

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

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 8,217,887**

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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-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	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

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., and Samsung Display Co., Ltd. (collectively, “Petitioner”) request inter partes review (“IPR”) of claims 1-21 of U.S. Patent No. 8,217,887 (“the ’887 Patent”) (Ex-1001), currently assigned to Polaris PowerLED Technologies, LLC (“Patent Owner”).

The ’887 Patent relates to techniques for controlling backlight displays. Specifically, “controlling the intensity of light emitting diodes (LEDs) in the backlights of electronic displays.” Ex-1001, 1:6-7.

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.

II. 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.

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III. 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.

IV. 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.

V. PRECISE RELIEF REQUESTED

Petitioner requests cancellation of Claims 1-21 of the '887 Patent under 35 U.S.C. § 103 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.

VI. THE CHALLENGED PATENT

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.

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. “[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.

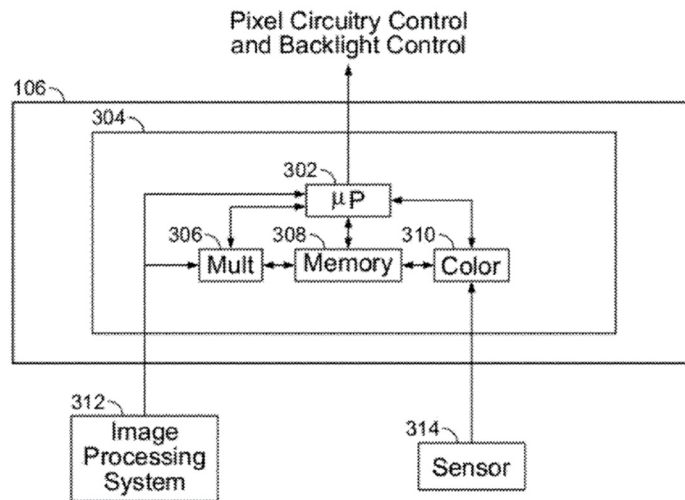


FIG. 3

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.

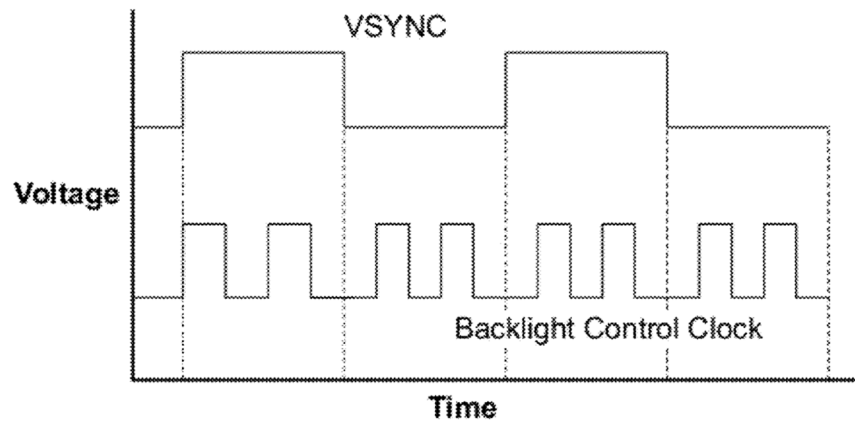


FIG. 4

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

VII. PATENT PROSECUTION HISTORY

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

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. 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 0092. Applicant also amended Claim 13 to include features similar to independent Claim 1. *Id.* at 0093.

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.

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 were cited during the prosecution of application 12/018,399 that led to the ’887 Patent. Indeed, to the best of Petitioner’s 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.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

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. PRIORITY DATE

The earliest possible priority for the '887 Patent is January 23, 2008. Petitioner takes no position on the proper priority date for each claim of the '887 Patent. Assuming this earliest date, all prior art references asserted in this petition are prior art.²

X. 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 not believe that any term requires explicit construction. Ex-1002 ¶58.³

² Petitioner reserves the right to challenge the priority date in other proceedings to the extent PO attempts to swear behind the prior art relied upon in this Petition.

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 claim construction order as soon as it becomes available, so that it is timely made of record in the proceeding and can be considered by the Board. 37 C.F.R. § 42.100(b).

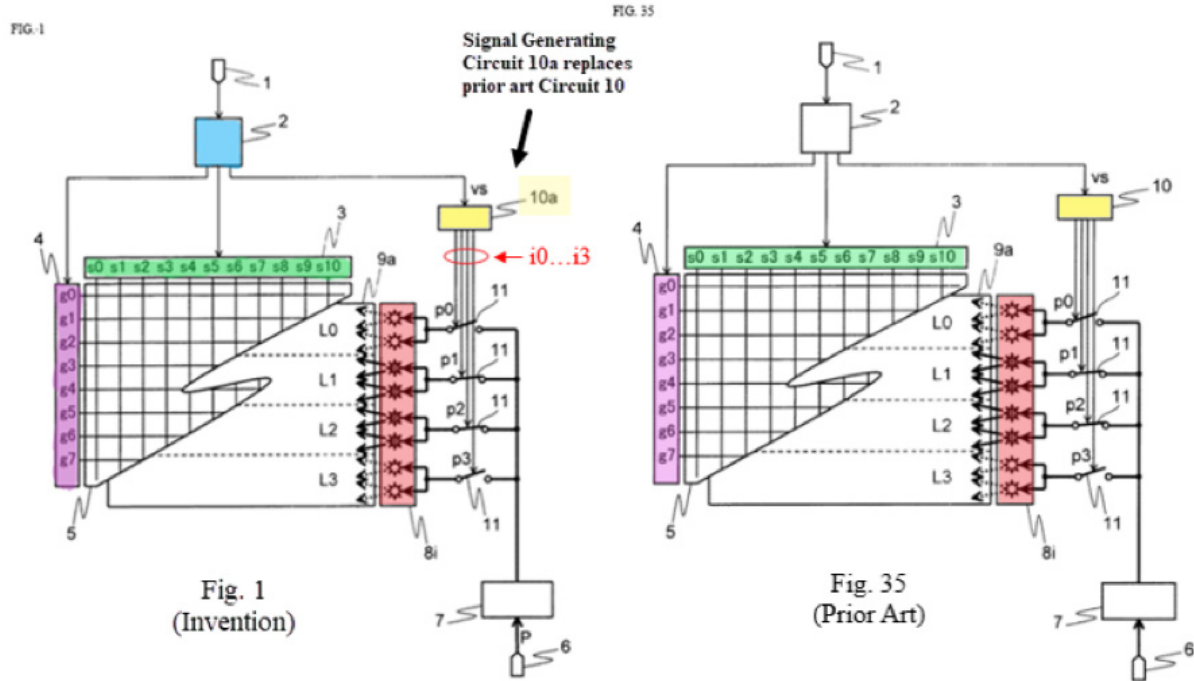
XI. BRIEF DESCRIPTION OF THE APPLIED PRIOR ART REFERENCES

A. Seo (Ex-1005)

Seo, titled “Image Display Device,” Japanese Patent Application 2006-18200, was filed on July 5, 2004 and published on January 19, 2006. Seo is §102(b) prior art. A certified translation is included in Ex-1005. Ex-1002 ¶¶59-63.

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.

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, Abstract (explaining that 8i is a “light source body”).

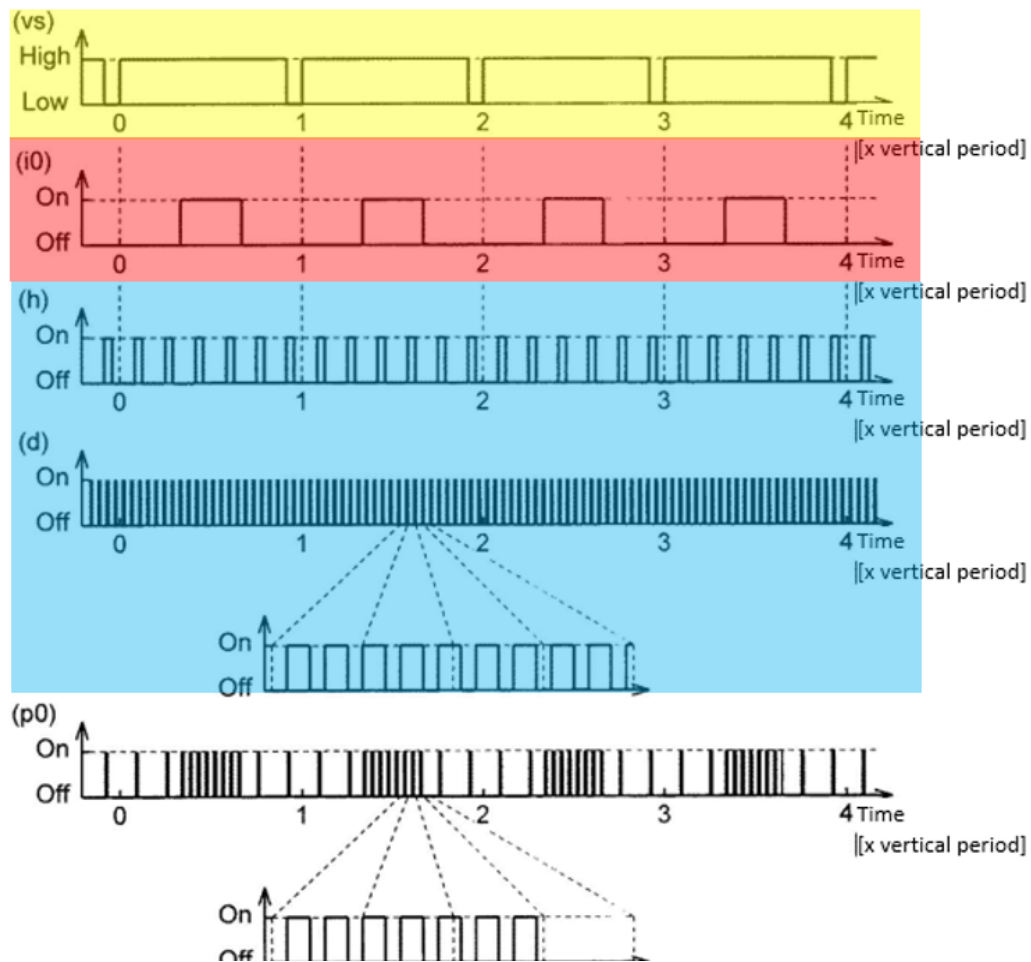


As illustrated in Figure 1 (and prior art Figure 35), “the hold type light emitting display device includes a video signal input terminal 1, a control circuit 2, a source driver 3, a gate driver 4, [] a liquid crystal panel 5,” and also generating circuit 10a. Ex-1005 ¶¶7, 112. “In addition, source lines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

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 “d,” (blue) result in adjusting the luminosity of the LEDs several times within a single “vs” period (yellow). Ex-1002 ¶63.⁴

FIG. 9



⁴ Throughout this Petition, all annotations and emphasis have been added, unless otherwise noted.

B. Yao (Ex-1006)

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

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.

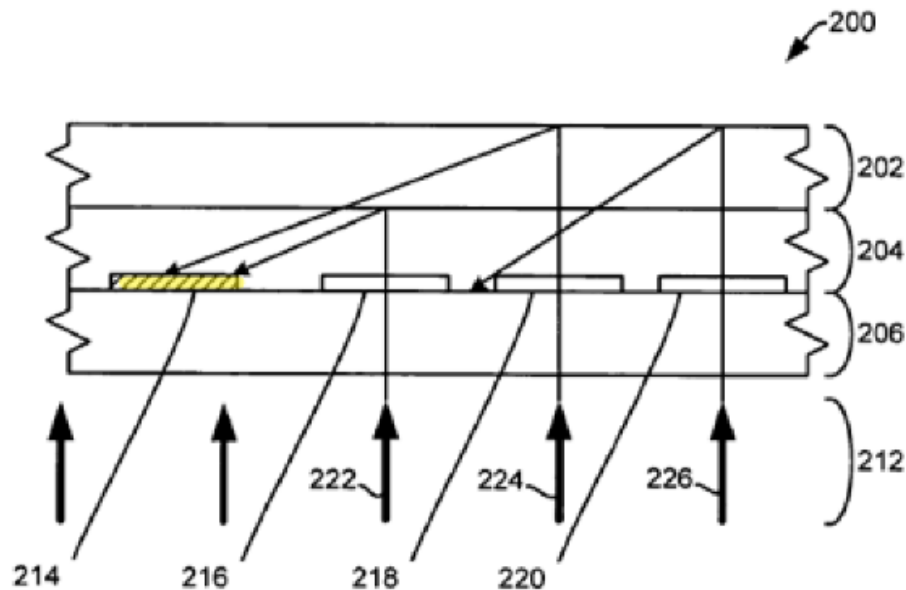


FIG. 2

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)

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

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.

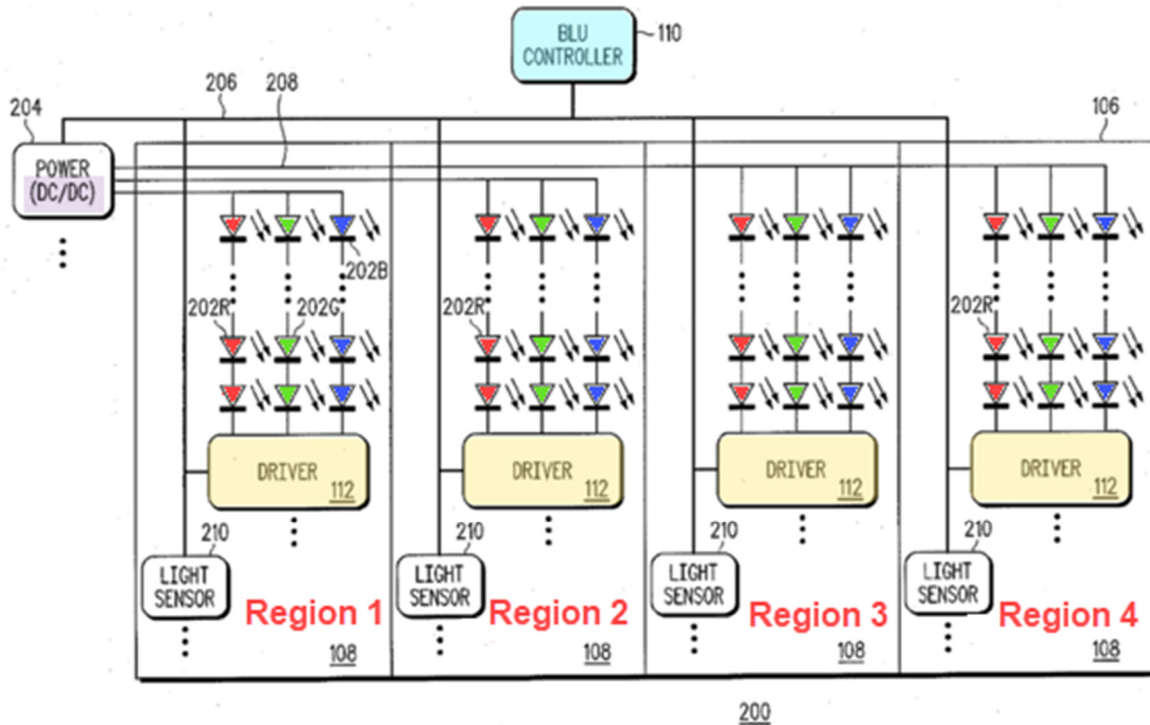


FIG. 2

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 PWM⁵ signal.” *Id.*

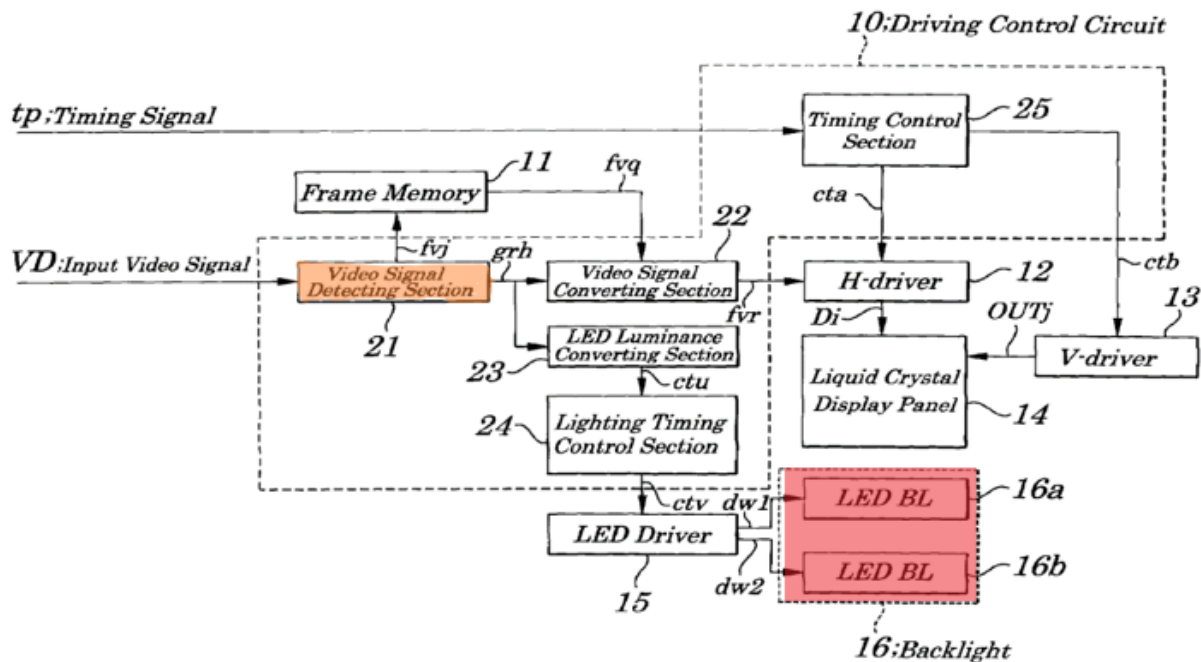
⁵ PWM refers to Pulse-width modulation.

D. Honbo (Ex-1008)

Honbo, titled “Liquid Crystal Display Device, Driving Control Circuit and Driving Method Used in Same Device,” U.S. Patent No. 7,952,556, was filed on July 9, 2007 and issued on May 31, 2011. Honbo is 35 U.S.C. §102(e) prior art. Ex-1002 ¶¶70-72.

As shown in Figure 1, Honbo discloses “[a] liquid crystal display device capable of improving quality of moving images.” Ex-1008, Abstract. Figure 1 includes “a driving control circuit 10, [] a liquid crystal display panel 14, an LED driver 15, and a backlight 16 [below, red].” *Id.* at 9:43-45.

FIG. 1



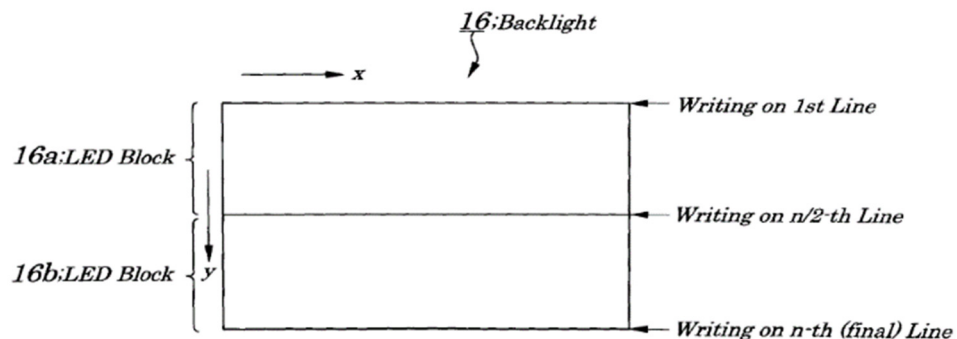
Driving control circuit 10 “has a video signal detecting section 21, a video signal converting section 22, an LED luminance converting section 23, a lighting

timing control section 24, and a timing control section 25.” Ex-1008, 9:46-49.

Video signal detecting section 21 (highlighted orange) “detects, in a manner to correspond to each of LED blocks (LED BL) 16*a* and 16*b*, 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 16*a* and 16*b*, in a y direction of the liquid crystal display panel 14.” *Id.* at 11:53-55.

FIG. 4



XII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS

The '887 Patent contains 21 Claims, of which three are independent. Claims 1, 13, and 17 are similar, with a few minor variations in some of the elements. Exhibit 1020 is a summary table showing correspondence between challenged claims and elements. 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**

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. 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 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.” *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

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.

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.

2. Independent Claims 1 and 13

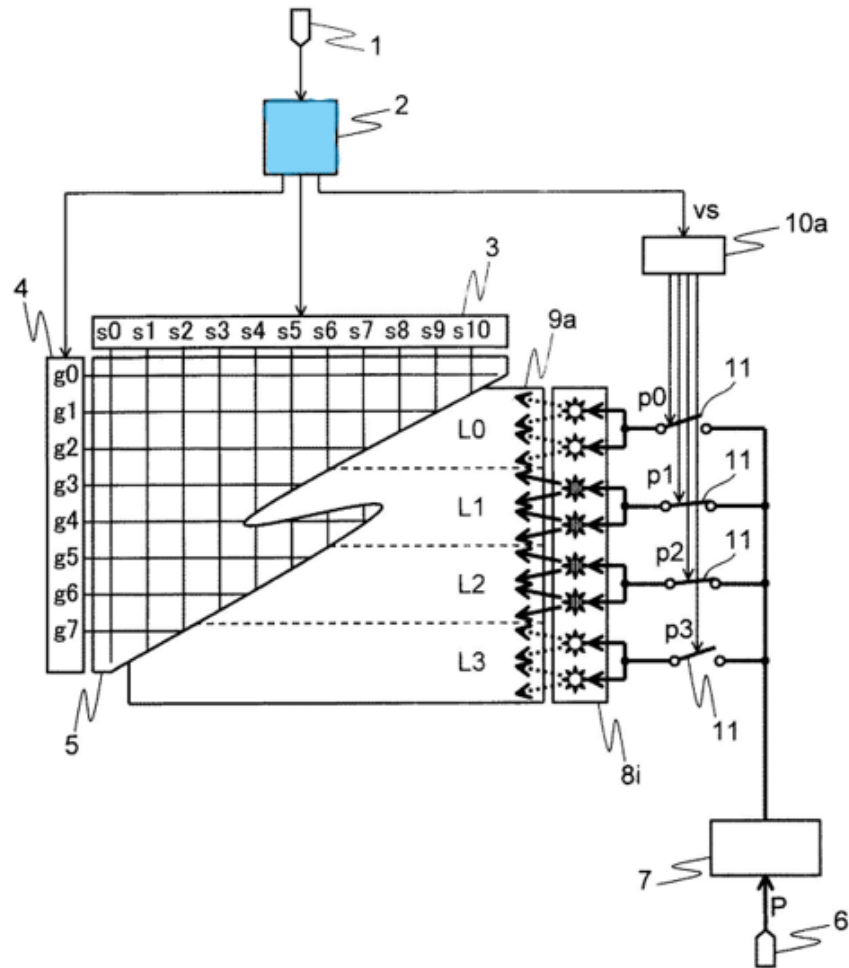
a. 1[Pre] - A control circuit for an electronic display comprising:

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

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

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



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

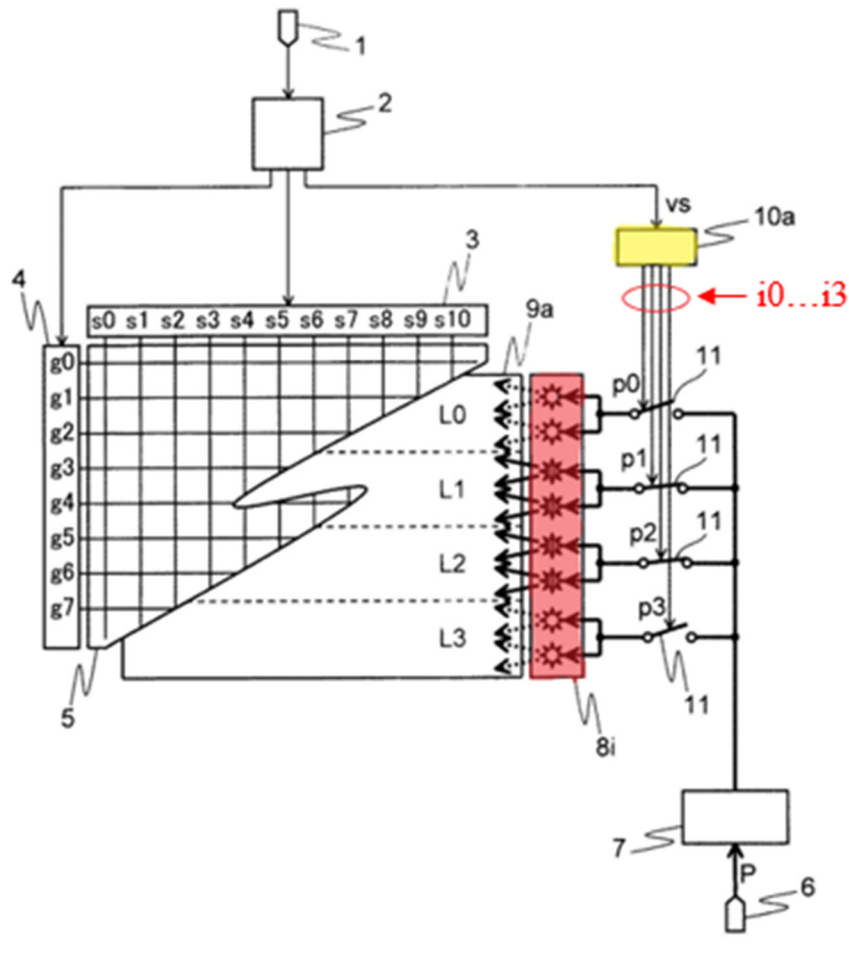
13[Ci] - using the clock signal for adjusting luminosity levels of a plurality of strings of light emitting diodes (LEDs) in a backlighting circuitry of the electronic display,

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

¶¶78-84.

As shown in Figure 1, Seo discloses generating circuit 10a (below, yellow), which is the first circuitry for controlling the luminosity levels of the LEDs. Ex-
1005 ¶¶111-114, 136, 145-166.

FIG. 1



Specifically, circuit 10a produces three kinds of luminosity-driving clock signals: impulse signal “i0-i3” (identified above), pseudo hold pulse signal “h,” and PWM dimming signal “d.” *Id.* ¶154. As shown in Figure 1, the input to box 10a is “vs,”

the vertical synchronization clock signal,⁶ used to generate the resulting luminosity-driving clock signals “i0-i3,” “h,” and “d.” Ex-1002 ¶80. Seo 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 ¶¶135-136. Moreover, these signals are used to drive LEDs, creating “an impulse type light emitting backlight” to illuminate the display pixels. *Id.* ¶116. 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.

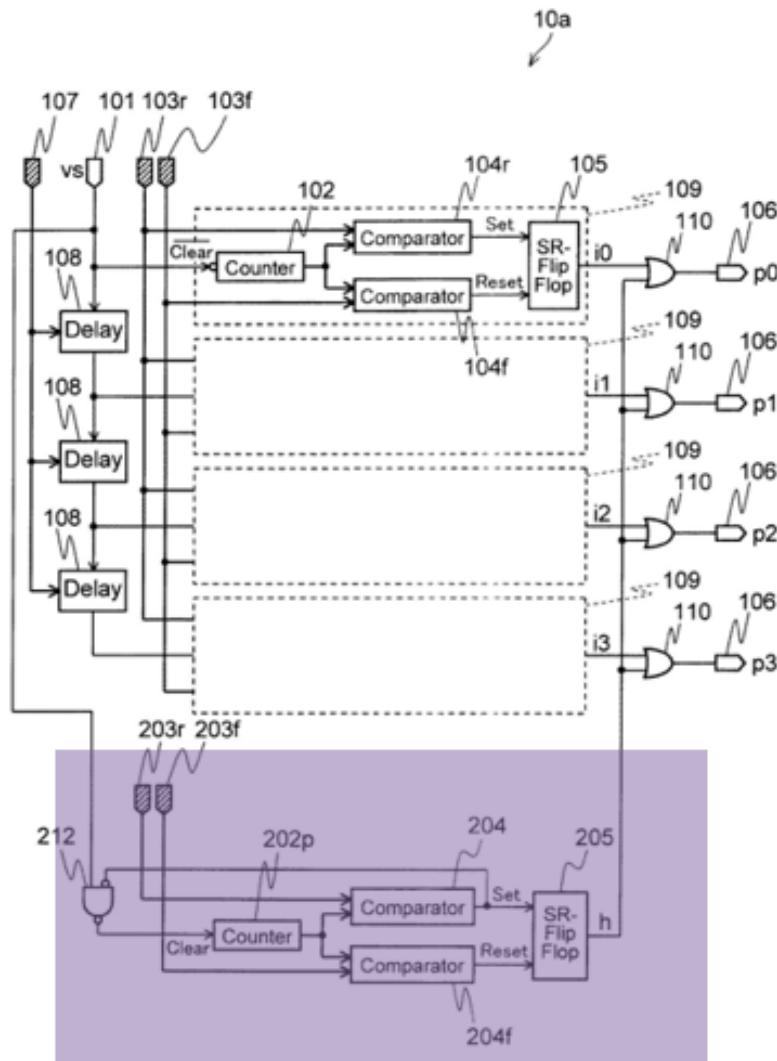
Figure 10⁷ (depicting “the turn ON signal generating circuit 10a for the LCD of invention 1,” Ex-1005 ¶113), shows that signal generating circuit 10a, i.e. the first circuitry, includes at least two clocking circuits used to generate impulse signals that drive the LEDs: counter 102 and counter 202p. 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

⁶ 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.

⁷ 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.

203r, [and] turn OFF time setting means 203f[.]” Ex-1005 ¶114. 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



Ground 1

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 end, and a string of LEDs would provide more uniform illumination and more control over the illumination level.⁸ Ex-1002 ¶¶41-44, 82. 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

⁸ 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.

(two or more per zone)⁹ 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. Ex-1002 ¶82; *see e.g.* Ex-1009, Fig. 4.

Ground 2

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 XII.A.1. Ex-1002 ¶83.

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. 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 of light sources on each 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 to provide white light as the backlight for the LCD. Ex-1002 ¶¶84. 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.

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

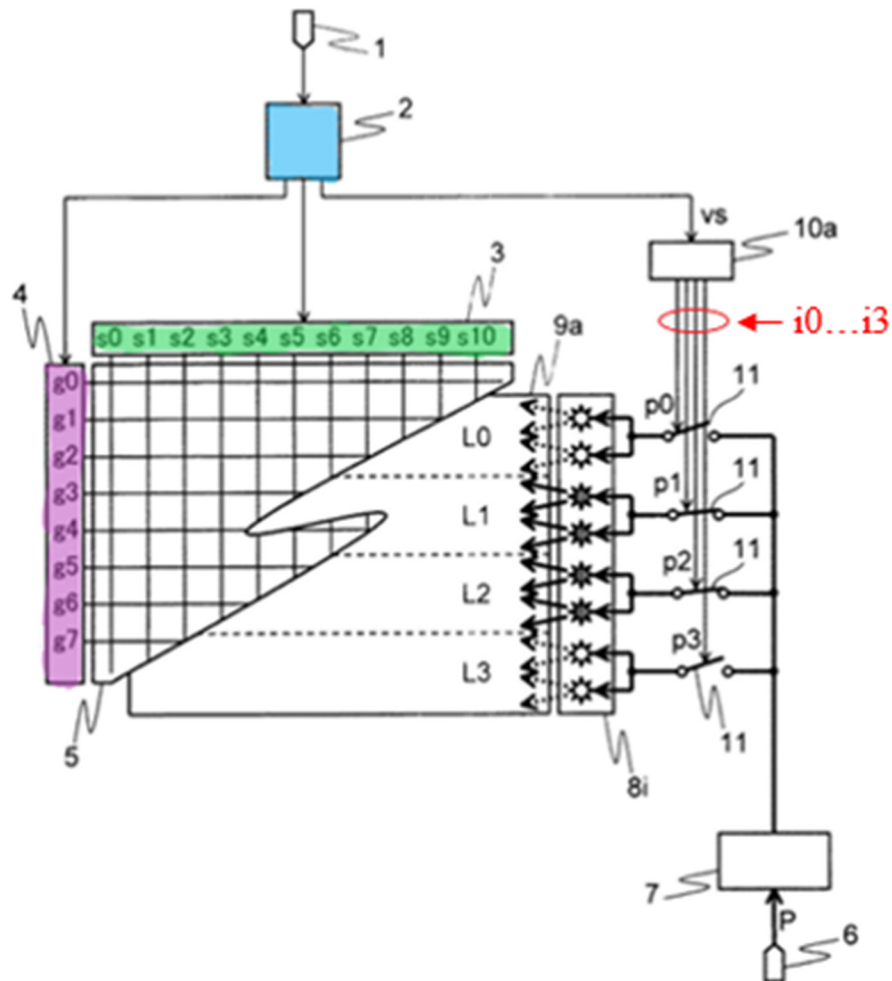
Seo alone teaches elements 1[B]. Ex-1002 ¶¶85-87.

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 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.*

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. A

POSITA would have understood that the picture elements scanned by gate driver 4 are a plurality of pixels for displaying image frames of a video. Ex-1002 ¶87.

FIG. 1



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

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

Seo discloses that impulse signals i_0 to i_3 are synchronized with the vertical sync signal “vs” and are output to gate lines g_0 to g_7 of gate driver 4. Ex-1005

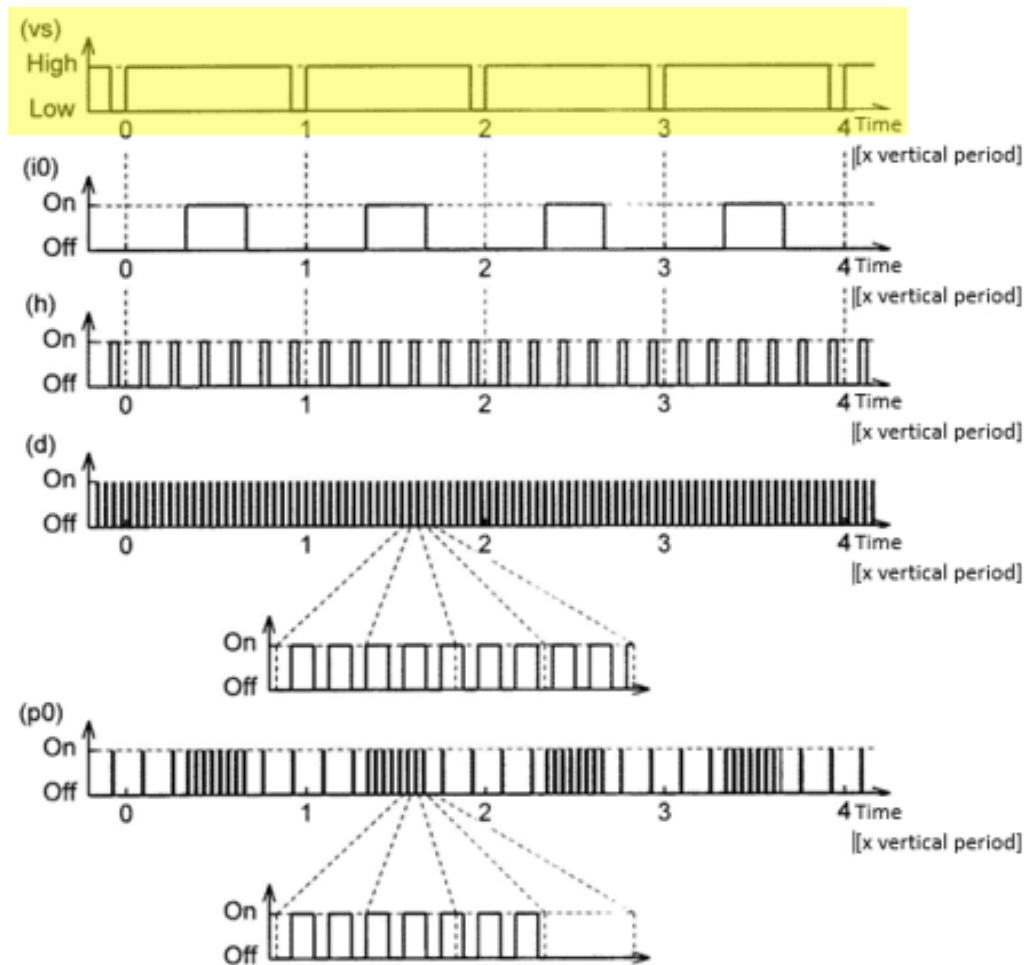
¶188. Seo further uses standard refresh rates for the image frames of its video signal. For example, “the vertical frequency of the TV is also set to about 50 to 60 Hz.” *Id.* ¶30; *see also id.* ¶153. Additionally, “the impulse signals i0 to i3 are emitted in synchronization with the vertical sync signal 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. A 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. Ex-1002 ¶89. 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.

- e. **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

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

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 9, the signal “vs” (below, yellow) is used to change the displayed image frame at a first frequency:

FIG. 9



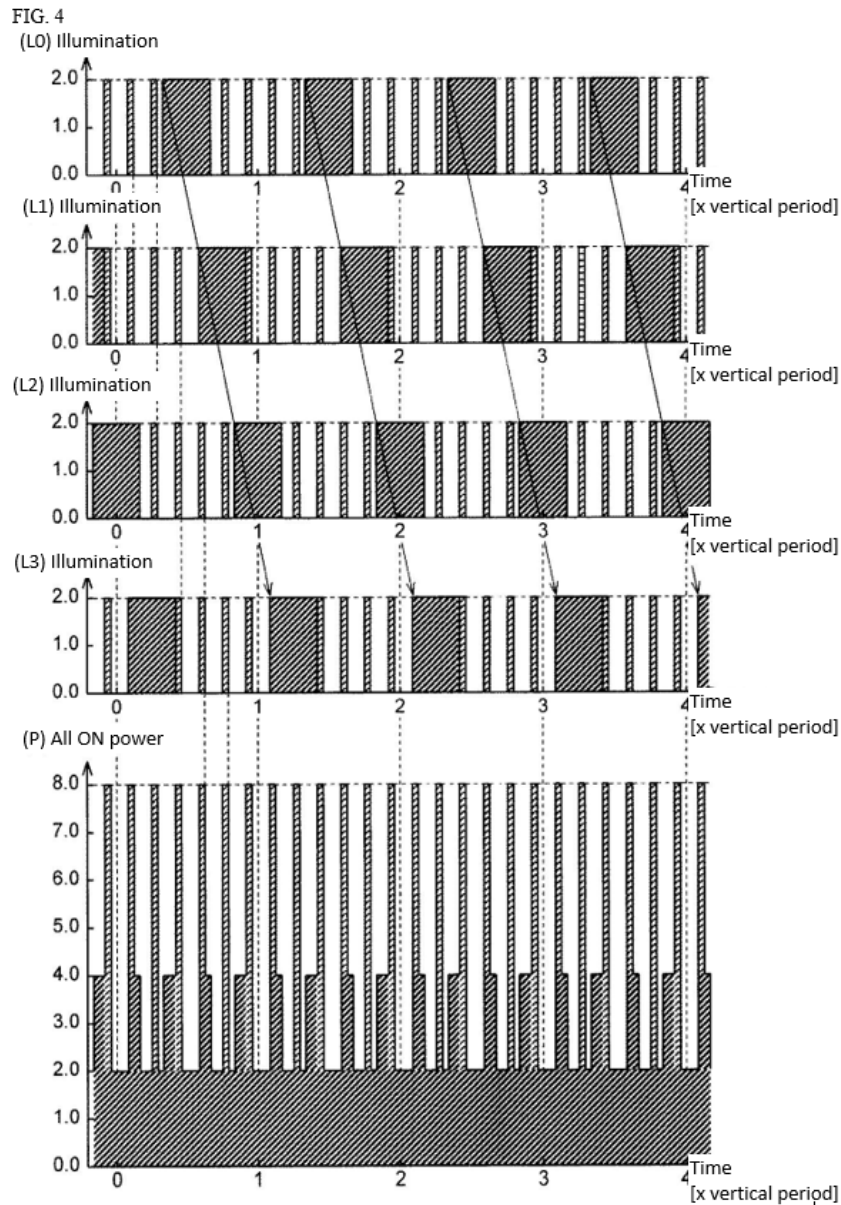
Id., Fig. 9. Thus, a POSITA would have understood that Seo discloses a second circuitry that changes a displayed image frame once every cycle of a first clock signal having a first frequency, the first frequency corresponding to the vs clock signal, such as 60 Hz. Ex-1002 ¶92.

f. **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

Seo alone teaches elements 1[Di] and 13[Cii]. Ex-1002 ¶¶93-101.

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, 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. Thus, a POSITA would have understood the illuminating areas 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[.]" Ex-1005 ¶154. An example of the luminosity-driving impulse signal i_0 is shown in Figure 9 (below, red), underneath the image-display signal vs , discussed in Section XII.A.2.e (below, yellow). Seo explains that the illuminating areas are independently controlled by the corresponding "p0-p3" signals. *Id.* ¶18. Circuit 10a

produces at least two other luminosity-driving signals used for adjusting the luminosity levels of the LEDs multiple times within a single “vs” period. Ex-1002 ¶95. 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 clock signals: “pseudo hold pulse signal h” and a “PWM dimming signal d” (below, blue). Ex-1005 ¶154. As shown in Figure 9, the lamp turn ON signal “p0” is a composite of the impulse signal “i0,” high frequency signal “h,” and PWM dimming signal “d.” *Id.* at Fig. 9; Ex-1002 ¶95. For example, when “i0” is high (1), “d” is equal to “p0,” and where “i0” is low (0), “h” is equal to “p0.” Ex-1002 ¶95.

FIG. 9

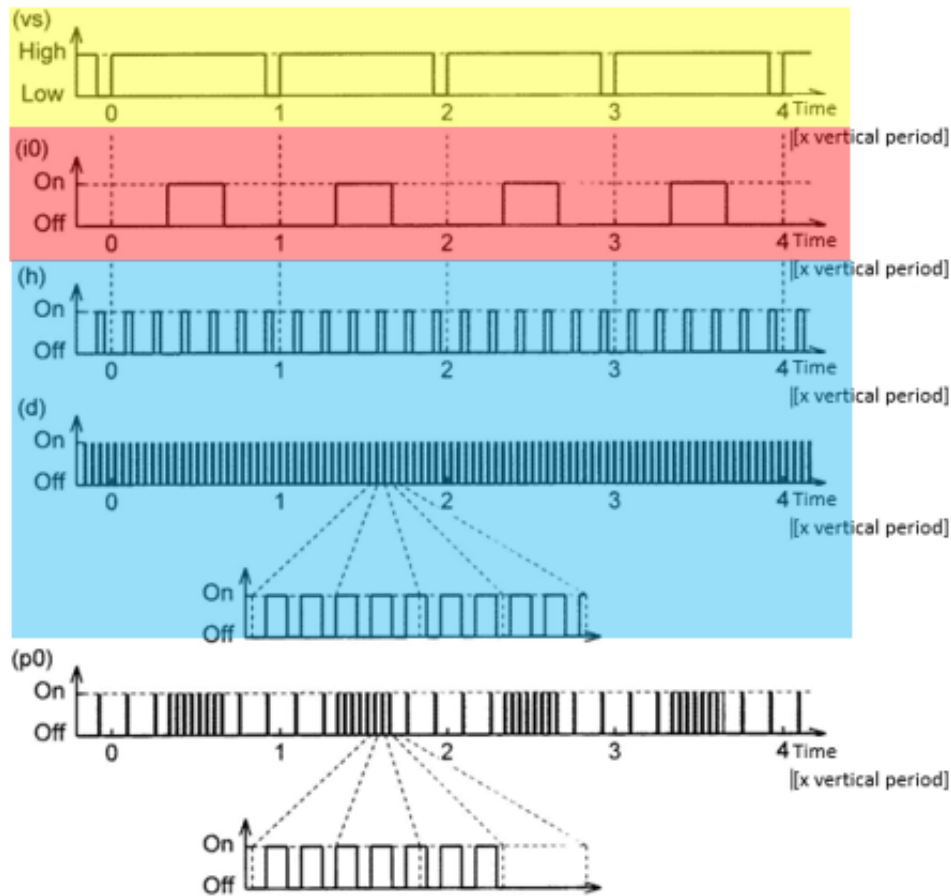


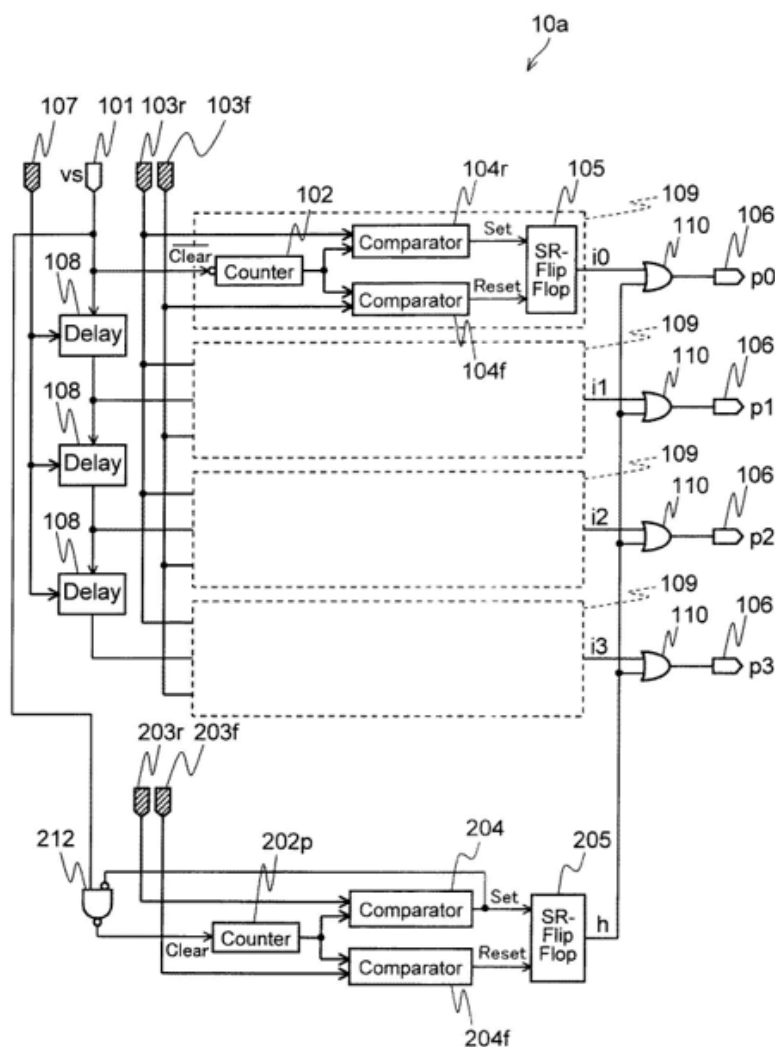
Figure 9 displays “the vertical sync signal vs, impulse signal i0, pseudo hold pulse signal h, PWM dimming signal d, and lamp turn ON signal p0.” Ex-1005 ¶154. As depicted in the Figure 9 example, “h” will adjust the luminosity 6 times in a single “vs” period. And “d” is driven at an even higher frequency, 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

times during display of one image frame (within one “vs” time period). Ex-1002

¶98.

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”, 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 cleared by (and thus based on) the pulse of the vertical sync signal. Ex-1002 ¶99.

FIG. 10



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

FIG. 6

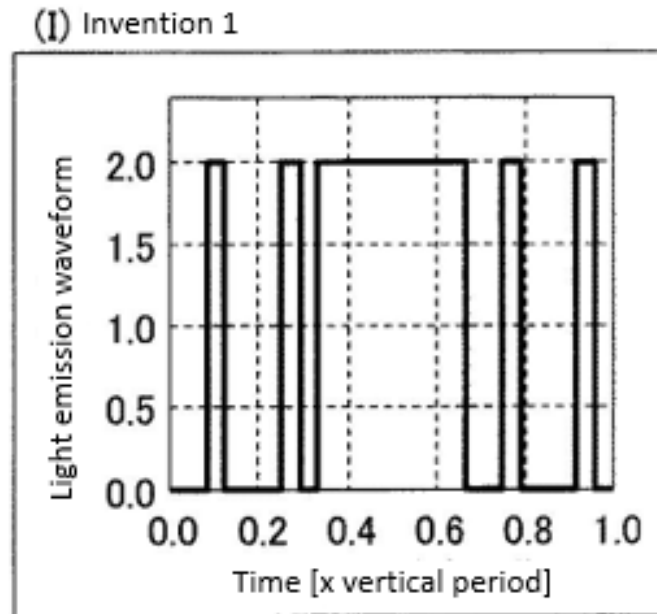


Figure 6 (Part I) shows the LED light emission waveform of the L0 region as a function of the vs time period. Ex-1005 ¶130 (“Part I of FIG. 6 has the same waveform as the light emission waveform of the area L0 illustrated in FIG. 4”).

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 “vs” time period. *Id.*; Ex-1005, Fig. 6 (counting 5 discrete luminosity peaks in the figure).

- g. 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;

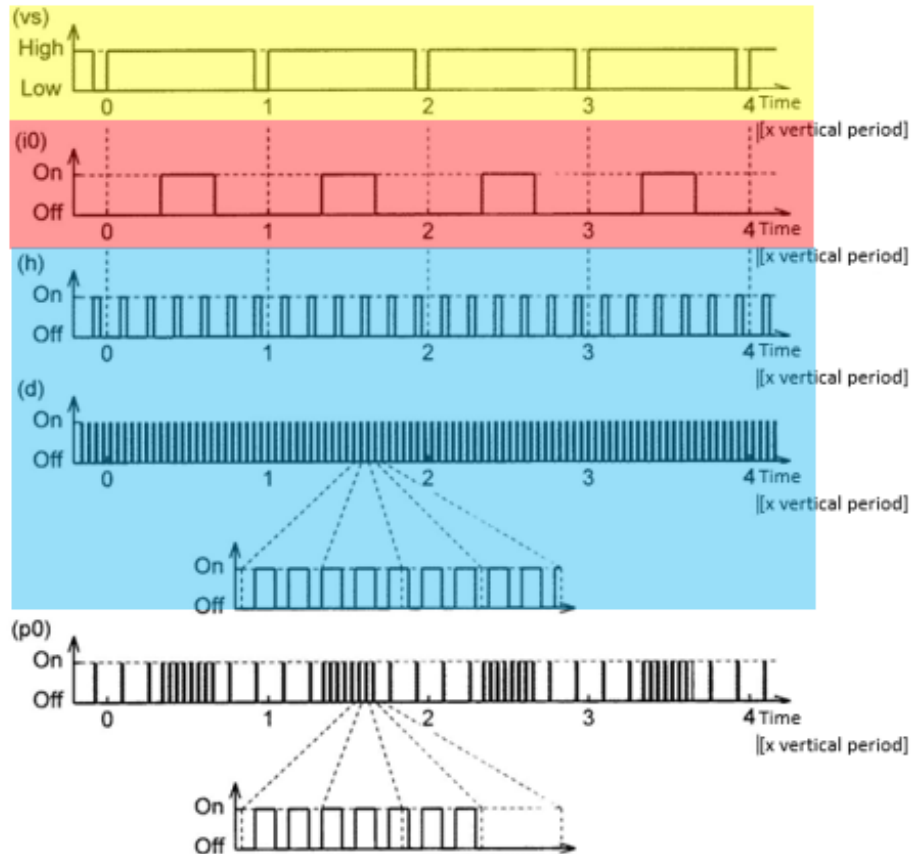
Seo alone teaches elements 1[Dii] and 13[A]. Ex-1002 ¶¶102-106.

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 “PWM dimming signal d” are used for adjusting the luminosity levels of the LEDs multiple times within a single “vs” time period, as explained in Section XII.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. 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 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

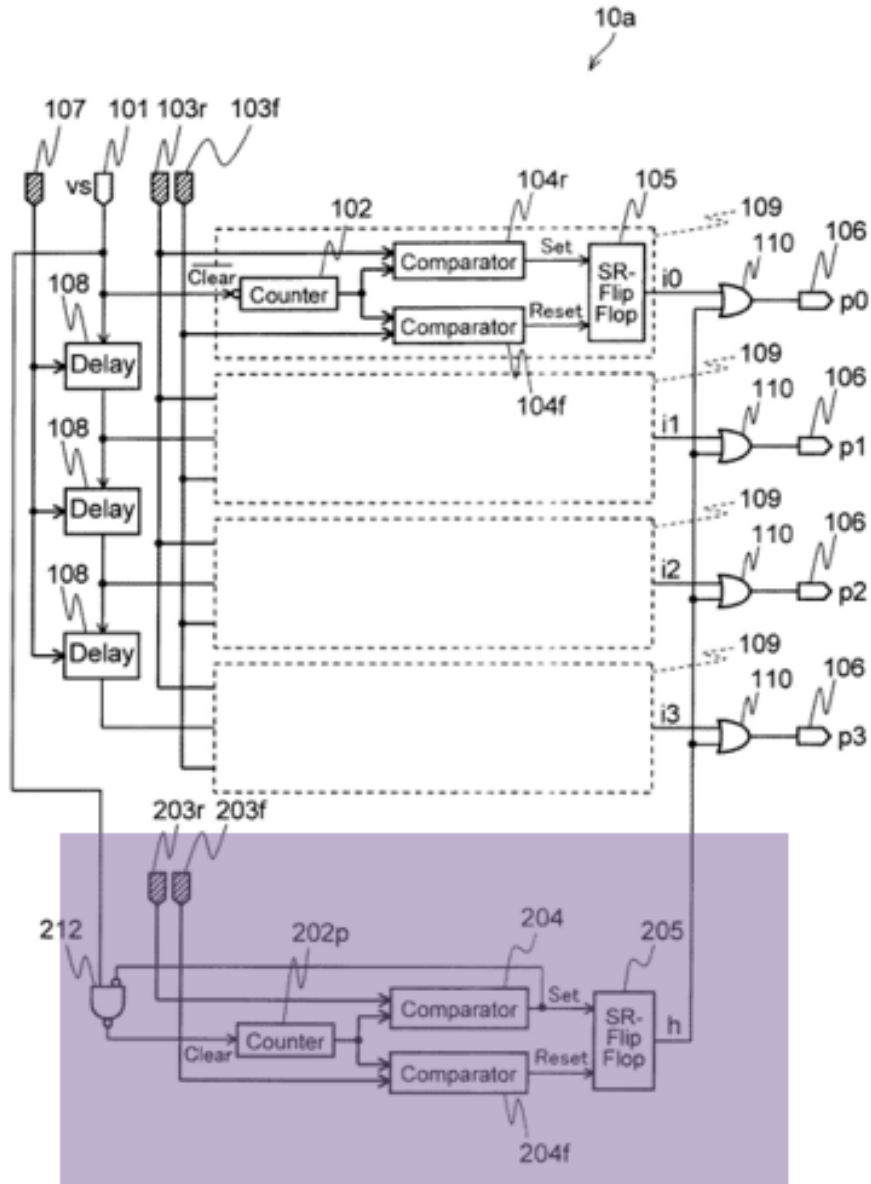
“h” and “d” are a clock signal with a frequency that is a multiple of, and higher, than reference signal “vs.” Ex-1002 ¶104.

FIG. 9



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



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.

Seo alone teaches Claims 2 and 18. 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 could 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.

Seo alone teaches Claims 3 and 19 for the same reasons discussed in Section XII.A.1.f (Shown in Figure 9, “h” will adjust the luminosity 6 times in a single vs period and a single i0 period.). Ex-1002 ¶109. Seo also discloses many other

numbers of adjustments such as “h” being 10 times “vs.” Ex-1005 ¶153. 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.**

Seo alone teaches Claim 4. Ex-1002 ¶110-111. As discussed in Section XII.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 VSYNC signal. Ex-1002 ¶110. 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, 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.

- 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.**

Seo alone teaches Claim 5 for the same reason discussed with claim 4 in

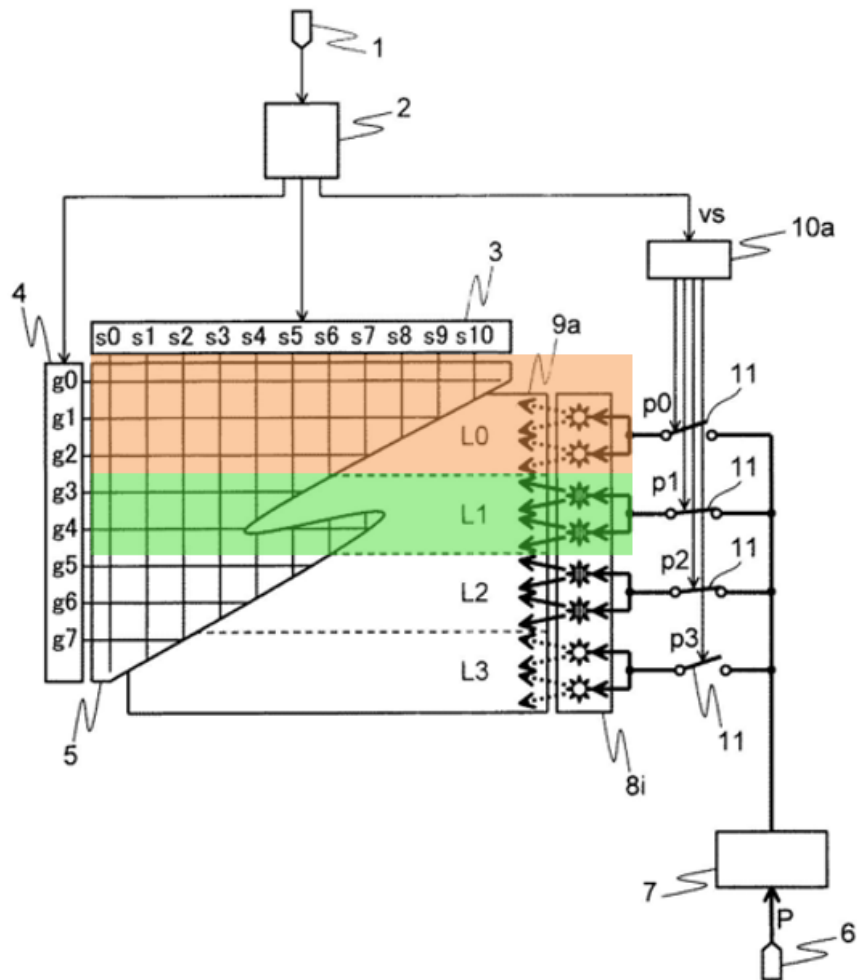
Sections XII.A.2.f and XII.A.2.c. Ex-1002 ¶112.

- 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.**

Seo alone teaches Claim 7 for the same reasons discussed in Section XII.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



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

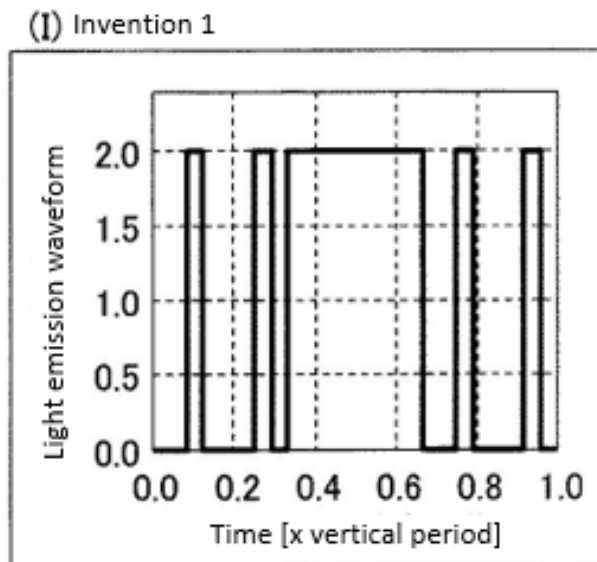
that provides impulse signals used to adjust the luminosity levels of the LEDs. Ex-1005, Fig. 1; Ex-1002 ¶114. As discussed above, illuminating areas “L0 to L3 of the light guide plate 9a sequentially emit light in the same direction as the scanning of the gate [] synchronized with the vertical sync signal vs,” used to display the associated video images in the display pixels. Ex-1005 ¶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.

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.

- g. 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.**

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

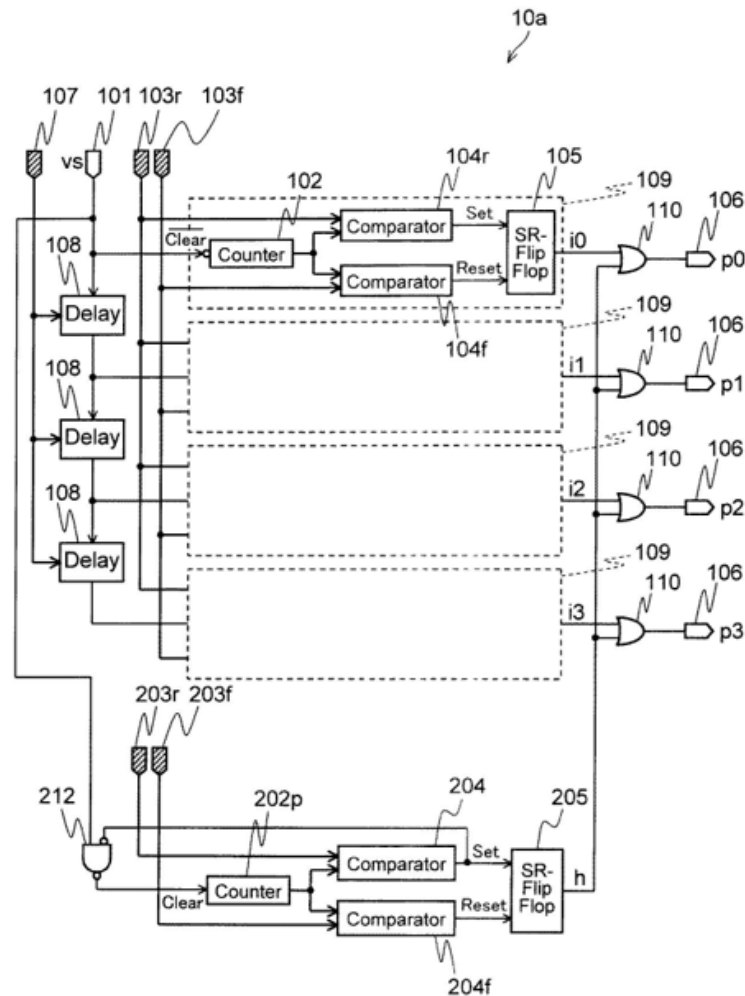
FIG. 6



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 ¶¶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



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

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 ¶119.

- 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.**

Seo alone teaches Claim 15 for the same reasons discussed with Claim 4 and Claim 5 in Sections XII.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.**

Seo alone teaches Claim 20 for the same reasons discussed in Section XII.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**

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.A.1. Ex-1002 ¶122.

2. Independent Claim 17

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

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

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;

Seo-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.

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. 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. 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.*; 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. 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 ¶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.

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

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

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

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

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

Seo-Fung teaches element 17[D] for the same reasons discussed in Section XII.A.2.c. Ex-1002 ¶128.

- 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,**

Seo-Fung teaches element 17[Ei] for the same reasons discussed in Section XII.A.2.d. Ex-1002 ¶129.

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

Seo-Fung teaches element 17[Eii] for the same reasons discussed in Section XII.A.2.e. Ex-1002 ¶130.

- 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,**

Seo-Fung teaches element 17[Fi] for the same reasons discussed in Section 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.**

Seo-Fung teaches element 17[Fii] for the same reasons discussed in Section 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.**

Seo-Fung teaches Claim 6 for the same reasons discussed in Section XII.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-Fung teaches Claim 12 for the same reasons discussed in Section XII.B.2.b. Ex-1002 ¶134. 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. A POSITA would have understood that the different combinations of colored LEDs may be strings of LEDs. Ex-1002 ¶134.

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

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-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). *Id.*

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 XII.A.2.b. Ex-1002 ¶¶136-137.

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.

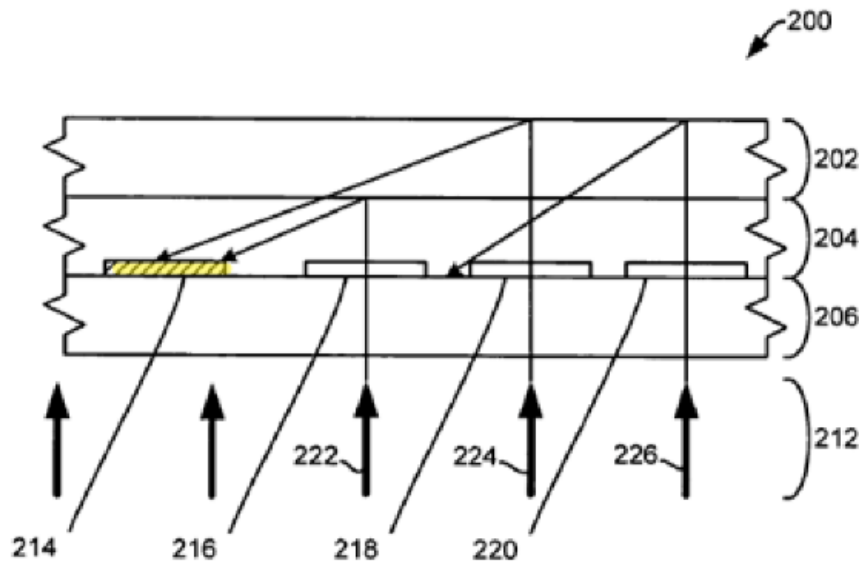


FIG. 2

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

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

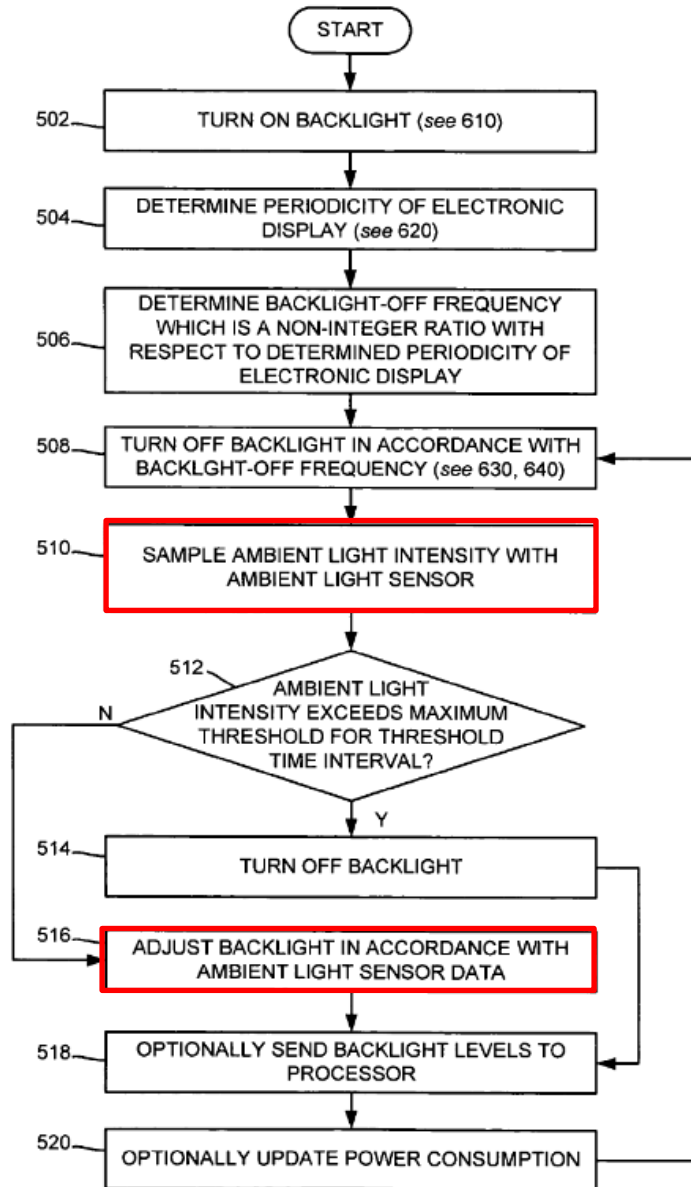


FIG. 5

- b. 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.

Seo-Fung in view of Yao teaches Claim 9 and Claim 21. Ex-1002 ¶¶138-140. 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.

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.

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 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").

c. 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.

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.

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 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”).

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.

Seo in view 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 relates 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 [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 until the liquid crystal shows a response to the application.” Ex-1008, 2:46-50. 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 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:

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

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

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

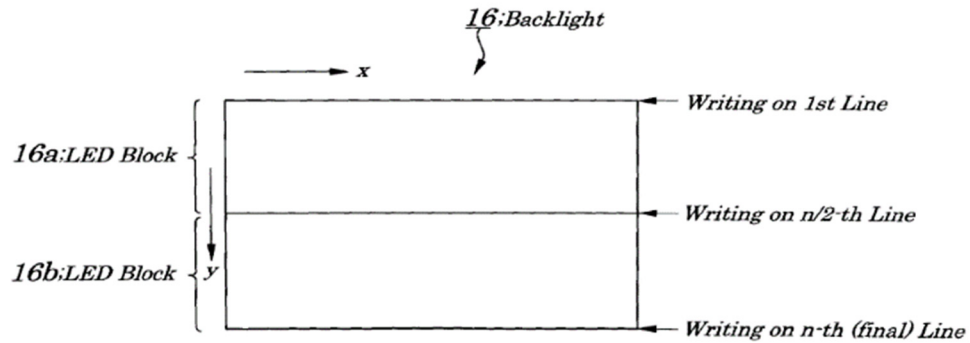
13[Ci] - using the clock signal for adjusting luminosity levels of a plurality of strings of light emitting diodes (LEDs) in a backlighting circuitry of the electronic display,

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

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

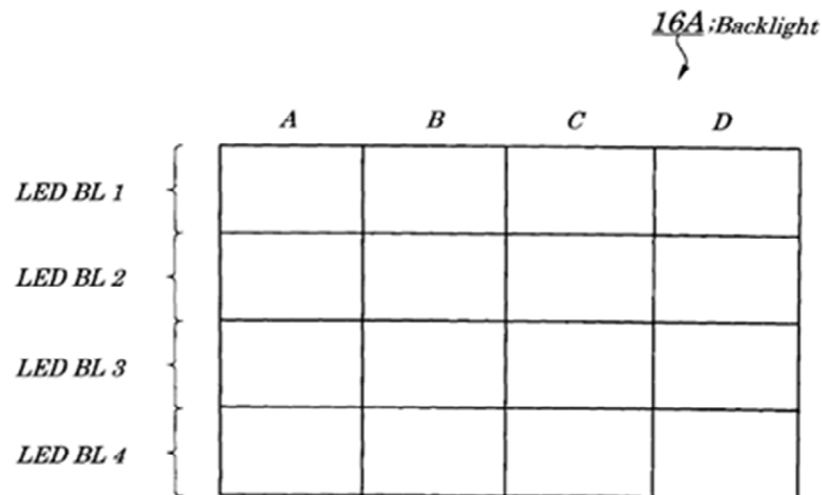
Additionally, it would have been obvious to a POSITA to implement Seo's LED's as a plurality of strings of LEDs in view of Honbo. Ex-1002 ¶148. Honbo expressly teaches that "the LED driver 15 generates driving voltages [] to make each of the LED blocks 16a and 16b flash based on a control signal [] fed 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.

FIG. 4



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



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

implementing Seo's light source 8i would have been motivated to apply the teachings of Honbo, and use a string of RGB LEDs to reduce "the trail-leaving in moving images." *Id.*; Ex-1008, 13:55-61.

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

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

See Seo's teachings in Section XII.A.2.c.

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

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

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

- e. **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

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

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

- f. **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

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

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

- g. **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;

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

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

3. Independent Claim 17

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

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

¶¶161-162.

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;

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

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.

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.* ¶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

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;

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

See Seo's teachings in Section XII.A.2.b (generating circuit 10a controlling luminosity levels),

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

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

See Seo's teachings in Section XII.A.2.c.

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

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

See Seo's teachings in Section XII.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,

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

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**

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

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,**

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

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.**

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

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.

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

See Seo's teachings in Section XII.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.

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

See Seo's teachings in Section XII.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.**

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

See Seo's teachings in Section XII.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.**

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

See Seo's teachings in Section XII.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.**

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

See Seo's teachings in Section XII.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.**

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

See Seo's teachings in Section XII.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.**

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

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 [] 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. *Id.* 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.

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

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.

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. A POSITA would have understood Honbo teaches adjust the luminosity levels of a red string to 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.

As explained previously, using ambient light sensors to control RGB color components of LEDs was a well-known implementation approach. Ex-1002 ¶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.

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

See Seo's teachings in Section XII.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.

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

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.

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

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

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

See Seo's teachings in Section XII.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.

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

See Seo's teachings in Section XII.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.

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

See Section XII.D.2.a and Section XII.D.2.b.

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.**

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

See Seo's teachings in Section XII.A.3.j

XIII. 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 NHK 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.

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

XIV. CONCLUSION

The unpatentability grounds presented above are reasonably likely to prevail, *inter partes* review should be instituted, and Claims 1-21 should be cancelled as unpatentable over the prior art.

Respectfully Submitted,

/s/ Ben Haber
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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:

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