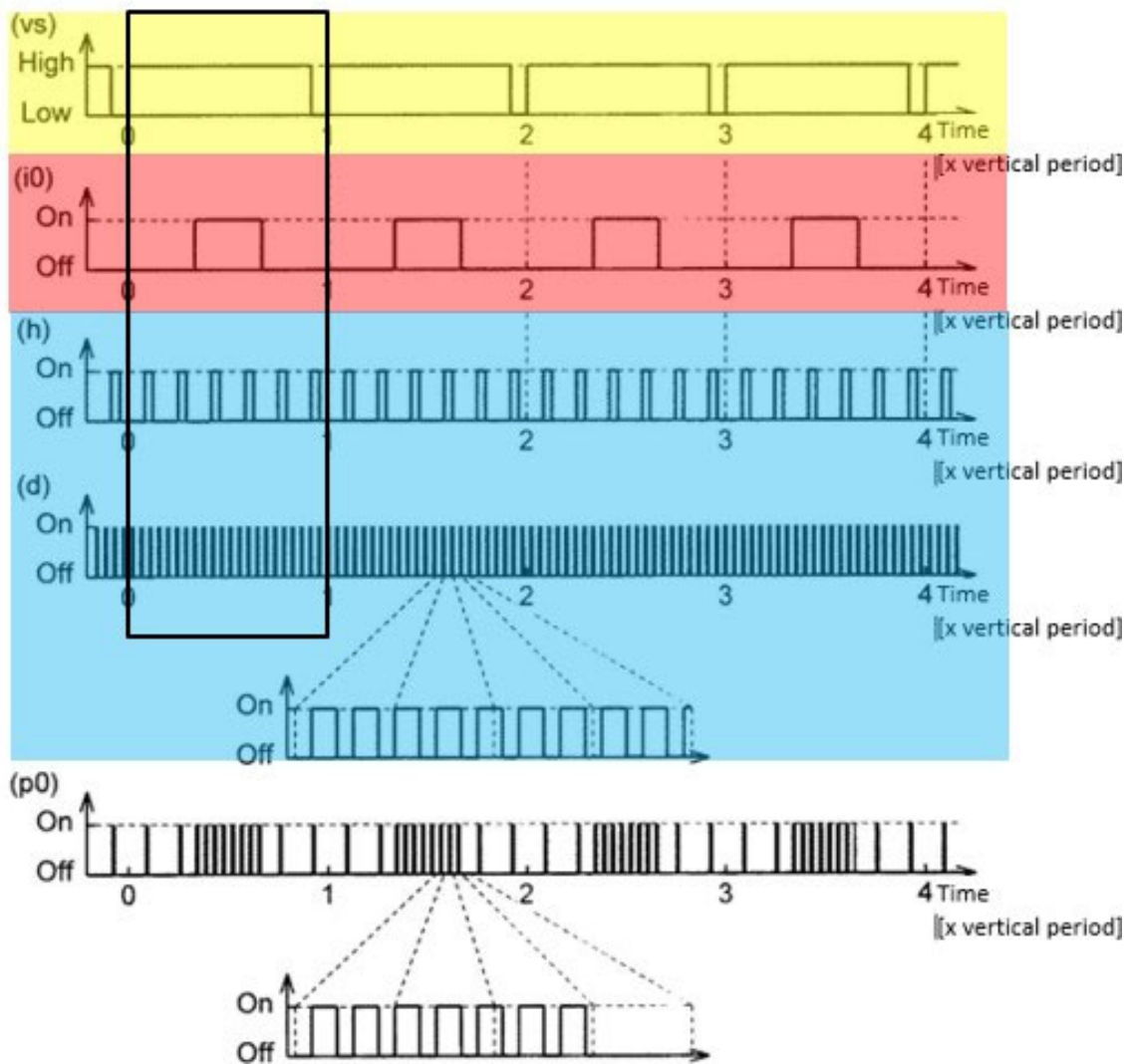
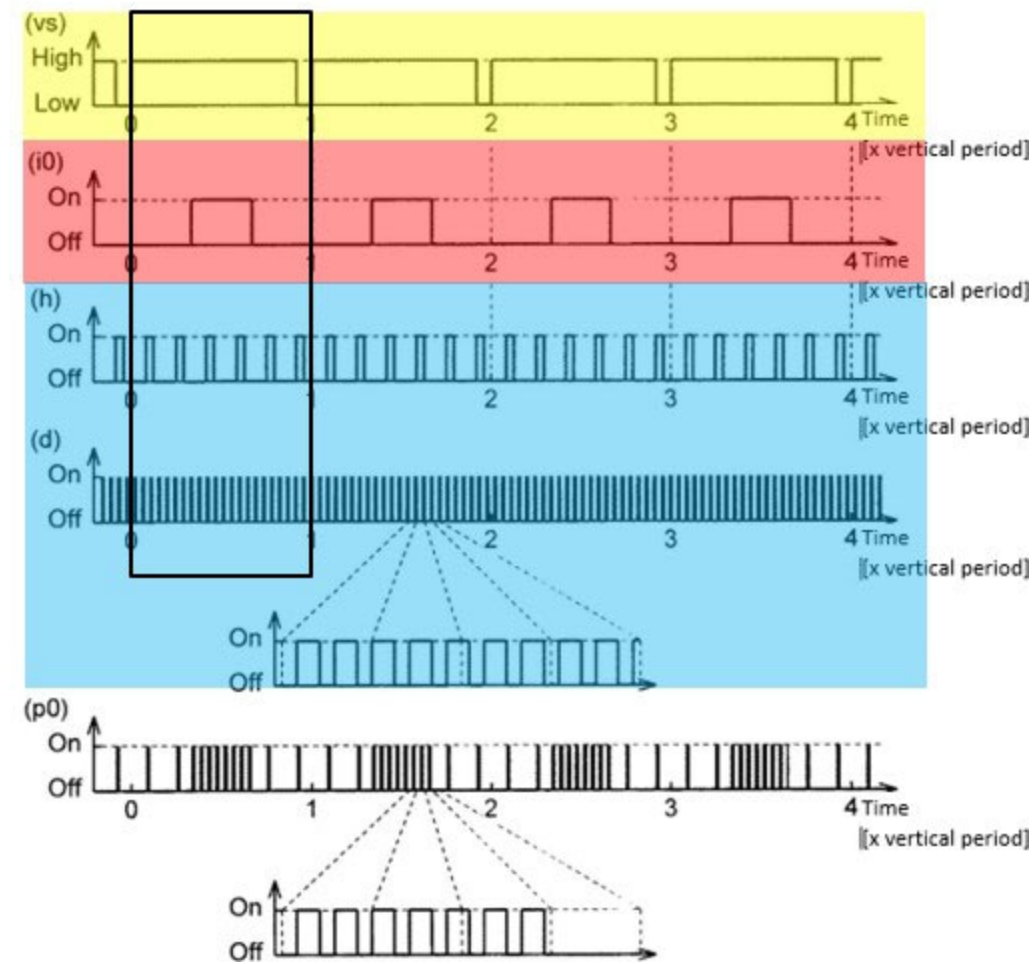


FIG. 9



111. Seo's Figure 3 (below, inside black rectangle) also discloses a predetermined period of time between two successive rising edges of pulses of the VSYNC signal. Ex-1005, Fig. 3. As shown in Figure 3, the signal "vs" (yellow) is a first clock signal used to change the displayed image frame within the predetermined period of time because as it is depicted in Fig. 37 the scanning of all the gate lines is completed within this predetermined period of time. *Id.*, Fig. 3, 37.

FIG. 3

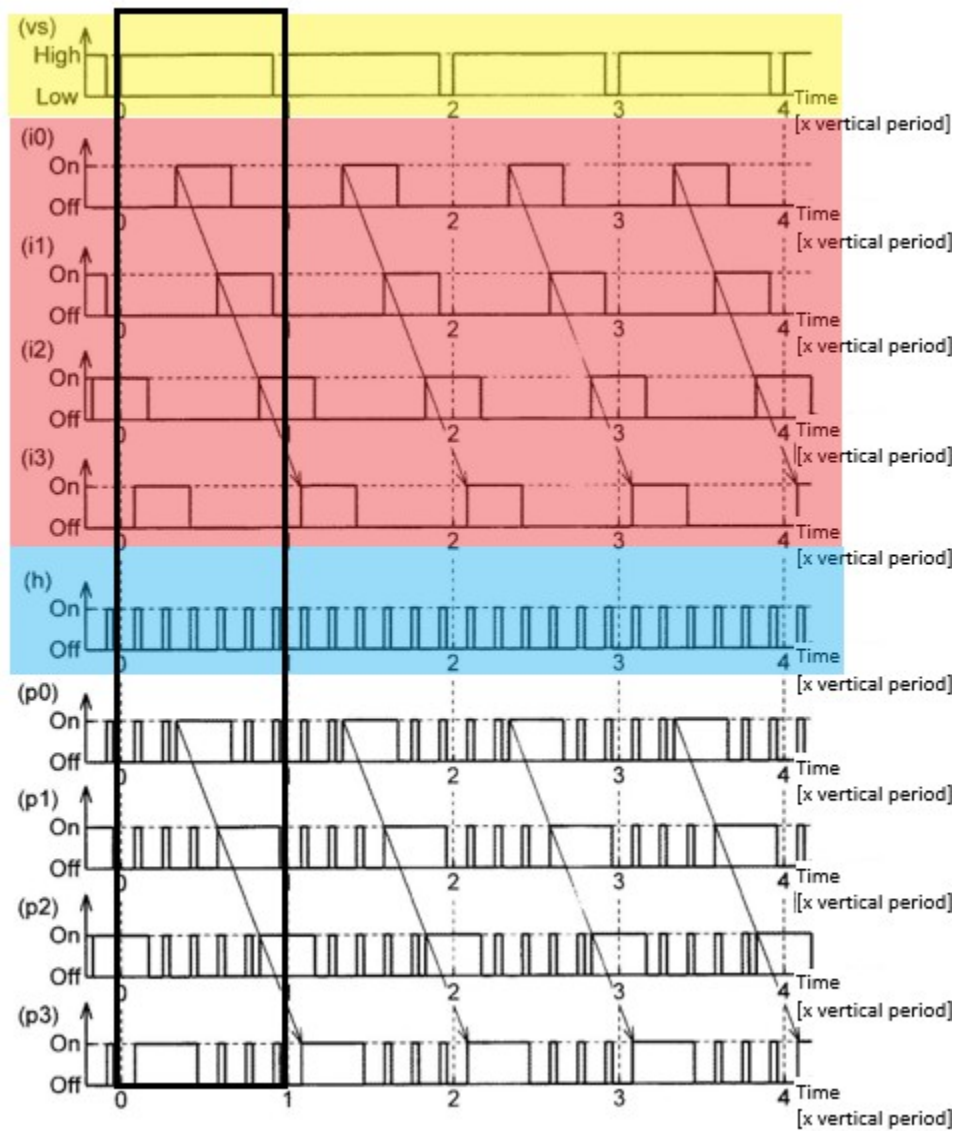
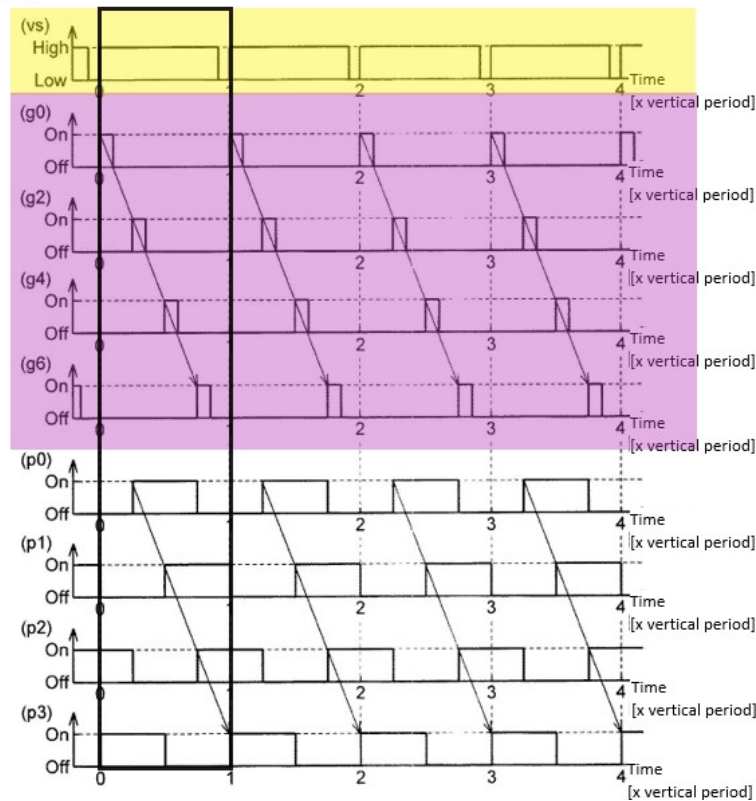


FIG. 37



- d. **Claim 5 - The control circuit of claim 1, wherein the first clock signal is a VSYNC signal, and the first circuitry configured to adjust the luminosity levels of the plurality of LED strings for a plurality of times between an occurrence of two successive pulses of a VSYNC signal.**

112. Seo alone teaches Claim 5 for the same reason discussed with claim 4 in Sections XII.A.2.f and XII.A.2.e. Ex 1002 ¶112. XIII.A.2.f and XIII.A.2.c. Moreover, as shown in the annotated Figure 3, the signal “vs” (yellow) is a first clock signal and within the disclosed predetermined period of time, i.e. the time period between two successive rising edges of pulses of the “vs” signal which is the claimed VSYNC signal, the first circuitry adjusts the luminosity levels of the plurality of LED strings for a plurality

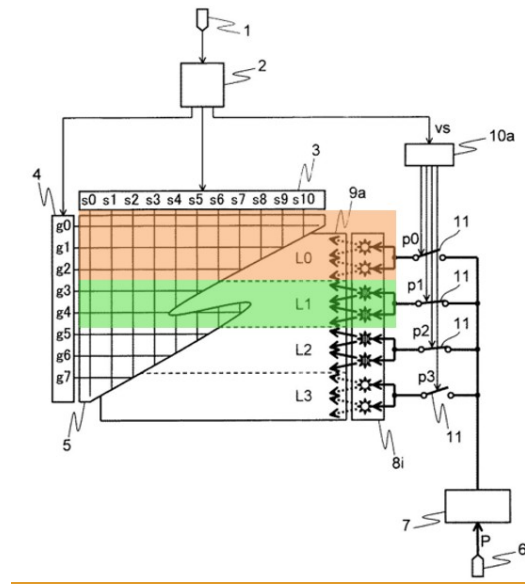
of times. Ex-1005 at Fig. 3. The latter is evident by the waveforms of the LED turn ON signals p0 to p3 depicting a plurality of pulses for each of the signals p0 to p1. Seo explains that “[t]he turning ON and OFF of each area L0 to L3 are independently controlled by the corresponding turn ON signals p0 to p3.” *Id.* ¶18. As Seo’s Figure 1 depicts, when each of these signals has a high value it connects its respective LED strings to the “power supply circuit 7” thus causing the LEDs to emit light. *Id.*, Fig. 1. This is also evident in Seo’s Figure 4. Figure 4 depicts the light emission waveforms of each of the areas L0 to L3 illuminated by respective LED strings. *Id.*, Fig. 4. As shown, the luminosity level of each region is adjusted a plurality of times within each predetermined period because the luminosity level of the string of LEDs in each region is adjusted a plurality of times by the turn ON signals as discussed above. Moreover, Seo’s Figure 5 shows the light emission waveform emitted by an LED string within a predetermined time period. *Id.*, Fig. 5

- e. **Claim 7 - The control circuit of claim 1, the display further comprising: a first display section associated with a first set of pixels of the plurality of pixels; a second display section associated with a second set of pixels of the plurality of pixels; a first set of strings of the plurality of strings associated with the first section; a second set of strings of the plurality of strings associated with the second section; the first circuitry configured to adjust luminosity levels of the first set of strings according to a portion of an image frame being displayed by the first set of pixels and to adjust luminosity levels of the second set of strings according to a portion of the image frame being displayed by the second set of pixels.**

~~108-113.~~ Seo ~~alone~~ teaches Claim 7 for the same reasons discussed in Section

XIII.A.2.c (picture elements scanned by g0 to g7 are illuminated by the four areas L0 to L3 on light guide plate 9a of Figure 1). ~~Ex-1002 ¶¶113-115.~~ As shown in Figure 1, Seo discloses four display-illuminating sections (L0 to L3), each associated with a set of pixels. Ex-1005, Fig. 1. As shown, Seo's first display section, L0 is associated with a first set of LEDs (orange box) and picture elements scanned by g0 to g7. *Id.* Seo's Figure 1 also discloses a second display section L1, associated with a second set of LEDs (green box) and picture elements scanned by g0 to g7. *Id.* Thus, A POSITA would have understood Seo-Fung to disclose at least a first and second display- illuminating section (L0 to L1) associated with a first and second set of pixels, each of L0 and L1 containing their respective LED strings. ~~Ex-1002 ¶113.~~

FIG. 1



109.114. Seo also teaches Claim 7 for the same reasons discussed in Section XII.A.2.f. As shown in Seo's Figure 1, generating circuit 10a is the first circuitry that provides impulse signals used to adjust the luminosity levels of the LEDs. Ex- 1005, Fig. 4; Ex-1002 ¶114. As discussed above, illuminating areas "L0 to L3 of the light guide plate 9a sequentially emit light in the same direction as the scanning of the gate [] synchronized with the vertical sync signal vs," used to display the associated video images in the display pixels. Ex-1005 *Id.* ¶27. Thus, a POSITA would have understood Seo's first circuitry to adjust luminosity levels of LEDs and for the illuminating areas (L0 to L3) to emit light synchronized with the vertical sync signal "vs" (which defines the "predetermined period of time" during which an image frame is displayed in each of the respective pixel sections illuminated by L0 to L3).

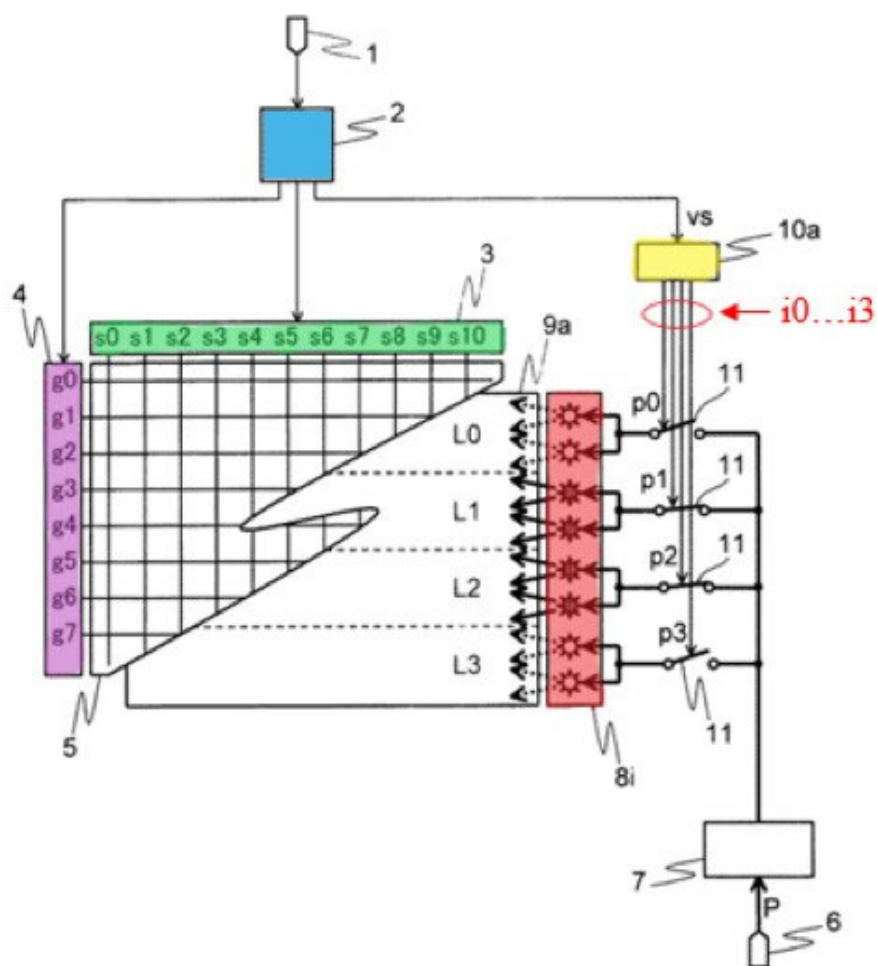
~~Ex-1002 ¶¶114.~~

~~110.115.~~ Further, Seo teaches adjusting luminosity levels of the (first or second) set of strings according to a portion of an image frame being displayed by (first or second) set of pixels. For example, the '887 Patent discloses “provid[ing] for a regional control of the display.” Ex-1001, 6:26-27. “LC1 [local controller 1] and LC2 [local controller 2] can be programmable modules, each including a multiplier circuit, a microprocessor, color circuitry and memory for generating its own backlight control signal for controlling backlighting of the portion for tile 1 to which it is assigned.” *Id.* at 6:27-31. This can also be shown in Seo’s Figure 1. The four illuminating areas, L0 to L3, include a portion of an image frame being displayed by a set of pixels. ~~Ex-1002 ¶¶115.~~

f. Claim 10 - The control circuit of claim 1, wherein the display includes a liquid crystal display.

~~111.116.~~ Seo alone teaches Claim 10. ~~Ex-1002 ¶¶116.~~ Seo discloses a “LCD (liquid crystal display)” illustrated in Figure 1. ~~Ex-~~ and specifically “an active matrix type LCD.” Ex- 1005 ¶¶1, 112.

FIG. 1



112.117. Seo alone teaches Claim 11 for the same reason discussed in Section

XIII.A.2.f (Figure 6 and Figure 10). ~~Ex-1002 ¶¶117-118.~~ Figure 6, shows the illumination caused by the superposition of the various impulse signals. Ex-1005, Fig. 6; ~~Ex-1002 ¶117.~~ Also shown in Figure 6, the light emission is adjusted by the various impulse signals at least 5 times during the “vs” period with the light emission becoming zero in between the impulse signals. ~~Ex-1005, Fig. 6.~~Id. A POSITA would have understood the raster blank period to occur when the luminosity levels of the plurality of strings of LEDs become zero. ~~Ex-1002 ¶117.~~

FIG. 6

(I) Invention 1

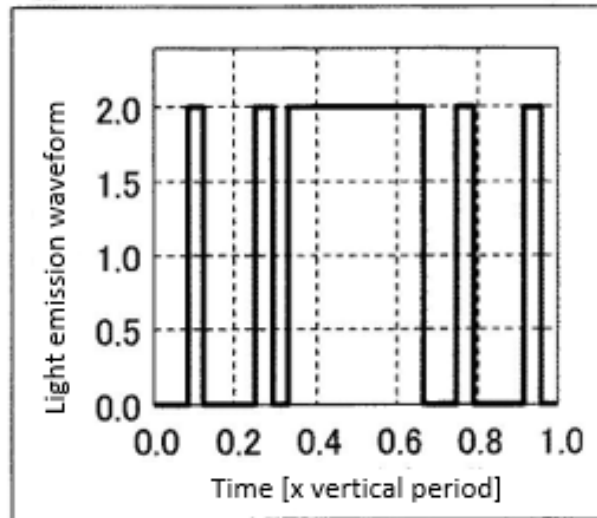
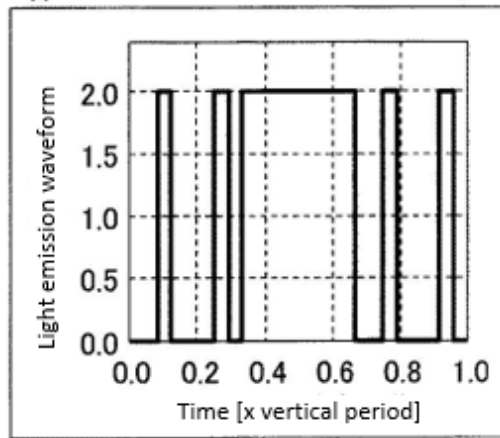


FIG. 6

(I) Invention 1



¶118. Seo's Figure 10 further explains that "the counter 202p is cleared by either the pulse of the vertical sync signal vs or the output of the equality comparator 204." Ex-1005 *Id.* ¶¶160-162. Thus, A POSITA would have understood that as counter 202p is cleared during a raster blanking interval, the luminosity levels of the plurality of strings of LEDs will become zero when the vertical sync signal is zero. Ex-1002

¶118.

FIG. 10

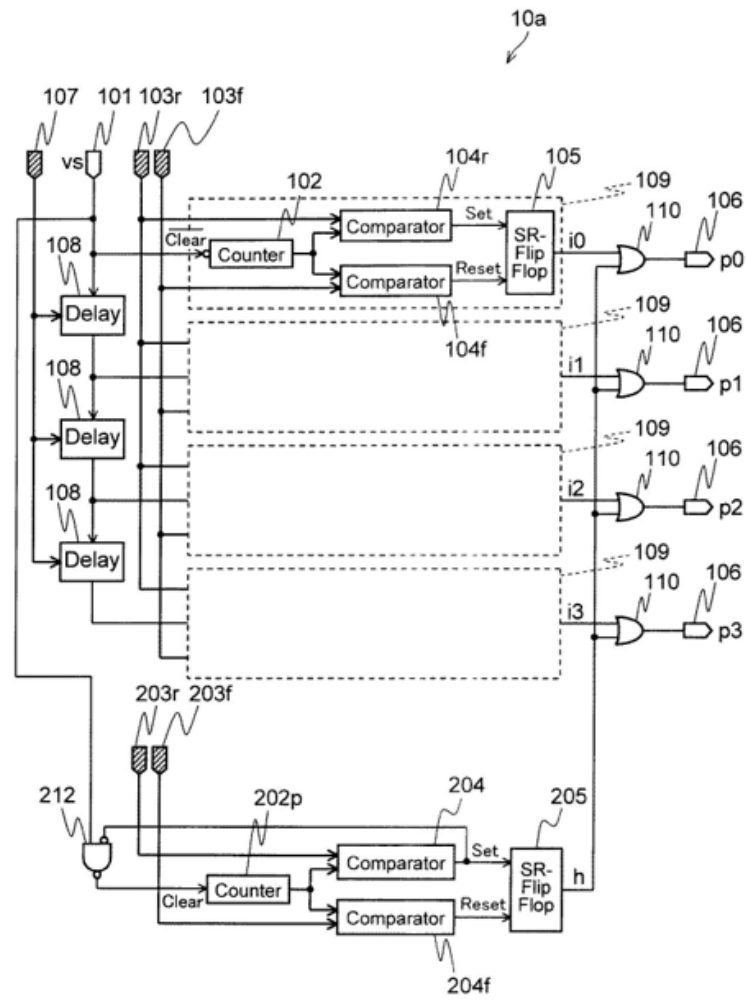
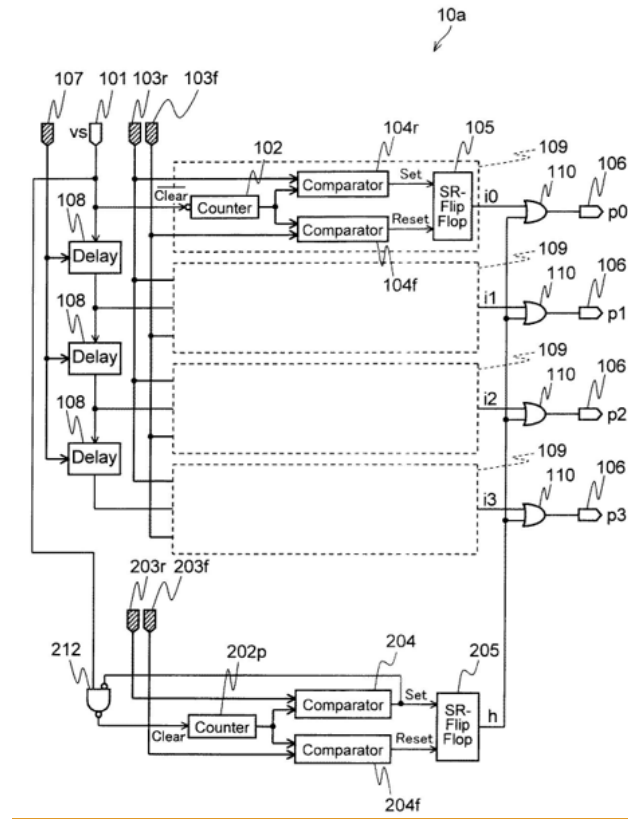


FIG. 10



- h. **Claim 14 - The method of claim 13, wherein the reference frequency includes a frequency of a VSYNC signal.**

119. Seo alone teaches Claim 14 for the same reasons discussed with Claim 4 and Claim 5 in Sections ~~XII.A.2.c-d. Ex 1002~~ XIII.A.2.c-d. Ex 1024. As explained above, a POSITA would have understood the vertical sync signal to be the claimed “VSYNC signal” and the period of time between two successive rising edges of its pulses as shown in the annotated Figure 9 below is the claimed “predetermined period of time.” See Ex-1024. A POSITA would have understood that the frequency is the inverse of the “predetermined period of time.”

- i. **Claim 15 - The method of claim 13, wherein adjusting the luminosity levels of a string of LEDs includes adjusting the luminosity levels at the frequency of the clock signal.**

~~114.120.~~ Seo alone teaches Claim 15 for the same reasons discussed with claim 4 and claim 5 in Sections XII~~I~~.A.2.c-d-~~Ex-1002 ¶120.~~

- j. **Claim 20 - The display of claim 17, wherein the first circuitry is configured to generate the second clock signal.**

~~115.121.~~ Seo-~~alone~~ teaches Claim 20 for the same reasons discussed in Section XIII.A.2.g (generating circuit 10a generates the pseudo hold pulse signal h).
~~Ex-1002 ¶121.~~

B. Ground 3: Claims 6, 12, and 17 are rendered obvious by Seo, Ex-1005 in view Fung, Ex-1007

- 1. **A POSITA would have been motivated to combine the teachings of Seo and Fung, and would have had a reasonable expectation of success in doing so.**

122. A POSITA would have been motivated to combine the teachings of Seo and Fung to reach all of the limitations of Claims 6, 12, and 17 for the same reasons discussed in Section XII~~I~~.A.1-~~Ex-1002 ¶122.~~

2. Independent Claim 17

- a. **17[Pre] - A liquid crystal display comprising:**

123. Seo-in view of Fung teaches the preamble of Claim 17 to the extent limiting for the same reason discussed in Section XII~~I~~.A.2.a-~~Ex-1002 ¶123.~~

a. 17[A] - a plurality of strings of light emitting diodes (LEDs) including a string of red LEDs, a string of green LEDs and a string of blue LEDs;

124. Seo- in view of Fung teaches element 17[A] for the same reasons discussed in Section XII.A.2.b (string of LEDs). ~~Ex-1002 ¶¶124-125.~~ Fung also discloses using “strings of LEDs [that] include blue LEDs 202B, green LEDs 202G and red LEDs 202R.” Ex-1007 ¶28.

125. A POSITA would have been motivated to implement Fung’s teachings of RGB LEDs in Seo for the reasons discussed in Section XII.A.2.a. For example, Seo teaches using LED’s for the backlight of an LCD. Ex-1005 ¶116. Seo also explains that neither the number of strings, nor the number of LEDs on each string is limited. *Id.* ¶144. A POSITA would have understood that, where an LCD is made up of three different colored pixels, a white backlight may be used to illuminate the LCD. ~~Ex-1002 ¶125.~~ thus creating three different colored pixels observable to the viewer. A POSITA would have further understood that three different colored LEDs could also be used as a standard design choice, in a number of ways. ~~Id. ¶¶41-44, 125.~~ See Ex- 1013. As one example applicable to LCD displays having color filters, red, green, and blue LEDs could be used as a backlight that illuminates ~~of~~ the LCD pixels, with the light mixed together to create a white backlight illuminating the LCD pixels. Ex-1007 ¶20. As another example applicable to LCD with no color filters, the red, green and blue LEDs would be illuminated sequentially so that the LCD pixels

~~together to create a white backlight illuminating the LCD pixels. *Id.*; Ex 1007 ¶20.~~
~~As another example, the red LCD pixel could be illuminated by the red LED, and~~
~~blue LCD could be illuminated by the blue LED, and the green LCD could be~~
~~illuminated by the green LED. Ex 1002 ¶¶41-44, 125.~~would modulate sequentially
the transmission of the red, green and blue light. Any of these approaches would
achieve the same result (a multi-colored pixel display observable by a user), and
would have benefits that a POSITA would be motivated to include in Seo.~~*Id.*~~ For
example, Fung explains that using RGB LEDs will lead to better lighting control
for very dark or very light images. ~~Ex 1007~~*Id.* ¶19. Additionally, it can lead to
better duty cycle and power consumption control. *Id.* ¶21. Accordingly, a POSITA
would have been motivated to implement, and would have had a reasonable
expectation of success in implementing, the Seo system in view of the RGB LED
string teachings of Fung.~~Ex 1002 ¶125.~~

**a. 17[B] - a first circuitry for controlling luminosity
levels of the plurality of strings of LEDs;**

126. Seo- in view of Fung teaches this element ~~17[B]~~ for the same
reasons discussed in Section XIII.A.2.b (generating circuit 10a controlling
luminosity levels).~~Ex 1002 ¶126.~~

**a. 17[C] - a plurality of pixels for displaying a plurality
of image frames of a video;**

127. Seo- in view of Fung teaches this element ~~17[C]~~ for the same
reasons discussed in Section XIII.A.2.c.~~Ex 1002 ¶127.~~

a. 17[D] - a second circuitry for controlling the plurality of pixels;

128. Seo-in view of Fung teaches this element ~~17[D]~~ for the same reasons discussed in Section XIII.A.2.c.

~~XII.A.2.c. Ex-1002 ¶128.~~

- a. **17[Ei] - the second circuitry for displaying each image frame of the plurality of image frames for a predetermined period of time determined by a frequency of a VSYNC signal having a first frequency,**

129. Seo- in view of Fung teaches this element ~~17[Ei]~~ for the same reasons discussed in Section XIII.A.2.d.

~~XII.A.2.d. Ex-1002 ¶129.~~

- a. **17[Eii]—the second circuitry configured to change a displayed image frame once every cycle of the VSYNC signal; and**

130. Seo- in view of Fung teaches this element ~~17[Eii]~~ for the same reasons discussed in Section XIII.A.2.e.

~~XII.A.2.e. Ex-1002 ¶130.~~

- a. **17[Fi] - the first circuitry for adjusting the luminosity levels of the plurality of strings of LEDs for a plurality of times within the predetermined period of time,**

131. Seo- in view of Fung teaches this element ~~17[Fi]~~ for the same reasons discussed in Section XIII.A.2.f.

~~XII.A.2.f. Ex-1002 ¶131.~~

i. 17[Fii] - the first circuitry configured to adjust the luminosity levels according to a second clock signal having a second frequency that is a multiple of the first frequency and is higher than the first frequency.

132. Seo-in view of Fung teaches this element ~~17[Fii]~~ for the same reasons discussed in Section XIII.A.2.g.

~~XII.A.2.g. Ex-1002 ¶132.~~

3. Dependent Claims 6 and 12

- a. **Claim 6 - The control circuit of claim 1, wherein the plurality of strings of LEDs include a string of red LEDs, a string of blue LEDs and a string of green LEDs.**

133. Seo-in view of Fung teaches Claim 6 for the same reasons discussed in Section ~~XIII.B.2.b. Ex-1002 ¶133.~~

- b. **Claim 12 – The control circuit of claim 1, wherein the plurality of strings of LEDs include a combination of a string of white LEDs and one or more strings of LEDs selected from the group consisting of a string of red LEDs, a string of blue LEDs, or a string of green LEDs.**

Seo-in view of Fung teaches Claim 12 for the same reasons discussed in Section ~~XIII.B.2.b. Fung teaches that “[t]ypically the BLU 106 will comprise red, blue and green LEDs, which are controlled in such a way that their light output mixes to generate white light.” Ex-1002 ¶1341007 ¶20.~~ Fung also discloses that ““[a]lternatively different combinations or colored LEDs may be used, or a single color such as white LEDs may be used.”

134. ~~Ex-1007 Id.~~ ¶20. A POSITA would have understood that the different combinations of ~~colored~~ LEDs may be a string of white LEDs and one or more strings of LEDs. Ex-1002 ¶134.colored LEDs (i.e. red, blue or green). See Ex-1013. It was well known that mixing the light of different LEDs including white LEDs with blue, green and red LEDs offers many advantages including flexibility in achieving

backlight with maximum color rendering index, high efficiency and low cost. Ex-1026, Ex-1027, Ex-1028, Ex-1029.

C. Ground 4: Claims 8-9, 16, and 21 are rendered obvious by Seo-Fung in view of Yao, Ex-1006

1. A POSITA would have been motivated to combine the teachings of Seo, Fung, and Yao, and would have had a reasonable expectation of success in doing so.

135. Seo-and Fung (Seo-Fung) in view Yao teaches all the limitations of Claims 8-9, 16, and 21. Yao, like Seo and Fung, relates to a liquid crystal display device having an LED backlight capable of improving image quality. Ex-1006 ¶6. Specifically, Yao discloses embodiments which “ may be utilized to eliminate stray light emissions from an LED while ambient light is being sensed.” *Id.* Yao discloses a “dynamic backlight control systems for use with an electronic display [] including: an ambient light sensor for sensing ambient light intensity[.]” *Id.* Yao explains that the backlight is adjusted “to a backlight level in response to the ambient light intensity.” *Id.* ¶8. Thus, A POSITA would have understood Yao to disclose an ambient light sensor for use with an LCD device, such as the LCD devices of both Seo and Fung, to improve image quality. ~~Ex-1002 ¶135.~~ A POSITA would have been motivated to combine the teachings of Seo-and Fung to use the ambient light sensor of Yao to achieve the benefits of Yao (e.g. reducing the effects of stray light on the image displayed in the LCD of Seo). ~~#~~See Section IX.A.

2. Dependent Claims 8-9, 16, and 21

- a. Claim 8 - The control circuit of claim 1, further comprising: an ambient light sensor coupled to the first circuitry; and the first circuitry configured for adjusting the luminosity levels of the plurality of strings of LEDs based on ambient lighting conditions.**

Seo-Fung in view of Yao teaches Claim 8 for the same reason discussed in Section XIII.A.2.b. ~~Ex-1002 ¶¶136-137.~~

136. As shown in Figure 2, Yao discloses LCD 200 with ambient light sensor 214 mounted on array glass layer 206. Ex-1006 ¶19. Yao also discloses that LCD 200 includes backlight 212 which provides illumination of pixels. *Id.* Yao explains that “embodiments provided herein may be equally applied to LED and OLED's without departing from the present invention.” *Id.* Thus, a POSITA would have understood Yao to teach using an ambient light sensor coupled to a first circuitry with a liquid crystal display to adjust luminosity levels of LEDs based on ambient light conditions. ~~Ex-1002 ¶136.~~

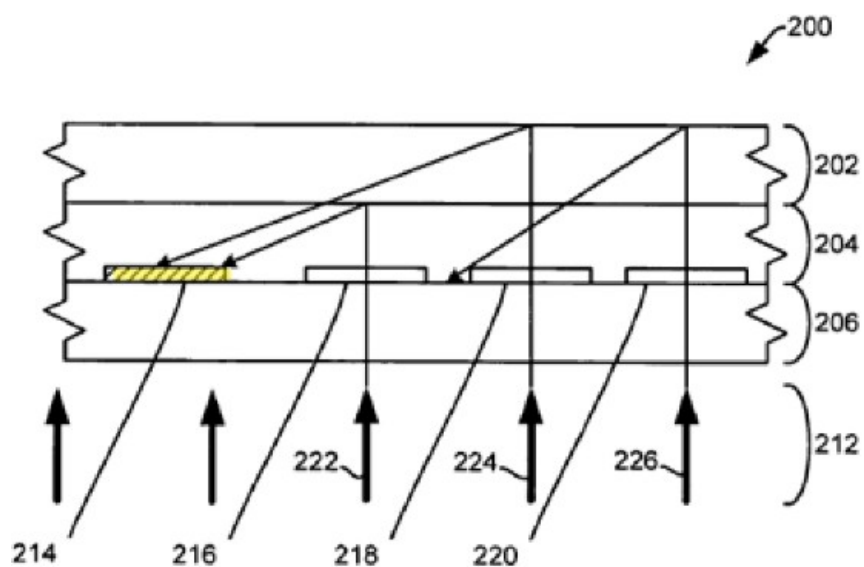


FIG. 2

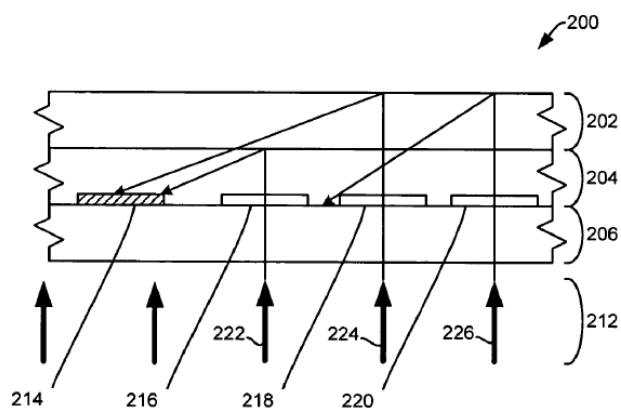


FIG. 2

Additionally, Yao's Figure 5 includes a flow chart that explicitly teaches a method of adjusting the luminosity levels of the LEDs based on the ambient light sensor (note steps 510 – “sample ambient light” and 516 – “adjust backlight in accordance with ambient light” in red boxes below). Ex-1006, Fig. 5; ~~Ex-1002 ¶137~~. Yao explains “[a]t a next step 510, ambient light intensity is sampled with an ambient light sensor. Light sensing is generally well-known in the art and may be accomplished in any number of manners without departing from the present invention.” Ex-1006 ¶24. Yao continues to explain that step 516 is performed “to adjust backlight level. As may be appreciated, adjusting a light level is well-known in the art. ~~Ex-1002 ¶137~~. Thus, any method of adjusting backlight level with

137. respect to ambient light sensor data may be utilized without departing from the present invention.” *Id.*

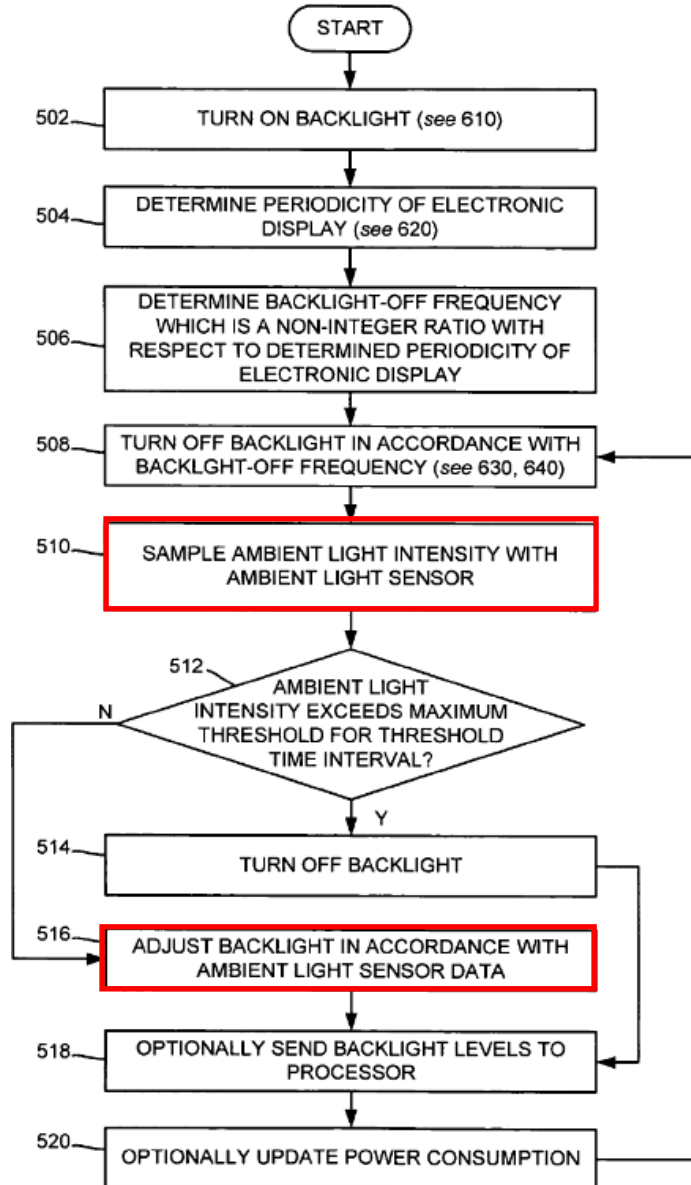


FIG. 5

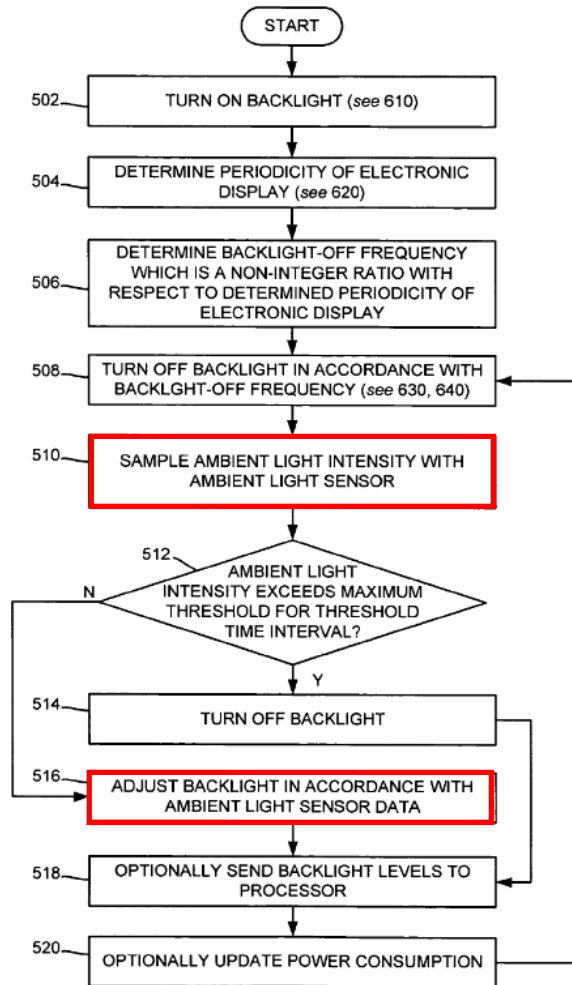


FIG. 5

- a. **Claim 9** - The control circuit of claim 8, wherein the first circuitry is configured to adjust a luminosity level of a red string of LEDs to a different luminosity level from a luminosity level of a green string of LEDs.

Claim 21 - The display of claim 17, wherein the first circuitry for adjusting a luminosity level of the string of red LEDs to a different luminosity level from a luminosity level of the string of blue LEDs based upon an ambient light condition.

138. Seo-Fung in view of Yao teaches Claim 9 and Claim 21. ~~Ex 1002 ¶¶ 138-~~

As discussed in Section XIII.C.2.a, Yao discloses that the first circuitry with a

liquid crystal

~~140. As discussed in Section XII.C.2.a, Yao discloses that the first circuitry with a liquid crystal~~ display is configured for adjusting the luminosity levels of the plurality of strings of LEDs based on ambient lighting conditions.

139. Fung teaches to control each colored LED strings independently based on their respective colors. Fung explains that “BLU 106 has been arranged into regions 108 that can be independently controlled or driven by the drivers 112[.]” Ex-1007 ¶19. Fung discloses that “BLU 106 comprises a number of strings of LEDs, each driven by its own one of the LED drivers 112 or one channel of one of the LED drivers 112.” *Id.* ¶20. BLU 106 typically comprises “red, blue and green LEDs, which are controlled in such a way that their light output mixes to generate white light.” *Id.* Fung also explains that “[i]n order to maintain good uniformity of light output from the BLU 106, the light output from the LEDs 202 needs to be adjusted[.]” *Id.* ¶45.

140. A POSITA would have understood that Yao’s ambient light signal would have been used and applied to each of the colored LED strings independently, as taught by Fung. ~~Ex-1002 ¶140.~~ This would have allowed for a finer level of control over each portion of the white light spectrum, and thus allowed for even greater reduction of the effects of stray light, which is Yao’s purpose. ~~*Id.* And, Dr. Hatalis explains that~~ Using ambient light sensors to control RGB color components of LEDs was a well- known implementation approach. ~~*Id.* ¶¶49-~~

~~55, 134 (citing and discussing~~ See Ex-1010 ¶68, which explains “Each new ratio-
corrected control coefficient (for R, G and B components) is calculated from ~~the~~
~~previous control coefficient on the basis of the ratio of the proportions of ambient light and illumination~~
~~in the corresponding light component”).~~

the previous control coefficient on the basis of the ratio of the proportions of ambient light and illumination in the corresponding light component”).

- a. **Claim 16 - The method of claim 15, wherein adjusting the luminosity levels of the string of LEDs is based on a color of the LEDs and an ambient light condition.**

141. Seo-Fung in view of Yao teaches Claim 16 for the same reason discussed in Section XII.C.3.a and Section XII.C.3.b. ~~Ex-1002 ¶¶141-142.~~ Yao discloses that “any method of adjusting backlight level with respect to ambient light sensor data may be utilized.” Ex-1006 ¶24. Yao also discloses that “embodiments provided herein may be equally applied to LED and OLED's without departing from the present invention.” *Id.* ¶19.

142. Fung discloses “each regional array of LEDs (i.e., each BLU region 108) comprises one or more strings of LEDs of each color-red 202R, blue 202B, and green 202G.” Ex-1007 ¶29. Fung explains that “using appropriate control of the light output of the LEDs of the various colors, an appropriate combined color of light output can be obtained.” *Id.* Thus, a POSITA would have understood Seo-Fung in view of Yao to disclose adjusting luminosity levels of the strings of LEDs based on a color of the LEDs and an ambient light condition. ~~Ex-1002 ¶142. And, Dr. Hatalis explains that using ambient light sensors to control RGB color components of LEDs was a well-known implementation approach. *Id.* ¶¶49-55, 136 (citing and discussing~~ See Ex-1010 ¶68, which explains “Each new ratio-corrected control coefficient (for R, G and B components) is calculated from the

previous control coefficient on the basis of the ~~ratio of the proportions of ambient
light and illumination in the corresponding light component~~”).

ratio of the proportions of ambient light and illumination in the corresponding light component”).

D. Ground 5: Claims 1-21 are rendered obvious by Seo in view of Honbo, Ex-1008

1. A POSITA would have been motivated to combine the teachings of Seo and Honbo, and would have had a reasonable expectation of success in doing so.

143. Seo in view of Honbo (Seo-Honbo) teaches all the limitations of Claims 1-21. As set forth in more detail below, a POSITA would have been motivated to combine teachings of Honbo with the teachings of Seo. ~~Ex-1002 ¶143.~~ Both references relate to a liquid crystal display device having an LED backlight capable of improving image quality. Ex-1006, Abstract, 1:9-10. Seo uses a “lamp 8i” to provide backlighting for its LCD. Seo further explains that its “lamp 8i” is a “light source body” providing “light emission in the present invention include[ing] semiconductor light emitting elements, for example, LEDs.” Ex-1005 ¶¶279, 312. And Honbo specifically ~~teaches having a “driving control unit [discloses that] turns off “the backlight during a frame period~~ includes LEDs of the input video signal in which an upper limit gray level for₂ each of red (at least, the R), green (G), and blue (B) is set until the liquid crystal shows a response to the application.” Ex-1008, 4:8-9. Honbo also discloses that “the backlight includes a plurality of light source blocks” and that the driving control circuit includes components that make the backlight flash during a lighting period. Id. at 5:20-60. Specifically, Claim 15 of Hondo states that the “driving control unit

turns on said backlight N (“N” is an integer being 2:46-50 or more) times at

specified intervals in every frame period.” *Id.* at 20:15-18. Additionally, Honbo

discloses controlling

an emitted light quantity of each color of the backlight unit at a time based on an output signal sent from an external light sensor for detecting external environmental light. *Id.* at 1:58-67. Honbo also discloses providing “a liquid crystal display device capable of preventing degradation of image quality even in displaying moving images” and improving “contrast of a displayed image and a dynamic range of luminance.” *Id.* at 2:5-7, 2:27-30. Thus, a POSITA would have understood Honbo to disclose an ambient light sensor for use with an LCD device for to improve image quality. ~~Ex-1002 ¶¶143.~~ A POSITA would have combined the teachings of Seo to use the ambient light sensor of Honbo and the RGB LED teachings of Honbo with a reasonable expectation of success, achieve the benefits taught by Honbo, such as expanding the dynamic range and preventing degradation of a moving image. *Id.*

2. Independent Claims 1 and 13

a. **1[Pre] - A control circuit for an electronic display comprising:**

13[Pre] - A method for controlling an electronic display comprising:

144. Seo-Honbo teaches the preamble to the extent limiting. ~~Ex-1002 ¶¶144-145.~~

145. *See* Seo’s teachings in Section XIII.A.2.a.

- a. **1[A] - a first circuitry for controlling luminosity levels of a plurality of strings of light emitting diodes (LEDs);**

13[Ci] - using the clock signal for adjusting luminosity levels of a plurality of strings of light emitting diodes (LEDs) in a backlighting circuitry of the electronic display,

146. Seo-Honbo teaches elements 1[A] and 13[Ci]. ~~Ex 1002 ¶¶146-150.~~

147. *See* Seo's teachings in Section XII.A.2.b (string of LEDs).

148. Additionally, it would have been obvious to a POSITA to implement Seo's LED's as a plurality of strings of LEDs in view of Honbo. ~~Ex 1002 ¶148.~~

Honbo expressly teaches that "the LED driver 15 generates driving voltages [] to make each of the LED blocks 16a and 16b flash based on a control signal [] fed from the light timing control section." Ex-1008, 10:23:26. As shown in Figure 4, backlight 16 is divided into two sections, LED blocks 16a and 16b. *Id.* at 11:51-54. Honbo also discloses that the backlight "is configured to use light of R, G, and B fed from the LEDs" and that the "white light from the backlight...enters the liquid crystal layer." *Id.* at 11:29-38.

FIG. 4

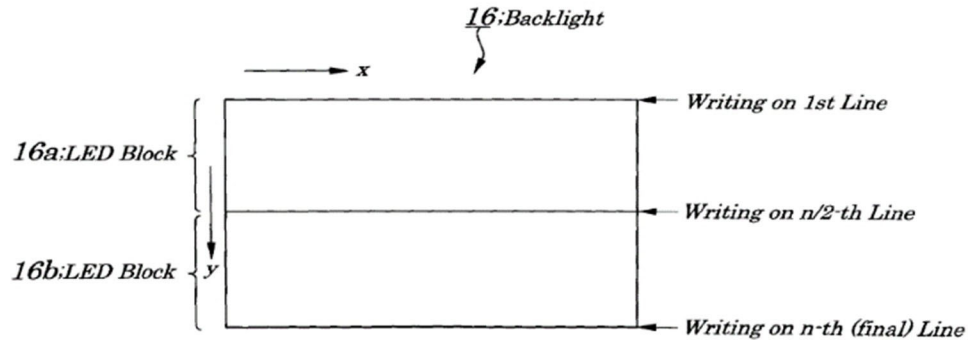
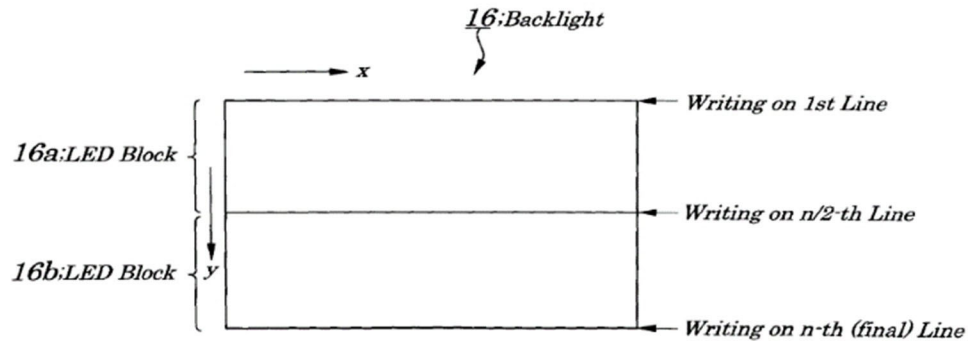


FIG. 4



149. Moreover, Hondo discloses that backlight 16A “is divided into 4 rowsx4 columns and is made up of LED block 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D, 4A, 4B, 4C, and 4D.” *Id.* at 16:50-52.

FIG.14

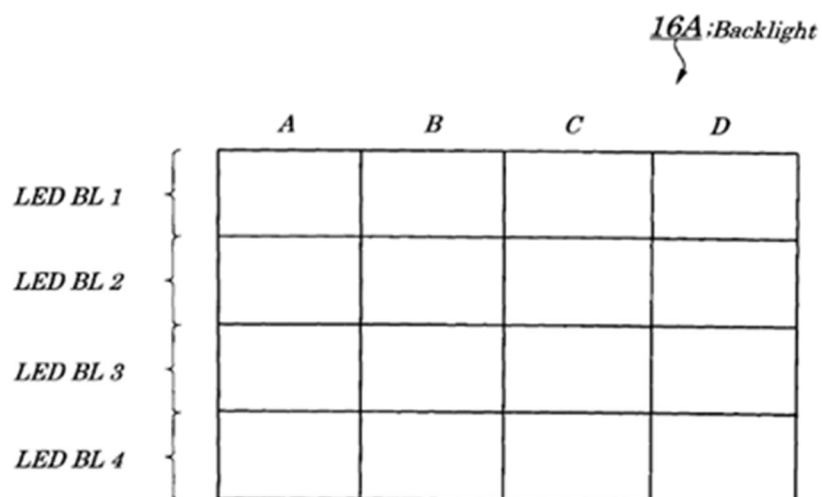
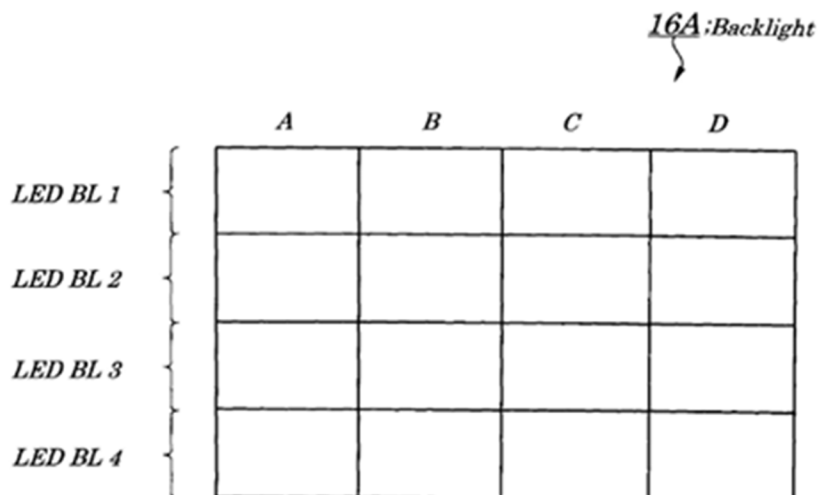


FIG.14



A POSITA would have understood that Honbo's LED block 1A-4D includes strings associated with backlight 16a in a LCD device. ~~Ex 1002 ¶149. A POSITA~~

150. As the '887 Patent discloses in the background section, it was well known that “multiple LEDs are required to provide adequate backlight for the LCD display” such as those used for computers and televisions. Ex-1001, 1:37-40. It was also well known that LEDs within an LCD backlight the LEDs were arranged in strings. See Ex-1025. A POSITA implementing Seo’s light source 8i would have been motivated to apply the teachings of Honbo, and use a string of RGB LEDs as the light emitting backlight in each of the four areas L0 to L3, to reduce “the trail-leaving in moving images.” ~~Id.~~ Ex-1008, 13:55-61.

- a. **1[B] - a second circuitry for controlling a plurality of pixels for displaying a plurality of image frames of a video;**

151. Seo-Honbo teaches element 1[B]. ~~Ex-1002 ¶¶151-152.~~

152. See Seo’s teachings in Section XIII.A.2.c.

- a. **1[Ci] – the second circuitry for displaying each image frame of the plurality of image frames for a predetermined period of time,**

153. Seo-Honbo teaches element 1[C]. ~~Ex-1002 ¶¶153-154.~~

154. See Seo’s teachings in Section XIII.A.2.d.

- a. **1[Cii] – the second circuitry configured to change a displayed image frame once every cycle of a first clock signal having a first frequency; and**

13[B] – changing a displayed image frame on the electronic display once every cycle of the reference signal; and

155. Seo-Honbo teaches elements 1[Cii] and 13[B]. ~~Ex 1002 ¶¶ 155-156.~~

156. *See* Seo's teachings in Section XII.A.2.e.

- a. **1[Di] – the first circuitry for adjusting the luminosity levels of the plurality of strings of LEDs for a plurality of times within the predetermined period of time,**

13[Cii] – wherein luminosity levels of at least one of the plurality of strings of LEDs are adjusted a plurality of times based on the clock signal during display of one image frame in a sequence of image frames

157. Seo-Honbo teaches elements 1[Di] and 13[Cii]. ~~Ex 1002 ¶¶ 157-158.~~

158. *See* Seo's teachings in Section XII.A.2.f.

- a. **1[Dii] - the first circuitry configured to adjust the luminosity levels according to a second clock signal having a second frequency that is a multiple of the first frequency and is higher than the first frequency.**

13[A] - generating a clock signal having a frequency that is a multiple of a reference frequency by multiplying a reference signal having the reference frequency, the frequency being higher than the reference frequency;

159. Seo-Honbo teaches elements 1[Dii] and 13[A]. ~~Ex 1002 ¶¶ 159-160.~~

160. *See* Seo's teachings in Section XII.A.2.g.

3. Independent Claim 17

a. 17[Pre] - A liquid crystal display comprising:

161. Seo-Honbo teaches the preamble of Claim 17 to the extent limiting. ~~Ex-1002~~

~~¶¶161-162.~~

162. See Seo's teachings in Section XII.A.2.a.

b. 17[A] - a plurality of strings of light emitting diodes (LEDs) including a string of red LEDs, a string of green LEDs and a string of blue LEDs;

163. Seo-Honbo teaches element 17[A]. ~~Ex-1002 ¶¶163-165.~~

164. See Seo's teachings in Section XII.A.2.b (string of LEDs).

Additionally, Honbo discloses that the backlight includes LEDs of, each at least, the R, G, and B. Ex-1008, 4:8-10.

165. A POSITA would have been motivated to implement Honbo's teachings of RGB LEDs in Seo for the reasons discussed in Section XII.D.2.b. For example, Seo teaches using LED's for the backlight of an LCD. Ex-1005 ¶116.

Seo also explains that neither the number of strings, nor the number of LEDs on each string is limited. ~~Id.~~ Ex-1005 ¶144. A POSITA would have understood that, where an LCD is made up of three different colored pixels, a white backlight may be used to illuminate the LCD. ~~Ex-1002 ¶165.~~ A POSITA would have further understood that three different colored LEDs could also be used as a standard design choice, in a number of ways. ~~Id.~~ As one example, red, green, and blue LEDs could be used as a backlight that illuminates of the LCD pixels, the light mixed

together to create a white backlight illuminating the LCD pixels. *Id.* ¶¶40-43, 159; Ex 1008, 11:35-

36. As another example, the red LCD pixel could be illuminated by the red LED, and blue LCD could be

illuminated by the blue LED, and the green LCD could be illuminated by the green LED. Ex 1002 ¶¶41-

44, 165. Any of these approaches

white backlight illuminating the LCD pixels. Ex-1008, 11:35-36. As another example applicable to LCD displays with no color filters, the LCD pixels could be illuminated sequentially by the red LEDs, then the blue LEDs, and finally with the green LEDs within each frame period. Any of these approaches would achieve the same result (a multi-colored pixel display observable by a user), and would have benefits that a POSITA would be motivated to include in Seo. ~~Id.~~ Accordingly, a POSITA would have been motivated to implement, and would have had a reasonable expectation of success in implementing, the Seo system in view of the RGB LED teachings of Honbo. ~~Id.~~

c. 17[B] - a first circuitry for controlling luminosity levels of the plurality of strings of LEDs;

166. Seo-Honbo teaches element 17[B]. ~~Ex-1002 ¶¶166-167.~~

167. See Seo's teachings in Section XIII.A.2.b (generating circuit 10a controlling luminosity levels). ~~¶167.~~

d. 17[C] - a plurality of pixels for displaying a plurality of image frames of a video;

168. Seo-Honbo teaches element 17[C]. ~~Ex-1002 ¶¶168-169.~~

169. See Seo's teachings in Section XIII.A.2.c.

e. 17[D] - a second circuitry for controlling the plurality of pixels;

170. Seo-Honbo teaches element 17[D]. ~~Ex-1002 ¶¶170-171.~~

171. See Seo's teachings in Section XIII.A.2.c.

- f. 17[Ei] - the second circuitry for displaying each image frame of the plurality of image frames for a predetermined period of time determined by a frequency of a VSYNC signal having a first frequency,**

172. Seo-Honbo teaches element 17[Ei]. ~~Ex 1002 ¶¶172-173.~~

173. *See* Seo's teachings in Section XII.A.2.d.

- g. 17[Eii] - the second circuitry configured to change a displayed image frame once every cycle of the VSYNC signal; and**

174. Seo-Honbo teaches element 17[Eii]. ~~Ex 1002 ¶¶174-175.~~

175. *See* Seo's teachings in Section XII.A.2.e.

- h. 17[Fi] - the first circuitry for adjusting the luminosity levels of the plurality of strings of LEDs for a plurality of times within the predetermined period of time,**

176. Seo-Honbo teaches element 17[Fi]. ~~Ex 1002 ¶¶176-177.~~

177. *See* Seo's teachings in Section XII.A.2.f.

- i. 17[Fii] - the first circuitry configured to adjust the luminosity levels according to a second clock signal having a second frequency that is a multiple of the first frequency and is higher than the first frequency.**

178. Seo-Honbo teaches element 17[Fii]. ~~Ex 1002 ¶¶178-179.~~

179. *See* Seo's teachings in Section XII.A.2.g.

4. Dependent Claims 2-12, 14-16, 18-21

- a. **Claim 2 - The control circuit of claim 1, wherein the predetermined period of time includes approximately 1/30 seconds.**

Claim 18 - The display of claim 17, wherein the predetermined period of time includes approximately 1/30 seconds.

180. Seo-Honbo teaches Claims 2 and 18. ~~Ex 1002 ¶¶ 180-181.~~

181. *See* Seo's teachings in Section XII I.A.3.a.

- b. **Claim 3 - The control circuit of claim 1, wherein the plurality of times includes a number selected from a set of one, two, three, four, five, six, seven, eight, nine and ten.**

Claim 19 - The display of claim 17, wherein the plurality of times includes a number selected from a set of one, two, three, four, five, six, seven, eight, nine and ten.

182. Seo-Honbo teaches Claims 3 and 19. ~~Ex 1002 ¶¶ 182-183.~~

183. *See* Seo's teachings in Section XII I.A.3.b.

- c. **Claim 4 - The control circuit of claim 1, wherein the first clock signal is a VSYNC signal, and the predetermined period of time is a period of time between two successive rising edges of pulses of the VSYNC signal.**

184. Seo-Honbo teaches Claim 4. ~~Ex 1002 ¶¶ 184-185.~~

185. *See* Seo's teachings in Section XII I.A.3.c.

- d. **Claim 5 - The control circuit of claim 1, wherein the first clock signal is a VSYNC signal, and the first circuitry configured to adjust the luminosity levels of the plurality of LED strings for a plurality of times between an occurrence of two successive pulses of a VSYNC signal.**

186. Seo-Honbo teaches Claim 5. ~~Ex 1002 ¶¶ 186-187.~~

187. *See* Seo's teachings in Section XIII.A.3.d.

- e. **Claim 6 - The control circuit of claim 1, wherein the plurality of strings of LEDs include a string of red LEDs, a string of blue LEDs and a string of green LEDs.**

188. Seo-Honbo teaches Claim 6. ~~Ex 1002 ¶¶ 188-189.~~

189. *See* Seo's teachings in Section XIII.D.3.b.

- f. **Claim 7 - The control circuit of claim 1, the display further comprising: a first display section associated with a first set of pixels of the plurality of pixels; a second display section associated with a second set of pixels of the plurality of pixels; a first set of strings of the plurality of strings associated with the first section; a second set of strings of the plurality of strings associated with the second section; the first circuitry configured to adjust luminosity levels of the first set of strings according to a portion of an image frame being displayed by the first set of pixels and to adjust luminosity levels of the second set of strings according to a portion of the image frame being displayed by the second set of pixels.**

190. Seo-Honbo teaches Claim 7. ~~Ex 1002 ¶¶ 190-191.~~

191. *See* Seo's teachings in Section XIII.A.3.e.

- g. Claim 8 - The control circuit of claim 1, further comprising: an ambient light sensor coupled to the first circuitry; and the first circuitry configured for adjusting the luminosity levels of the plurality of strings of LEDs based on ambient lighting conditions.**

192. Seo-Honbo teaches Claim 8. ~~Ex-1002 ¶¶192-193.~~

193. Honbo discloses an ambient light sensor as “external light sensor 1.”

Honbo explains that the liquid crystal display device may include an “external light sensor 1 ~~to~~ detect external environmental light.” Ex-1008, 1:63-64. Honbo explains that “in the disclosed liquid crystal display device, the controller 2 controls, based on a signal “pe” output from the optical sensor 7 ~~and~~ and on a signal “pg” output from the external light sensor 1.” *Id.* at 1:53-67. Honbo uses “a signal ‘pg’ output from the external light sensor 1 to detect external environmental light,” and then applies “a process of changing displaying data for each color (red (R), green (G), and blue (B)) in the liquid crystal display section 5 and an amount of light, for each color (R, G, B), emitted from the backlight 6.” *Id.* ~~at 1:64-67; Ex-1002 ¶¶50-56, 193; see e.g.,~~ Ex-1011. Thus, a POSITA would have understood Honbo to teach using an ambient light sensor coupled to a first circuitry with a liquid crystal display to adjust luminosity levels of LEDs based on ambient light conditions.

~~Ex-1002 ¶193.~~

- h. Claim 9 - The control circuit of claim 8, wherein the first circuitry is configured to adjust a luminosity level of a red string of LEDs to a different luminosity level from a luminosity level of a green string of LEDs.**

Claim 21 - The display of claim 17, wherein the first circuitry for adjusting a luminosity level of the string of red LEDs to a different luminosity level from a luminosity level of the string of blue LEDs based upon an ambient light condition.

194. Seo-Honbo teaches Claim 9 and Claim 21. ~~Ex-1002 ¶¶194-197.~~

195. Honbo discloses that “FIG. 15, includes an external light sensor 1, a controller 2, a display data changing circuit 3, a backlight light amount controlling circuit 4, a liquid crystal display section 5, a backlight 6, and an optical sensor 7.”

Ex-1008, 1:54-58. Honbo explains that:

In the disclosed liquid crystal display device, the controller 2 controls, based on a signal “pe” output from the optical sensor 7 to detect emission of light from the backlight 6, on an image signal “vf” input to be used for displaying on the liquid crystal display section 5, and on a signal “pg” output from the external light sensor 1 to detect external environmental light, a process of changing displaying data for each color (red (R), green (G), and blue (B)) in the liquid crystal display section 5 and an amount of light, for each color (R, G, B), emitted from the backlight 6.

Id. at 1:58-67.

196. Honbo also discloses having a driving control unit that “turns off the backlight during a frame period of the input video signal in which an upper limit

gray level for each of red (R), green (G), and blue (B) is set.” Ex-1008, 2:46-49.

The upper limit gray level is set “until the liquid crystal shows a response to the application of the specified gray level voltage in the pixel region.” *Id.* at 2:49-51.

Moreover, Hondo discloses that “[c]olor images are obtained by additive mixture of color stimuli of light passed through each pixel of R, G and B of the color filter.” *Id.* at 11:48-50. A POSITA would have understood Honbo teaches adjusting the luminosity levels of a red string, ~~for~~ the luminosity of a green string or ~~of a red string to~~ the luminosity of a blue string until the liquid crystal shows the desired response. ~~Ex-1002 ¶196~~ which would include the set gray level for each of the R, G, B LEDs and to display the proper colors within a color image or frame.

197. As explained previously, using ambient light sensors to control RGB color components of LEDs was a well-known implementation approach. ~~Ex-1002~~ (citing and discussing Ex-1010 ¶68, which explains “Each new ratio-corrected control coefficient (for R, G and B components) is calculated from the previous control coefficient on the basis of the ratio of the proportions of ambient light and illumination in the corresponding light component”).
~~¶197(citing and discussing Ex-1010 ¶68, which explains “Each new ratio-corrected control coefficient (for R, G and B components) is calculated from the previous control coefficient on the basis of the ratio of the proportions of ambient light and illumination in the corresponding light component”).~~

i. Claim 10 - The control circuit of claim 1, wherein the display includes a liquid crystal display.

198. Seo-Honbo teaches Claim 10. ~~Ex 1002 ¶¶ 198-199.~~

199. *See* Seo's teachings in Section XII I.A.3.f.

- j. **Claim 11 - The control circuit of claim 1, further comprising: the first circuitry for causing the luminosity levels of the plurality of strings of LEDs to become zero during a raster blanking interval.**

200. Seo-Honbo teaches Claim 11. ~~Ex 1002 ¶¶200-201.~~

201. See Seo's teachings in Section XII.A.3.g.

- k. **Claim 12 – The control circuit of claim 1, wherein the plurality of strings of LEDs include a combination of a string of white LEDs and one or more strings of LEDs selected from the group consisting of a string of red LEDs, a string of blue LEDs, or a string of green LEDs.**

202. Seo-Honbo teaches Claim 12 for the same reason discussed in Section XII.D.4.e with respect to Claim 6.

203. ~~Ex 1002 ¶¶202-203.~~ Honbo discloses that “[i]n the liquid crystal display panel 14, white light from the backlight 16 becomes linearly polarized light.” ~~Ex-1008, 11:35-36. Thus, a POSITA would have understood the backlight could have been implemented a string of white LEDs to provide white light as the backlight for the LCD, and/or as a string of RGB LEDs that mix together to make white light. Id. at 4:8-9. Ex 1002 ¶203. after passage through the polarizer 32” and that this white light source “is configured to use light of R, G and B fed from the LEDs.” Ex-1008, 11:29-37, 4:8-9. Honbo also teaches that “[a]s the color of the LEDs of the backlights 16, 16A, in addition to R, G, and B, deep red may be used.” Id. at 17:32-34. Thus, a POSITA would have understood that Hondo is teaching mixing the colors of different LEDs to form the backlight. It was well known that mixing the light of different LEDs including white LEDs with blue,~~

green, and red LEDs offers many advantages including flexibility in achieving
backlight with maximum color rendering index, high efficiency and low

cost. Ex-1026, Ex-1027, Ex-1028, Ex-1029. Thus, it would have been obvious to a POSITA to also mix light from a string of white LEDs and one or more strings of colored LEDs (i.e. red, blue, or green). See Ex-1013.

l. Claim 14 - The method of claim 13, wherein the reference frequency includes a frequency of a VSYNC signal.

204. Seo-Honbo teaches Claim 14. ~~Ex-1002 ¶¶204-205.~~

205. See Seo's teachings in Section XIII.A.3.h.

m. Claim 15 - The method of claim 13, wherein adjusting the luminosity levels of a string of LEDs includes adjusting the luminosity levels at the frequency of the clock signal.

206. Seo-Honbo teaches Claim 15. ~~Ex-1002 ¶¶206-207.~~

207. See Seo's teachings in Section XIII.A.3.i.

n. Claim 16 - The method of claim 15, wherein adjusting the luminosity levels of the string of LEDs is based on a color of the LEDs and an ambient light condition.

208. Seo-Honbo teaches Claim 16 ~~Ex-1002 ¶¶208-210.~~

209. See Section XIII.D.2.a and Section XIII.D.2.b.

210. For example, Honbo's controller controls based "on a signal "pg" output from the external light sensor 1 to detect external environmental light, a process of changing displaying data for each color (red (R), green (G), and blue (B)) in the liquid crystal display section 5 and an amount of light, for each color (R, G, B), emitted from the backlight 6." Ex-1008, 1:58-66. A POSITA would

have understood Honbo to disclose adjusting luminosity levels of the strings of LEDs based on a color of the LEDs and an ambient light condition because of the signal “pg” output from the external light sensor. ~~Ex 1002 ¶210.~~

- o. Claim 20 - The display of claim 17, wherein the first circuitry is configured to generate the second clock signal.**

211. Seo-Honbo teaches Claim 20. ~~Ex 1002 ¶¶211-212.~~

See Seo’s teachings in Section XIII.A.3.j

~~**V. THE BOARD SHOULD NOT USE ITS DISCRETION TO DENY INSTITUTION UNDER *FINTIV***~~

~~The Board should decline to exercise its discretion to deny institution under 35 U.S.C. § 314(a). While Director Vidal’s June 21, 2022 Guidance made clear that “Fintiv is limited to facts of that case,” for completeness, Petitioner addresses the factors set forth in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential). As explained below, the six factors set out in *Fintiv* do not justify denying institution.~~

~~The first *Fintiv* factor is neutral here because Samsung has not yet moved to stay the district court proceedings pending IPR, and the PTAB will not infer how the district court would rule should a stay be requested. See, e.g., *Hulu LLC v. SITO Mobile R&D IP, LLC et al.*, IPR2021-00298, Paper 11 at 10-11 (PTAB May 19, 2021).~~

~~For the second *Fintiv* factor, the district court has not set a trial date in the~~

~~Samsung matter. Speculating based on prior practice in Judge Gilstrap's Court, the earliest estimated trial date is approximately October 2024. Even if trial proceeds in October 24, the above timing does not tip in favor of denying the petition in this~~

~~case. See, e.g., *Apple Inc. v. Koss Corp.*, IPR2021-00305, Paper 14 at 13 (PTAB June 3, 2021). This Petition is filed in February 2023. An institution decision should be issued within six months of docketing, around July 2023. And a final written decision (FWD) should be issued in July 2024. Thus, the *earliest* estimated trial date is around several months after the FWD. Recent PTAB cases analyzing similar schedules have weighed the second factor as neutral or, at most, slightly in favor of denial. See, e.g., *Google LLC et al. v. Parus Holdings, Inc.*, IPR2020-00847, Paper 9 at 12 (PTAB Oct. 21, 2020) (trial scheduled for three months before FWD weighs “at best, neutral”); *Apple Inc. v. Koss Corp.*, IPR2021-00305, Paper 14 at 13-14 (PTAB, June 3, 2021) (trial scheduled for two months before FWD weighs “at most, minimally in favor” of denial).~~

~~On the other hand, if the median time to trial for civil actions in the Eastern District of Texas is used to estimate the trial date, as advised by Director Vidal’s June 2022 Guidance, trial should not be expected to occur until December 2024, at least a month *after* a FWD will issue, Ex-1017, at 35 (indicating a most recent median time to trial for civil actions in the Eastern District of Texas of 24.5 months).~~

~~The **third *Fintiv* factor** weighs strongly against denial. Samsung has not yet answered Polaris’s Complaint. No hearing has been set and no substantive activity has occurred in the case. The Case Management Conference is expected to~~

~~be set no earlier than March 2024. Because the investment in the parallel court proceeding has been minimal and Petitioner acted diligently, this factor weighs strongly against discretionary denial. See, e.g., *Hulu*, Paper 11 at 13.~~

~~The **fourth *Fintiv* factor** also weighs against denial. As explained above, the median time to trial for civil actions in the Eastern District of Texas suggests that trial will not occur until at least a month after a FWD is issued. Thus, “there is a reasonable likelihood that the Board will address the overlapping validity issues prior to the district court reaching them at trial..., thereby providing the possibility of simplifying issues for trial.” *Juniper Networks, Inc. v. Packet Intelligence LLC*, IPR2020-0039, Paper 21 at 18 (PTAB Sept. 10, 2020); *see also MED-EL Elektromedizinische Geraete GmbH v. Sonova AG*, IPR2020-00176, Paper 13 at 15 (PTAB June 3, 2020) (“As to the fourth factor, the parties do not dispute that overlap exists between the invalidity issues in this case and in the district court. This overlap may inure to the district court’s benefit, however, by simplifying issues for trial should we reach our determination on the challenges raised in the Petition before trial.”).~~

~~Moreover, Petitioner is challenging more claims than what is likely to be asserted in the district court litigation. Patent Owner’s Complaint identifies only independent claim 1. *Polaris PowerLED Techs., LLC v. Samsung Elecs. Am., Inc.*, No. 2:22-cv-00469, Dkt. 1 ¶54 (E.D. Tex. Dec. 12, 2022). In the district court, PO~~

~~will likely assert a subset of claims, while this Petition challenges all claims of the '887 Patent. This IPR petition is thus the only venue in which these invalidity challenges will be adjudicated against several claims in the '887 Patent, which promotes system efficiency and benefits the public in that many more claims will be addressed here and will resolve disputes against future district court defendants. See *Fintiv*, Paper 11 at 4 (“the Board’s cases addressing earlier trial dates as a basis for denial under NHHK have sought to balance considerations such as system efficiency, fairness, and patent quality.”). Accordingly, challenging additional claims further weighs against denial. See, e.g., *Vudu, Inc. v. Ideahub, Inc.*, IPR2020-01688, Paper 16 at 14-15 (PTAB April 19, 2021) (“differences in asserted claims” and claims challenged in the petition weighs against denial).~~

~~On the **fifth *Fintiv* factor**, the Board should give little weight to the fact that Petitioner and PO are the same parties as in district court. See *Weatherford U.S., L.P., v. Enventure Global Tech., Inc.*, Paper 16 at 11-13 (April 14, 2021). Although Samsung is both petitioner and litigation defendant, this factor does not outweigh the other factors that strongly weigh against discretionary denial.~~

~~“Other circumstances” under the **sixth *Fintiv* factor** further weigh against discretionary denial. The merits of the Petition are strong. Here, references Seo and Fung, render obvious Claims 1-5, 7, 10-11, 13-15, and 18-20. Likewise, Seo and Honbo also renders Claims 1-21 obvious. The reference Yao is added simply~~

~~to demonstrate the obvious feature of adding an ambient light sensor. All elements recite nothing more than predictable approaches to controlling a display's backlight LED strings. See *Align Tech., Inc. v. 3Shape A/S*, IPR2020-01087, Paper 15 at 42-43 (PTAB Jan 20, 2021). See also Section VII above.~~

212. ~~Taken together holistically, the *Fintiv* factors strongly weigh against denial.~~

IX.XIV. CONCLUSION

213. ~~The unpatentability grounds presented above are reasonably likely to prevail, *inter partes* review should be instituted, and~~ For at least these reasons, Claims 1-21 ~~should be cancelled as unpatentable~~ are invalid over the prior art.

Respectfully Submitted,

/s/ Ben Haber

Ben Haber (Reg. No. 67,129)

CERTIFICATE OF WORD COUNT

~~Pursuant to 37 C.F.R. § 42.24(d), Petitioner certifies that this petition includes 13,213 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under § 42.8, certificates of service, word count, and exhibits.~~

CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e)(1))

The undersigned certifies pursuant to 37 C.F.R. §§42.6(e) and 42.105 that on February 2, 2023, a true and correct copy of the Petition For *Inter Partes* Review Of U.S. Patent No. 8,217,887 and Exhibits 1001 through 1029 were served via express mail on the Patent Owner at the below correspondence address of record:

~~Fish & Richardson PC / Atmel
P.O. Box 1022
Minneapolis, MN~~

A courtesy copy was sent to the below counsel via electronic mail:

~~Robert F. Kramer
rkramer@kramerdlay.com
Kramer Day Alberti Lim Tonkovich & Belloli LLP
577 Airport Blvd., Suite 250
Burlingame, CA 94010
Phone: (650) 825-4300~~

~~Deron R. Dacus
ddacus@dacusfirm.com
The Dacus Firm, P.C.
821 ESE Loop 323, Suite 430
Tyler, TX 75701
Phone/Fax: (903) 705-1117~~

~~Dated: February 2, 2023~~ ~~Respectfully submitted,~~

~~/s/ Ben Haber~~
~~Ben Haber (Reg. No. 67,129)~~
~~O'Melveny & Myers LLP~~
~~400 South Hope Street, 18th Floor~~
~~Los Angeles, CA 90071~~
~~Telephone: (213) 430-6000~~
~~Fax: (213) 430-6407~~

214. ~~Email: bhaber@omm.com Attorney for Petitioner~~ In signing this declaration, I
understand that the declaration will be filed as evidence in a contested case before
the Patent Trial and Appeal Board of the United States Patent and Trademark
Office. I acknowledge that I may be subject to cross-examination in this case and
that cross-examination will take place within the United States. If cross-
examination is required of me, I will appear for cross-examination within the
United States during the time allotted for cross- examination.

215. I declare that all statements made herein of my knowledge are true,
that all statements made on information and belief are believed to be true, and that
these statements were made with the knowledge that willful false statements and

the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

216. I declare under penalty of perjury that the foregoing is true and correct.

Respectfully Submitted,

/s/ 
Dr. Miltiadis Hatalis