UNITED STATES PATENT AND TRADEMARK OFFICE

_____

BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

Hisense USA Corporation

Petitioner

v.

Brightplus Ventures LLC

Patent Owner

_____

Case IPR2023-01412

U.S. Patent No. 8,330,710

_____

Ex. 2001 - Declaration of William Bohannon

TABLE OF CONTENTS

I. INTRODUCTION 1

A. EXPERT QUALIFICATIONS 2

B. BASIS OF MY OPINION AND MATERIALS CONSIDERED 6

C. SUMMARY OF OPINIONS 7

II. LEGAL STANDARDS TO BE APPLIED 7

A. PERSON OF ORDINARY SKILL IN THE ART 7

B. VALIDITY 7

III. TECHNOLOGY OVERVIEW 10

IV. THE '710 PATENT'S OVERVIEW 10

V. A PERSON OF ORDINARY SKILL IN THE ART 11

VI. CLAIM CONSTRUCTION 13

VII. PRIOR ART SUMMARY 14

A. SHTEYNBERG 15

B. ARAI 16

C. ZHANG 17

D. KOBORI 17

E. KAWABATA 18

F. LEE 19

VIII. GROUND 1 19

A. A POSITA WOULD NOT BE MOTIVATED TO COMBINE SHTEYNBERG, ARAI AND ZHANG 19

B. THE COMBINATION OF SHTENYBERG AND ARAI FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 1A: "A PLURALITY OF STRINGS OF SOLID STATE LIGHTING DEVICES… POSITIONED AT INTERVALS IN AT LEAST ONE SECOND DIRECTION" 23

C. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 1B: A "CURRENT SUPPLY CIRCUIT CONFIGURED TO SELECTIVELY SUPPLY A PLURALITY OF ON-STATE DRIVE CURRENTS TO THE PLURALITY OF STRINGS RESPONSIVE TO A CONTROL SIGNALS." 25

D. SHTENYBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 1C: A "CONTROL SYSTEM CONFIGURED TO RECEIVE A USER INPUT AND TO SELECTIVELY PROVIDE CONTROL SIGNALS TO THE CURRENT SUPPLY CIRCUIT RESPONSIVE TO THE USER INPUT TO SELECTIVELY DRIVE THE PLURALITY OF STRINGS." 30

E. SHTEYNBERG AND ZHANG FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 1D: THE "CONTROL SYSTEM FURTHER INCLUDING FIRING LOGIC CONFIGURED TO DETERMINE A FIRING ORDER OF THE PLURALITY OF STRINGS." 31

F. SHTEYNBERG AND ZHANG FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 2: "THE SYSTEM OF CLAIM 1, WHEREIN THE FIRING LOGIC COMPRISES RULE-BASED LOGIC OPERATIVE TO GENERATE A NON-SPATIALLY SEQUENTIALLY FIRING ORDER."..... 34

G. ARAI FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 5: "THE SYSTEM OF CLAIM 1, WHEREIN ONES OF THE PLURALITY OF STRINGS ARE ARRANGED CORRESPONDING TO A PLURALITY OF BARS THAT INCLUDE PORTIONS OF THE PLURALITY OF STRINGS, WHEREIN THE PLURALITY OF BARS EXTEND IN THE FIRST DIRECTION AND ARE POSITIONED ADJACENT ONE ANOTHER IN A SUBSTANTIALLY PARALLEL ARRANGEMENT." 35

H. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 12: "THE SYSTEM OF CLAIM 1, FURTHER COMPRISING A MEANS FOR GENERATING A FEEDBACK SIGNAL CONFIGURED TO PROVIDE DISPLAY PERFORMANCE INFORMATION TO THE CONTROL SYSTEM." 35

I. SHTEYNBERG AND ARAI FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 16: "THE SYSTEM OF CLAIM 1, WHEREIN THE SECOND DIRECTION IS SUBSTANTIALLY ORTHOGONAL TO THE FIRST DIRECTION."..... 37

J. SHTEYNBERG AND ARAI FAIL TO DISCLOSE OR RENDER OBVIOUS THE PREAMBLE OF CLAIM 17 PREAMBLE: "A METHOD FOR CONTROLLING A PLURALITY OF STRINGS OF SOLID STATE LIGHTING DEVICES CONFIGURED TO EXTEND IN A FIRST DIRECTION AND TO BE ARRANGED IN SUBSTANTIALLY ADJACENT POSITIONS RELATIVE TO ONE ANOTHER IN A SECOND DIRECTION THAT IS DIFFERENT FROM THE FIRST DIRECTION, THE METHOD COMPRISING."....37

K. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 17A "RECEIVING AN INPUT FROM A USER; AND."....37

L. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 17B: "SUPPLYING, BASED IN PART ON THE INPUT FROM USER, A PLURALITY OF PULSED DRIVER CURRENTS TO THE PLURALITY OF STRINGS IN A NON-SPATIALLY-SEQUENTIAL FIRING ORDER." 37

IX. GROUND II....39

A. A POSITA WOULD NOT BE MOTIVATED TO COMBINE SHTEYNBERG, ARAI, ZHANG AND KOBORI 39

X. GROUND III....40

A. A POSITA WOULD NOT BE MOTIVATED TO COMBINE SHTEYNBERG, ARAI AND LEE 40

B. SHTENYBERG AND ARAI FAIL TO DISCLOSE [CLAIM 47 PREAMBLE] THE "A METHOD FOR CONTROLLING A PLURALITY OF STRINGS OF SOLID STATE LIGHTING DEVICES CONFIGURED TO EXTEND IN A FIRST DIRECTION AND ARRANGED SUBSTANTIALLY ADJACENT TO ONE ANOTHER". 43

C. SHTENYBERG, ARAI, AND LEE FAIL TO DISCLOSE [CLAIM 47A] "THE METHOD COMPRISING SUPPLYING A PLURALITY OF PULSED DRIVE CURRENT TO A PLURALITY OF GROUPS OF THE PLURALITY OF STRINGS". 43

D. SHTENYBERG, ARAI, AND LEE FAIL TO DISCLOSE OR RENDER OBVIOUS [CLAIM 48] "THE METHOD OF CLAIM 47, FURTHER COMPRISING RECEIVING A USER INPUT, WHEREIN SUPPLYING THE PLURALITY OF PULSED DRIVE CURRENTS IS BASED ON USER INPUT."....45

XI. GROUND IV 46

A. A POSITA WOULD NOT BE MOTIVATED TO COMBINE SHTEYNBERG, ARAI AND KAWABATA 46

B. THE COMBINATION OF SHTEYNBERG AND ARAI FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 1A: "A PLURALITY OF STRINGS OF SOLID STATE LIGHTING DEVICES…POSITIONED AT INTERVALS IN AT LEAST ONE SECOND DIRECTION." 48

C. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 1B: "A CURRENT SUPPLY CIRCUIT CONFIGURED TO SELECTIVELY SUPPLY A PLURALITY OF ON STATE DRIVE CURRENTS TO THE PLURALITY OF STRINGS RESPONSIVE TO A PLURALITY OF CONTROL SIGNALS." 49

D. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 1C: "A CONTROL SYSTEM CONFIGURED TO RECEIVE A USER INPUT AND TO SELECTIVELY PROVIDE CONTROL SIGNALS TO THE CURRENT SUPPLY CIRCUIT RESPONSIVE TO THE USER INPUT TO SELECTIVELY DRIVE THE PLURALITY OF STRINGS." 49

E. SHTEYNBERG AND KAWABATA ALONE OR IN COMBINATION FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 1D: "A CONTROL SYSTEM FURTHER INCLUDING FIRING LOGIC CONFIGURED TO DETERMINE THE FIRING ORDER OF THE PLURALITY OF STRINGS." 49

F. KAWABATA FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 2: "WHEREIN THE FIRING LOGIC COMPRISES RULE-BASED LOGIC OPERATIVE TO GENERATE A NON-SPATIALLY SEQUENTIAL FIRING ORDER." 55

G. THE COMBINATION OF SHTEYNBERG AND ARAI FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 5 "WHEREIN ONES OF THE PLURALITY OF STRINGS ARE ARRANGED CORRESPONDING TO A PLURALITY OF BARS THAT INCLUDE PORTIONS OF THE PLURALITY OF STRINGS, WHEREIN THE PLURALITY OF BAR EXTEND IN THE FIRST DIRECTION AND ARE POSITIONED ADJACENT ONE ANOTHER IN A SUBSTANTIALLY PARALLEL ARRANGEMENT." 55

H. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 12: "A MEANS FOR GENERATING A FEEDBACK SIGNAL CONFIGURED TO PROVIDE DISPLAY PERFORMANCE INFORMATION TO THE CONTROL SYSTEM." 55

I. THE COMBINATION OF SHTEYNBERG AND ARAI FAILS TO DISCLOSE OR RENDER OBVIOUS THE PREAMBLE OF CLAIM 17: "A METHOD FOR CONTROLLING A PLURALITY OF STRINGS OF SOLID STATE LIGHTING DEVICES CONFIGURED TO EXTEND IN A FIRST DIRECTION AND TO BE ARRANGED IN SUBSTANTIALLY ADJACENT POSITIONS RELATIVE TO ONE ANOTHER IN A SECOND DIRECTION THAT IS DIFFERENT FROM THE FIRST DIRECTION." 55

J. SHTEYNBERG FAILS TO DISCLOSE OR RENDER OBVIOUS CLAIM 17A: "RECEIVING AN INPUT FROM A USER." 56

K. SHTEYNBERG AND KAWABATA ALONE OR IN COMBINATION FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 17B: "SUPPLYING, BASED IN PART ON THE INPUT FROM THE USER, A PLURALITY OF PULSED DRIVE CURRENTS TO THE PLURALITY OF STRINGS IN A NON-SPATIALLY SEQUENTIAL FIRING ORDER." 56

XII. GROUND V 56

A. A POSITA WOULD NOT BE MOTIVATED TO COMBINE SHTEYNBERG, ARAI, KAWABATA AND KOBORI 56

XIII. GROUND VI 57

A. A POSITA WOULD NOT BE MOTIVATED TO COMBINE SHTEYNBERG, ARAI, KAWABATA, AND LEE 57

B. LEE AND KAWABATA ALONE OR IN COMBINATION FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 13A: "WHEREIN THE CURRENT SUPPLY CIRCUIT COMPRISES A PLURALITY OF PHASE DRIVERS CONFIGURED TO SUPPLY A PLURALITY OF ON-STATE DRIVE CURRENTS AT A PLURALITY OF TIMES." 60

C. LEE AND KAWABATA ALONE OR IN COMBINATION FAIL TO DISCLOSE OR RENDER OBVIOUS CLAIM 13B OR CLAIM 13C: "WHEREIN THE PLURALITY OF STRINGS OF SOLID STATE LIGHTING DEVICES COMPRISE A PLURALITY OF STRING GROUPS, EACH CONFIGURED TO RECEIVE CURRENT FROM ONE OF THE PLURALITY OF PHASE DRIVERS" AND "WHEREIN THE CONTROL SYSTEM IS FURTHER CONFIGURED TO DETERMINE THE PLURALITY OF TIMES THAT EACH OF THE PLURALITY OF

PHASE DRIVERS BEGIN TO SUPPLY CURRENT TO THE PLURALITY OF STRING GROUPS.”.....65

Exhibit List

Exhibit	Description
2001	Declaration of William K. Bohannon ("Bohannon Decl.")
2002	Curriculum vitae of William K. Bohannon

I, William K. Bohannon, hereby declare under penalty of perjury:

I. INTRODUCTION

1. I am an independent consultant. I am over eighteen years of age, and I would otherwise be competent to testify as to the matters set forth herein if I am called upon to do so.

2. I have prepared this Declaration for consideration by the Patent Trial and Appeal Board in the Inter Partes Review of U.S. Patent No. 8,330,710 ("the '710 Patent").

3. I provide this Declaration at the request of and have been retained by Ni, Wang & Massand, PLLC, which represents Patent Owner Brightplus Ventures LLC ("Brightplus" or "Patent Owner") in connection in connection with the above-captioned Inter Partes Review.

4. I have been informed and understand that Petitioner Hisense USA Corporation ("Hisense" or "Petitioner") contends that claims 1-2, 5, 11-13 and 16-17, and 47-48 of the '710 Patent are invalid based on Grounds 1-6.

5. I am being compensated at an hourly rate of $350 per hour. My compensation is not dependent on the outcome of or any issue in relation to the above-captioned Inter Partes Review, and I have no interest in either party.

6. In forming my opinions, I relied on my knowledge, education, experience, and training in the field and on documents and information referenced in this Declaration.

A. Expert Qualifications

7. My curriculum vitae ("CV") is attached hereto as Exhibit 2002 and provides an accurate identification of my background and experience.

8. I have over (30) years of commercial industrial electronics experience including experience in the areas of LCD, Plasma, CRT and Large Screen Display Equipment: LCD manufacturing, substrates, drivers and other related components for rear screen displays including Avionics and cockpit displays.

9. I studied Physics and Mathematics in college as shown in my CV. I learned electronics in my physics course work and obtained practical experience making my own telescope drive electronics and with amateur radio projects. After graduation I worked with Science Applications (1976) developing neutron spectroscopy methods and laboratory equipment including specialized software and electronics. A paper I wrote regarding this work and published by American Nuclear Society, ANS. [Bohannon, W.K., et al., Fast Program for Automatic Gamma-Ray Analysis, Transactions of the American Nuclear Society, May 1978.]

10. Thereafter, I continued my electronics work with radar systems for a small defense contractor as well as with Hughes Aircraft Company. My work with

Hughes Aircraft Company included work as the Systems Engineer responsible for all hardware and software used in part of a large laser weapon system. In that capacity, I was required to debug, diagnose and repair problems in the electronic sub-systems including digital, analog and power supply sub-systems used on board the test aircraft. After I left Hughes Aircraft, I worked with TRW where I was responsible for hardware (including analog, RF and digital systems) and software as well as computer architectures used in complex avionics systems.

11. My work with electronics continued when I became Chief Scientist for Computer Accessories in charge of the company's technology direction for consumer products. As I recall well, one of the largest changes involved with moving from military avionics to consumer electronics was in the power sources and power supplies. In particular, military electronics used in aviation depend upon the on-board aircraft's power bus whereas the consumer electronics produced by Computer Accessories depended on inexpensive flyback converters used to convert 120 volt 60 Hz AC line power to the low voltage DC needed to power the product's PCBs as well as on board PCB buck and boost converters (for example 5, 12 and 25 volt) needed by LCD based display products. One of my patents (U.S. Patent No. 5,089,810) filed in 1990 shows how a portion of this low voltage DC power is supplied and used. I have been granted several other patents related to LCD displays as shown in my CV. As part of my work with Computer Accessories, I searched for

new sources of power supplies for our products as well as for other types of electronic components.

12. Since 1994, I have been an independent consultant for Manx Research working on various display products including managing and conducting detailed technical product evaluations for all kinds of display products – LCD, CRT, Plasma and LED direct view, projection products of all types, CRT products and plasma products. Furthermore, I was also a design and procurement consultant to an aerospace display company involved in re-designing Avionic LCD cockpit display sub-systems to use full color R, G, B LED light sources instead of short arc lamps in a compact, rear-screen 3 panel projection system. As a part of my work with Manx Research, I studied all available power supply architectures including isolated, off-line flyback AC/DC converters as well as buck and boost DC-DC converters. I also helped my customers manage their power supply intellectual property by identifying potential infringers of their power supply patents.

13. Edge Semiconductor designed and manufactured specialized analog ICs used in automatic testing equipment (ATE) for testing of other ICs (either in packages or on wafers) in mass production. Edge Semiconductor produced drivers, comparators, clock distribution ICs and PMUs. A parametric measurement unit (PMU) is an extremely accurate power supply used for testing that can force and measure both current and voltage to a device under test (DUT). When I worked with

Edge Semiconductor, I initially helped to define their analog PMU design requirements as well as worked with ATE customers, such as Advantest in Japan, when they evaluated some of our initial PMU prototypes. Advantest's requirements included the ability for a PMU to supply DC power and to accurately measure I-V during various transient conditions. For example, when a microprocessor or memory chip is being tested, the various power-on and power-down modes must also be tested. Switching from a sleep mode to a power-on mode causes a large transient to the power supply. Edge Semiconductor had to revise their initial PMU designs many times before finally achieving customer acceptance. Each time a new version became available, I worked with the customers to re-evaluate those new designs and to help with their board design.

14. Planet ATE went a step further than Edge-Semtech and developed a more powerful (more than 1 amp) DUT power supply with I-V measurement ability in a programmable analog IC format. I introduced each of these new designs to all of my customers, worked with them to evaluate the design and to design the ICs into their systems. Each of these power supply ICs could be ganged together to supply multi-Amp power to any part under test, all while maintaining an accurate, real time measurement of the voltage and current being used. Like the smaller PMUs, these analog power supply ICs needed to be able to handle large transients as well as to turn on and off quickly. Along with customers needing to test memory and

processors, these power supply ICs were also used by customers needing to test LEDs. Testing LEDs in a mass production process required contacting the LED's power leads, turning the LEDs on as quickly as possible and then getting an accurate measure of voltage and current as quickly as possible after the turn-on transients have passed. LED testing is a very strenuous requirement for a power supply.

15. ATE Engines took the DUT/PMU power supply architecture in a different direction by designing an IC that could be programmed to perform as a driver-comparator with a 50 ohm output and then re-programmed and changed into a DUT power supply capable of driving more than 1 amp through the same output pin with low impedance. Unfortunately, their designs struggled to deal with the various transients involved with mass production testing of various DUTs. As with Planet ATE, I took the early versions of this IC to my customers in Japan and worked through their evaluations and design studies. All in all, through my career I have worked with electronics from 1976 until the present time, concentrating upon consumer electronics and the power supplies relevant to this case since 1989.

16. I also have 7 issued U.S. Patents in displays and display technology.

B. Basis of My Opinion and Materials Considered

17. I have reviewed the '710 Patent, including the claims of the patent in view of the specification. In addition, I have reviewed the '710 Patent's prosecution

history, the Declaration of Rafael Betancourt (Ex. 1005), the prior art discussed herein, and the remaining exhibits listed herein.

C. Summary of Opinions

18. In my opinion, claims 1-2, 5, 11-13 and 16-17, and 47-48 of the '710 Patent aren't rendered obvious by the prior art combinations cited in Grounds 1-6. In the remainder of this declaration, I demonstrate these in detail and address the lack of motivation to combine certain references.

II. LEGAL STANDARDS TO BE APPLIED

19. Counsel has advised me of the following legal standards that are relevant to IPR proceedings, which I have applied in forming my opinions.

20. I understand that an inter partes review ("IPR") is a proceeding before the United States Patent & Trademark Office for evaluating the patentability of an issued patent's claims based on prior-art patents and printed publications.

A. Person of Ordinary Skill in the Art

21. I understand that the claims of a patent are reviewed from the point of view of a hypothetical person of ordinary skill in the art ("POSITA") at the time of the filing of the patent. The "art" is the field of technology to which a patent relates.

B. Validity

22. I understand that, in this proceeding, Petitioner has the burden of proving that the challenged claims of the '710 Patent are unpatentable by a

preponderance of the evidence. I understand that "preponderance of the evidence" means that a fact or conclusion is more likely true than not true.

23. I understand that there are two ways in which prior art may render a patent claim unpatentable. First, the prior art can "anticipate" the claim. Second, the prior art can render the claim "obvious" to a POSITA. I understand that for an invention claimed in a patent to be patentable over the prior art, it must not be anticipated and must not be obvious based on what was known before the invention was made.

24. I understand that a patent claim may be invalid as anticipated under 35 U.S.C. § 102 if a prior art reference discloses each element of the claimed subject matter.[1]

25. I understand that a patent claim may be invalid as obvious under 35 U.S.C. § 103 if the differences between the subject matter claimed and the prior art are such that the claimed subject matter as a whole would have been obvious to a POSITA at the time the invention was made. I also understand that several factual inquiries underlie a determination of obviousness. These inquiries include (1) the scope and content of the prior art, (2) the level of ordinary skill in the field of the

[1] Patent laws discussed herein refer to AIA versions of the relevant laws.

invention, (3) the differences between the claimed invention and the prior art, and (4) any objective evidence of non-obviousness (i.e., "secondary considerations").

26. I further understand that when a party alleges obviousness, that party may rely on one reference or a combination of multiple references. I also understand that, when a party alleges obviousness based on a combination of references, that party should identify a reason why a POSITA would have been motivated to combine the asserted references in the manner recited in the claims and to explain why a POSITA would have had a reasonable expectation of success in making such combinations. A combination is especially non-obvious when a reference teaches away from a combination.

27. I understand that an obviousness analysis permits the application of "common sense" in examining whether a claimed invention would have been obvious to a POSITA. For example, I understand that combining familiar elements according to known methods and in a predictable way may suggest obviousness when such a combination would yield nothing more than predictable results. And I understand a party asserting obviousness should still provide a specific motivation to combine the references as recited in the claims and explain why one would have reasonably expected to succeed in doing so.

28. I understand that one indicator of nonobviousness is when prior art teaches away from combining certain known elements. For example, a prior art

reference teaches away from the patent's particular combination if it leads in a different direction or discourages that combination, recommends steps that would not likely lead to the patent's result, or otherwise indicates that a seemingly inoperative device would be produced.

III. TECHNOLOGY OVERVIEW

29. The relevant field for that of the '710 Patent is that of solid-state lighting systems, and more particularly to adjusting the light output of solid-state lighting (e.g. backlighting). Generally, the field relates to employing solid state lighting devices (e.g., LEDs) to illuminate a liquid crystal display (LCD) panel. This may be accomplished through the employment of several structures and layers incident upon the surface on which the LEDs are mounted as well as between the LEDs and the LCD panel. These structures may include reflective surfaces, polarizers of varying type and function, diffusers, lenses, brightness enhancement layers and others. The purpose and alignment of these structures is intended to maximize the amount of light that is directed through the LCD panel at an angle and intensity that is appropriate for viewing the images displayed on the LCD panel.

IV. THE '710 PATENT'S OVERVIEW

30. The '710 Patent discloses an improved solid state lighting panel. One embodiment of the '710 Patent is directed to a system including a controller that provides controls signals and a sequence generator that generates a firing sequence

for firing multiple strings of solid-state lighting devices. The '710 Patent explicitly describes deficiencies in the prior art. For example, it states "Sequentially firing the strings independently and/or in combinations without regards to the relative string location with the display, however, can produce undesirable display characteristics" (EX1001 2:20-24). The firing logic described in the '710 Patent allows for improved control of the LED strings. (*Id*. 2: 27-58)

31. The '710 Patent teaches additional embodiments which improve upon then current control methods to the LED strings. By way of example, it states, "A control system 800 selectively provides control signals to a current driver 808 or other type of electrical power supply circuit that responsively drives multiple solid state lighting devices in a solid-state lighting panel 801. The control system 800 can include firing logic 802 that can determine a firing order for the multiple strings. A firing order may determine an order in which individual strings of solid-state lighting devices and/or groups of strings of solid state lighting state devices are supplied current." (*Id*. 10:22-33) Further, "Such methods can include supplying pulsed drive currents to the strings in non-spatially sequential firing order." (*Id*. 3: 38-40).

V. A PERSON OF ORDINARY SKILL IN THE ART

32. I understand that the factors considered in determining the ordinary level of skill in a field of art at issue include the level of education and experience of persons working in the field; the types of problems encountered in the field; and

the sophistication of the technology at the time of the purported invention, which I understand to be as early as May 8, 2007. I understand that a person of ordinary skill in the art ("POSITA") is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a POSITA would also have knowledge from the teachings of the prior art, including the art cited below.

33. Based on these factors, on or before May 8, 2007, a POSITA relating to the technology of the '710 Patent would have (a) a Bachelor's of Science degree in a technical field and at least four years of experience in the field of design and/or manufacture of display systems; (b) a Master's of Science degree in a technical field and at least two years of experience in the field of design and/or manufacture of display systems; or (c) a PhD in a technical field relating to the design and/or manufacture of display systems. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education. A POSITA is presumed to have knowledge of all relevant prior art, and therefore would have been familiar with each of the references cited in this declaration and the full range of teachings they contain.

34. With respect to the subject matter of the '710 Patent, a Bachelor of Arts in Mathematics is equivalent to a Bachelor of Science degree in a technical field.

35. Before May 8, 2007, my level of skill in the art was at least that of a POSITA. I am qualified to provide opinions concerning what a POSITA would have known and understood at that time, and my analysis and conclusions in this declaration are from the perspective of a POSITA prior to May 8, 2007. Furthermore, I have taught, worked with and supervised persons whom I would consider to be persons of ordinary skill in the art according with the description given above.

VI. CLAIM CONSTRUCTION

36. For IPR petitions filed after November 13, 2018, I understand the Patent Trial and Appeal Board ("Board") construes claim terms as having their ordinary and customary meaning to a POSITA at the time of invention (i.e., the same standard used in district court). I have applied this standard in rendering my opinions on claim construction. In addition, I have been asked to assume that the claims are not indefinite.

37. Claim terms are generally given their plain and ordinary meaning, which is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention. When the words in the context of the surrounding claim language make the ordinary meaning readily apparent, claim construction involves little more than the application of the widely accepted meaning of commonly understood words.

38. The claims must be read in view of the specification of which they are a part. The specification is the best source for understanding a technical term. The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction.

39. Although terms must be construed in light of the specification, it is improper to import a limitation from the specification into the claims. Courts must capture the scope of the actual invention, rather than strictly limit the scope of claims to disclosed embodiments or allow the claim language to become divorced from what the specification conveys is the invention.

40. The prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be. The prosecution history consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent.

VII. PRIOR ART SUMMARY

41. I understand that Petitioner has identified two primary references and four secondary references as prior art to the '710 Patent in its Grounds 1-6.

A. Shteynberg

42. One primary reference is Shteynberg. Shteynberg is a publication of a U.S. Patent Application filed on November 21, 2006, and published on May 22, 2008. Shteynberg is related to converters and regulators used for driving and controlling arrays of light emitting diodes. (EX1007 at 0001) Further, Shteynberg discloses "An exemplary apparatus comprises a power converter which generates a current which generates a current, a first multiplexer, and a controller." (*Id*. Abstract)

43. Shteynberg states that the power converter 120 is operable "to deliver a controller current level to a load." (Id. at 0048) Further, the power converter 120 provides an average current Ic to all the strings. (*Id*. at 0055) "[The] average current Ic provided by the current source (in this case, power converter 120) is equal to $I_c = \sum_{i=1}^{i=n} I_{ci}$ With a period of time "Tc" to provide current (energize) all of the LED channels (all of the series of LEDs 110 1, 110 2, 110 3, through 110 N), then the time of energizing each channel (series of LEDs 110) will be $T_{Qi} = \frac{I_{ci}T_c}{I_c}$." (*Id*. at 0055 and 0056). The multiplexer is a time duration switch, "each series of LEDs… will be provided with a selected… current level, through control (by controller 125) of the switching state of each channel (via multiplexer 150), for a selected time period (or duration)." (*Id.* at 0054)

44. Shteynberg further discloses that "The controller 125 may receive input from a wide variety of sources, including open or closed-loop feedback of various

signals and measurements from within the LED array driver circuit 100, as discussed in greater detail below. Not separately illustrated, the controller 125 may be coupled within a larger system, such as a computer-controlled lighting system in a building, and may interface with other computing elements using a wide variety of data transmission protocols, such as DMX 512, DALI, IC squared, etc." (*Id*. at 0049)

B. Arai

45. The other primary reference is Arai. Arai is a publication of a U.S. Patent Application filed on April 12, 2002, and published on May 31, 2007. Arai is directed to a backlight device using light emitting units in which a large number of light emitting diodes are mounted, which comprises a reflection plate comprising different surface reflection plates. (EX1008 Abstract) Aria discloses benefits over prior art systems, stating "On the other hand, in the area litconfiguration backlight units, in place of the above-described cold cathode florescent lamp, attention is drawn to backlight of the Light Emitting Diode (hereinafter referred to as LED as occasion may demand) area light type in which a large number of red, green and blue LEDs of light three primary colors are two-dimensionally arranged in the state positioned at the rear face side of the diffusion film to obtain white light. Such LED backlight unit permits reduction of cost with reduction of cost of LED, and permits display of high luminance on large-sized liquid crystal panel by low power consumption. (Id. at 0006)

C. Zhang

46. Petitioner also relies on Zhang. Zhang is a publication of a Chinese Patent Application filed on September 17, 2004, and published on March 22, 2006. Zhang discloses a method of changing the light emission sequence of backlight modules to improve the phenomenon of uneven brightness of the picture. (EX1010 at 1:6-9) Zhang primarily pertains to CCFL backlight modules "in order to save power consumed by the liquid crystal display, all backlight modules will not be illuminated at the same time… so as to achieve the purpose of clearly displaying and saving power… while several **lamps** in the upper half are illuminated, several **lamps** in the lower half of the screen are turned off." (*Id*. at 1:39 – 2:1) (emphasis added*)*

47. Zhang further discloses turning on one backlight module at a time, stating "The display screen is showed in the order in 15 which the backlight modules are illuminated, such as: Step S11 is to illuminate the first backlight module 11; Step S12 is to illuminate the second backlight module 12 and turn off the first backlight module [12]; Step S13 is to illuminate the third backlight module 13 and turn off the second backlight module 12… When the display screen 1 is not turned off, take steps S11 through S16 as a continuous cycle for lighting." (*Id*. at 5:16-23)

D. Kobori

48. Petitioner also relies on Kobori. Kobori is a publication of a U.S. Patent Application filed on August 24, 2005, and published on June 29, 2006. Kobori

discloses a drive circuit of light emission device arrays each having at least one light emission device. (EX1011 at Abstract) In the invention of Kobori "when at least one light emission device array driven with a different phase is OFF, a processing circuit acquires the luminiferous (light producing) level of each of the other light emission device arrays by using the at least one light emission device array which is OFF as a light reception device. Furthermore, a control circuit controls the drive level of the drive circuit for the light emission device arrays which are ON. (Id.) One embodiment of Kobori teaches "light emission driving of the LED is explained referring to the case of pulse driver for intermittently driving the LED" (Id. at 0025).Petitioner relies on U.S. Patent Publication No. 2005/0135115 ("Lamb") as one of two secondary references for both Grounds 1 and 2. Lamb was filed December 23, 2003.

E. Kawabata

49. Petitioner additionally relies on Kawabata. Kawabata is a publication of a U.S. Patent Application filed on July 17, 2002, and published on January 23, 2003. Kawabata discloses a lighting unit that includes a reflector, a plurality of light emitting elements and a controller. (EX1012 at Abstract) Kawabata discloses lighting units that are cold cathode tubes, "A cold-cathode tube may be used as the light-emitting element 2." (Id. at 0060) "A cold-cathode tube is used as each of the

light-emitting elements 2." (Id. at 0062) "For example, each of the light-emitting elements (or cold-cathode tubes) 2." (Id. at 0070)

F. Lee

50. Petitioner further relies on Lee. Lee is a publication of a U.S. Patent Application filed on July 13, 2006, and published on January 18, 2007. Lee discloses a surface light source using LEDs. (EX1013 at Abstract) The surface light source includes a plurality of red, green, and blue LEDs arranged on each divided region, and a plurality of LED driving units each having red, green, and blue LED driving circuits for respectively driving the red, green and blue LEDs (Id.). Lee further describes a method to prevent driving excessive current, "interconnecting the proper number of LEDs, which can be driven by a proper voltage, in series and by interconnecting the proper number of series connections, that can be driven by a proper current, in parallel" (*Id*. at 0050).

VIII. GROUND 1

A. A POSITA would not be motivated to combine Shteynberg, Arai and Zhang

51. While Shteynberg describes blending the emissions of red, green and blue LEDs to achieve light that is perceived by a viewer as "white" neither Arai nor Zhang describe that process. In fact, as shown below, the word "white" in Arai appears only in reference to the liquid crystal display panel:

> …the deflection film and the phase difference film allow the waveform characteristic to be non-colored and to be changed into white to perform realization of full color by the color filters to perform color display of receive image, etc. (EX1008 at 0026)

The word "white" does not appear at all in Zhang. Thus, Shteynberg, Arai and Zhang are not "in the same field of endeavor."

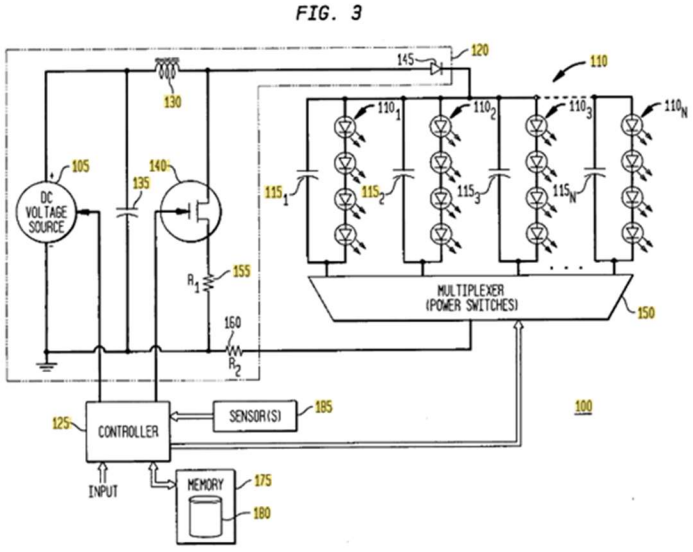
52. Also, Shteynberg relates to providing ambient lighting for a building and the like, not providing backlighting for an LCD panel as in Arai or Zhang. The system of Shteynberg would need significant adaptation to provide a backlight for an LCD panel as the power, switching and output demands for the two applications are very different. These significant differences in power switching and output demands for lighting in a display would make Arai and Zhang unsuitable options for combination with the ambient lighting system in Shteynberg.

53. Additionally, Arai discloses its own technique to achieve brightness uniformity, namely "corner reflection plates… in which the bottom surface reflection plate (16a) and the side surface reflection plates (16b) to (16e) … serves to permit rays of light incident onto a display panel (1) to be uniform to realize uniformity of brightness of the entire surface thereof." (EX1008 at Abstract). In Arai, all the backlights are illuminated, which allows the optical layers to distribute light uniformly. Zhang would not improve the brightness uniformity when combined

with Arai. Rather, Arai's invention would lose uniformity if the LED strings were cycled on and off as described in Zhang, since the optical layers in Arai would become unevenly distributed and the resulting image would be non-uniform. Accordingly, Zhang would not be a suitable option for combination with Arai as the combination would lead to an unevenly distributed optical layers.

54. Further, while Zhang does not explicitly describe the type of backlight module, it can be understood that Zhang is focused on CCFL Lamps. Zhang states "in order to save power consumed by the liquid crystal display, all backlight modules will not be illuminated at the same time… so as to achieve the purpose of clearly displaying and saving power… while several **lamps** in the upper half are illuminated, several **lamps** in the lower half of the screen are turned off" (EX100 at 1:39–2:1) (emphasis added). A POSITA would understand that LEDs consume low amounts of power and therefore that the backlight modules in Zhang comprise large, less efficient CCFL Lamps. Arai explicitly states the problem with CCFL backlighting and offers LEDs as an improved invention (EX1008 at 0004-0006). Accordingly, Arai is also unsuitable for combination with Zhang as they pertain to completely different types of lighting systems. The reasons a POSITA would not be motivated to combine CCFL and LED systems as proposed by Petitioner are further outlined below.

55. Also, a POSITA would not modify Shteynberg "to include non-spatially sequential firing order disclosed by Zhang" to meet the goal of brightness uniformity and high luminance on large-sized display as suggested by Petitioner. (Petition at 24) The preferred embodiments of Shteynberg and Zhang show that such a combination would not be functional. Figure 3 of Shteynberg, disclosed below, is "a circuit and block diagram illustrating a first exemplary LED array driver circuit" (EX1007 at 0030); on the other hand, as stated above, Zhang is directed to a "lamp" or CCFL type of backlight module. This is further demonstrated by the tube structures present in Fig. 1A of Zhang shown below.



EX1007, Figure 3

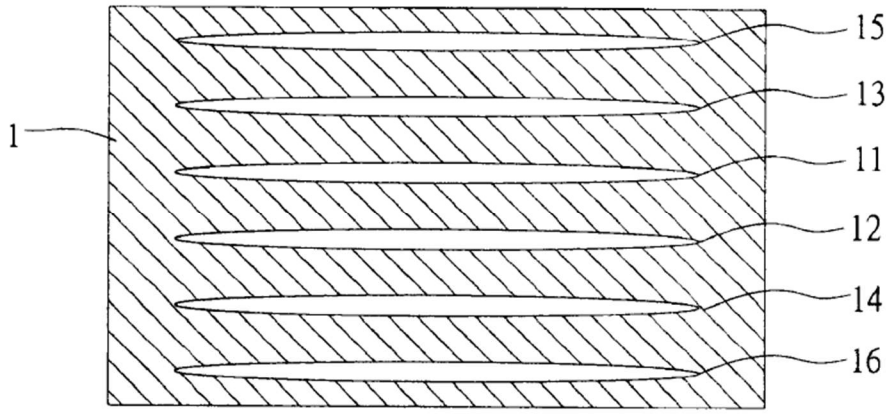


Figure 1A

EX1010, Fig. 1A

Unlike LEDs, lamps or cold cathode tubes generally require high AC voltages; therefore, they require an inverter. There is no inverter in Shteynberg's disclosure, nor is it expected that an inverter would function with Shteynberg's multiplexer. A POSITA would not look to a completely different and largely incompatible system of backlighting an LCD panel to combine with an LED based system. Additionally, any non-spatially sequential firing of individual lighting modules in the display system shown in Zhang would not be useful in the ambident lighting system of Zhang. Zhang would, therefore, not be suitable for combination with Shteynberg.

B. The combination of Shtenyberg and Arai Fails to disclose or render obvious Claim 1A: "A plurality of strings of solid state lighting devices… positioned at intervals in at least one second direction"

56. Shtenyberg is explicit that Fig. 3 is a circuit/block diagram. (EX2007 at 0030 and 0043) A circuit/block diagram is not an exact physical, mechanical

representation of the device it is representing. It would not be obvious to a POSITA how to orient and design a lighting panel simply based on the diagram in Fig. 3.

57. Shteynberg's disclosure is directed towards providing ambient lighting such as for a building not a backlight for an LCD panel: "Arrays of light emitting diodes ('LEDs') are utilized for a wide variety of applications, including for ambient lighting" and "the controller 125 may be coupled within a larger system, such as a computer-controlled lighting system in a building." (EX1007 at 0002 and 0049) Simply put, Shteynberg does not disclose the specific arrangement of the strings of LEDs relative to one another. Rather, when deploying ambient lighting, a designer would take into account a number of factors such as the shape of rooms, the height of ceilings, the color of the walls, ceiling and floors, the use of the space etc. which would not be part of the decision for designing a backlighting unit for an LCD panel.

58. In the following passage, Arai is comparing the benefits of LEDs over CCFL as backlighting units:

> "On the other hand, in the area litconfiguration backlight units, **in place of the above-described cold cathode florescent lamp**, attention is drawn to backlight of the Light Emitting Diode (hereinafter referred to as LED as occasion may demand) area light type in which a large number of red, green and blue **LEDs of light three primary colors are two-dimensionally arranged in the state positioned at the rear face**

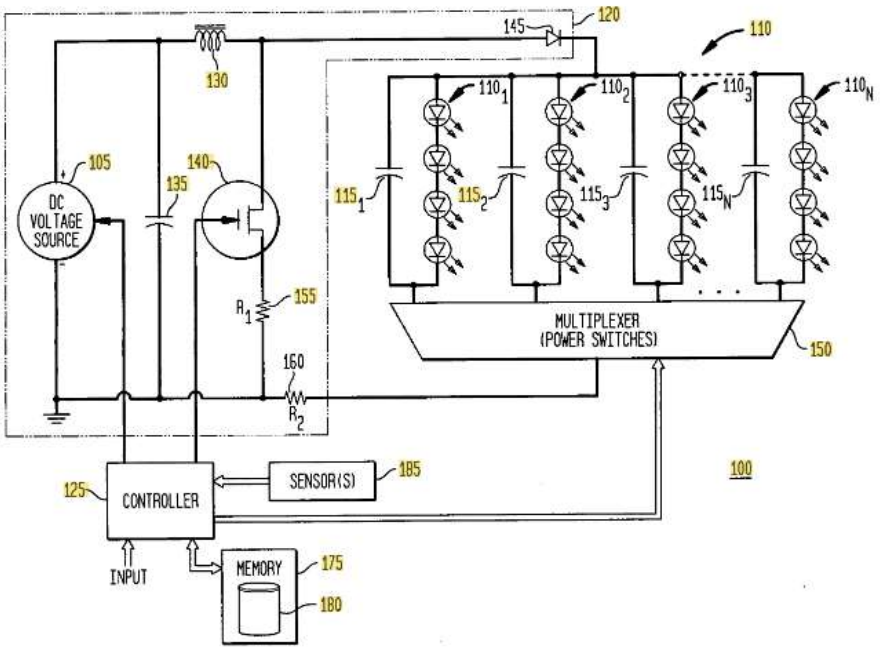
> **side of the diffusion film to obtain white light.** Such LED backlight unit permits reduction of cost with realization of reduction of cost of LED, and permits display of high luminance on large-sized liquid crystal panel by low power consumption." (EX1008 at 0006) (emphasis added)

Arai contemplates the use of LEDs to allow for lower power consumption, not for other reasons.

C. Shteynberg fails to disclose or render obvious Claim 1B: a "current supply circuit configured to selectively supply a plurality of on-state drive currents to the plurality of strings responsive to a control signals."

59. Shteynberg employs a controller 125 to control the output of its LED strings along with the above noted elements and several others. Figure 3 of Shteynberg is reproduced below.

FIG. 3



Shteynberg Figure 3

First, the DC voltage source 105, does not supply a plurality of on-state driver currents. Shteynberg states that the power converter 120 is operable "to deliver a controller current level to a load." (EX1007 at 0048) Further, the power converter 120 provides an average current Ic to all the strings. (*Id*. at 0055):

> "[The] average current Ic provided by the current source (in this case, power converter 120) is equal to $I_c = \sum_{i=1}^{i=n} I_{ci}$ With a period of time "Tc" to provide current (energize) all of the LED channels (all of the series of LEDs 110 1, 110 2, 110 3, through 110 N), then the time of

energizing each channel (series of LEDs 110) will be $T_{Qi} = \frac{I_{ci}T_c}{I_c}$.

(EX1007 0055 and 0056)

Based on the above equation, the power converter of Shteynberg supplies an *averaged current* (as opposed to an individually determined current for each string) to the LEDs 110 based on the required energizing time provided by the controller. Thus, the power converter supplies a single current to all of the LED strings.

60. In Arai, the multiplexer 150 and controller 125 only act as time duration switches, that either turn an LED string on or off. For example, it states "With a period of time 'Tc' to provide current (energize) all of the LED channels (all of the series of LEDs 110_1, 110_2, 110_3, through 110_N), then the time energizing each channel (series of LEDs 110) will be $T_{Qi} = \frac{I_{ci}T_c}{I_c}$." (EX1007 0055 and 0056) Shteynberg discloses that "For a system having three LEDs 110(1), 110(2), 110(3), with average channel currents are initially set as I(c1)=500ma, I(c2)=520ma… under the control of the controller 125 directing switching through multiplexer 150, the power converter 120 will supply to each channel a current of 150ma for the run times $T_{Qi} = \frac{500 \cdot 1000}{1500} = 333\ \mu s$, $T_{Qi} = \frac{520 \cdot 1000}{1500} = 347\ \mu s$, and $T_{Qi} = \frac{480 \cdot 1000}{1500} = 320\ \mu s$ (EX1007 at 0058) From Shteynberg it is clear that only one current is supplied to all of the strings which is a function of the energize time. "The power converter 120 may be of any topology which is capable of or adapted to deliver a

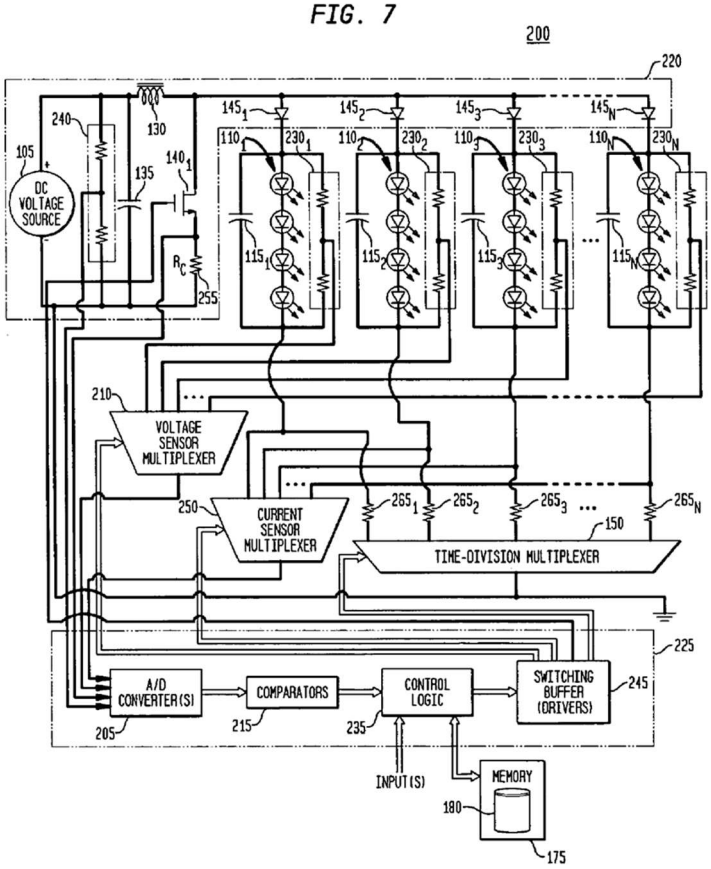
controller current level to a load, such as a current having a controlled peak to average current ratio." (*Id*. at 0048) Thus, Shtenyberg only discloses one current supplied to all the LED strings. Additionally, Shtenyberg only discloses a single control signal supplied to the DC voltage supply, thus the single current supplied is responsive to one control signal.

61. Third, the multiplexer and controller only use a "selected time period" which will determine when, if, and how long Ic will flow through each series of LEDs. The controller and multiplexer are not tasked with and are not capable of supplying an on state drive current. Taken together, these elements demonstrate that Shteynberg does not provide "a plurality of on state drive currents to [a] plurality of strings" as per the '710 Patent, rather Shteynberg discloses providing the same on state drive current to any or all of its strings. As seen in paragraph 0047, "The exemplary LED array driver circuit 100 further comprises a first, time-division or 'energizing' multiplexer (or other array of power switches) 150, which provides for individually and selectively allowing current to flow through each of the series of LEDs 110... i. e., turning on or off any selected series of LEDs 110... through 110~. Under the control of the controller 125, the multiplexer 150 is configured to allow current through one or more of the series of LEDs 110... through 110~ in any combination, and for any selected duration (time period or time slot), such as one

series of LEDs 110, two series of LEDs 110, none of the series of LEDs 110, or all of the series of LEDs 110, for example." (EX1007 at 0047)

62. By implementing a controller *and* a multiplexer, Shteynberg employs two distinct elements (the controller and the multiplexer) to accomplish what the '710 Patent describes using only a controller. The '710 Patent states that the "controller 106…can perform the processing tasks necessary to generate the control signals for the current driver 104…the controller 106 can use, for example, performance data from display performance feedback sensors 110 and user input 112 to achieve the desired display performance." (EX1001 at 8:26–32) Shtenyberg's Fig. 7 below shows the complexity and number of multiplexers used to control the LEDs to some extent but still not capturing any display performance or user inputs as shown by the '710 Patent and only a controller.

FIG. 7



D. Shtenyberg fails to disclose or render obvious Claim 1C: a "control system configured to receive a user input and to selectively provide control signals to the current supply circuit responsive to the user input to selectively drive the plurality of strings."

63. The system in Shteynberg, namely the controller 125, power converter 120, and multiplexer 150 does not "selectively drive the plurality of strings" as described in the '710 Patent. For example, the power converter 120 only supplies one current to all the LED strings. Further, the multiplexer 150 doesn't "drive" the strings but allows current to flow through the strings for a certain amount of time. The multiplexer 150 is best described as a switch, which activates each string for a selected duration. (EX1007 at 0043 and 0047)

64. Shteynberg relates to providing ambient lighting for a building, not backlighting an LCD panel. The system disclosed in Shteynberg receives input from "open or closed-loop feedback of various signals and measurements," and these signals may be transmitted over "a wide variety of data transmission protocols." (EX1007 at 0049) However, nothing in Shteynberg describes *user* input or feedback. Thus, Shteynberg does not disclose display performance data or user input as per the '710 patent as being an element of the control system of the current supply circuit.

E. Shteynberg and Zhang fail to disclose or render obvious Claim 1D: the "control system further including firing logic configured to determine a firing order of the plurality of strings."

65. As discussed above regarding element B of Claim 1, the multiplexer of Shteynberg does not supply current, nor does the multiplexer determine the current level. Shteynberg uses the switching period to determine the current through each string (see discussion of element B of claim 1 above). In Shteynberg, the multiplexer either turns on or off each LED string, for a time period T_{qn}. The length of this on/off cycle is a function of the current supplied to the multiplexer as described above, not of firing logic interpreted by the controller. Thus, there are not a plurality of currents being supplied to strings. These energizing time periods are not equivalent to the firing logic as described in the '710 Patent.

66. The '710 Patent discloses firing logic as follows,

> A control system 800 selectively provides control signals to a current driver 808 or other type of electrical power supply circuit that responsively drives multiple solid state lighting devices in a solid state lighting panel 801. The control system 800 can include firing logic 802 that can determine a firing logic 802 that can determine a firing order for the multiple strings. A firing order may determine an order in which individual strings of solid state lighting devices and/or groups of strings of solid state lighting state devices are supplied current. (EX1001 at 10:22-33).

Further, Fig. 8 of the '710 Patent illustrates that the firing logic is passed to the current driver 808 which supplies current signals to panel 810 according to the firing logic. As described above, a multiplexer is not a current driver. On the other hand, in Shteynberg the multiplexer functions as a rapid on/off switch, it does not supply or modulate the power provided to the LED strings.

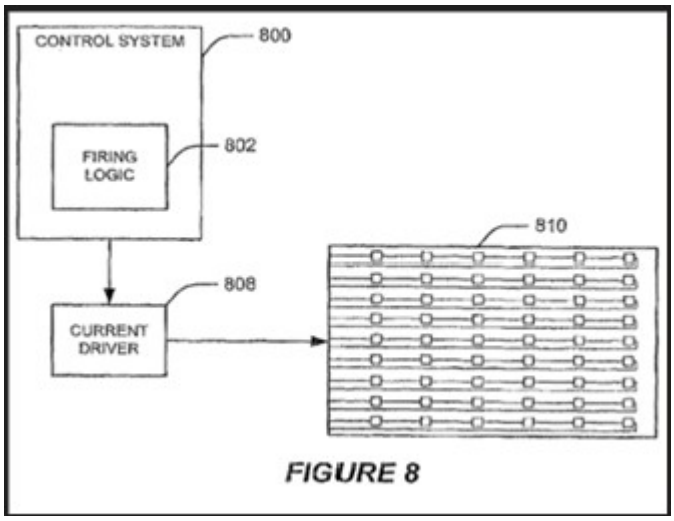


FIGURE 8

In Shteynberg, only the power converter 120 supplies current. The power converter 120 supplies one current to all strings. It does not selectively supply current based on a timing signal from the multiplexer or determine the order in which to supply current to the LED strings. Therefore, Shteynberg does not disclose a control system including firing logic configured to determine a firing order of the plurality of strings.

67. Similar to Shteynberg, Zhang discloses lights that are either in an on or off state. Zhang discloses lights being activated one after another. In other terms, only one "backlight module" is being supplied current at a time according to Zhang. As stated in Zhang,

> The display screen is showed in the order in 15 which the backlight modules are illuminated, such as: Step S11 is to illuminate the first backlight module 11; Step S12 is to illuminate the second backlight module 12 and turn off the first backlight module [12]; Step S13 is to illuminate the third backlight

> module 13 and turn off the second backlight module 12; Step S14 is to illuminate the fourth backlight module [13] and turn off the third backlight module [12]; Step S15 is to illuminate the fifth 20 backlight module [12] and turn off the fourth backlight module [13]; Step S16 is to illuminate the sixth backlight module [11] and turn off the fifth backlight module [12]. When the display screen 1 is not turned off, take steps S11 through S16 as a continuous cycle for lighting. (EX1010 at 5:16-23)

At each step, a backlight module is turned off and another turned on, to cycle through all the backlight modules. In Zhang, only one backlight module is activated at a time. This is illustrated in Figs. 1B, 2B, 4A-4F, 5, and 6. As stated above, the firing order described in Element 1D is a firing order to supply a plurality of currents to the plurality of LED strings. Zhang's method of only activating one lighting module at a time is not a disclosure of the firing logic or firing order contemplated by the '710 Patent nor does it render a firing logic or firing order obvious. Thus, neither Shteynberg nor Zhang disclose or render obvious the firing logic or firing order described in element1D.

F. Shteynberg and Zhang fail to disclose or render obvious Claim 2: "The system of claim 1, wherein the firing logic comprises rule-based logic operative to generate a non-spatially sequentially firing order."

68. For the same reasons stated above, Shteynberg in view of Zhang does not disclose the elements of this claim.

G. Arai fails to disclose or render obvious Claim 5: "The system of claim 1, wherein ones of the plurality of strings are arranged corresponding to a plurality of bars that include portions of the plurality of strings, wherein the plurality of bars extend in the first direction and are positioned adjacent one another in a substantially parallel arrangement."

69. Adding elongated rectangular wiring boards—as disclosed in Arai—to a system for providing ambient lighting to a building—as disclosed in Shteynberg—would not create a backlight for an LCD panel. Further, a POSITA would not be motivated to combine Shteynberg and Arai. The combination suggested by Petitioner with regard to claim 5 does not disclose a system that would be functional as a backlight for those reasons.

H. Shteynberg fails to disclose or render obvious Claim 12: "The system of claim 1, further comprising a means for generating a feedback signal configured to provide display performance information to the control system."

70. Shteynberg discloses a system for providing ambient lighting to a building, it does not disclose a display. Where Shteynberg discloses "feedback of various signals" (see Fig. 7 above) the disclosure is not the same as the "feedback signal configured to provide display performance information to the control system" of Claim 12. Shteynberg states that "the actual output voltage across each series of LEDs 110(1), 110(2), 110(3) through 110(N) is measured, also using a sensor 185. Corresponding to such measurements… utilized for subsequent output voltage prediction by the controller 125" (EX1007 at 0072). But Shteynberg does not teach

an LCD display. The ‘710 patent, on the other hand states that “The color management unit 108 and/or the controller 106 can use, for example, performance data from display performance feedback sensors 110 and user input 112 to achieve the desired display performance…Some embodiments can also include means for generating a feedback signal that can provide display performance information to the control system 800. The means can include performance sensors, such as thermal sensors and color sensors, among others.” (EX1001 at 8:28-32 and 11:30-34] Figure 1 of the ‘710 patent, reproduced below, further demonstrates this difference.

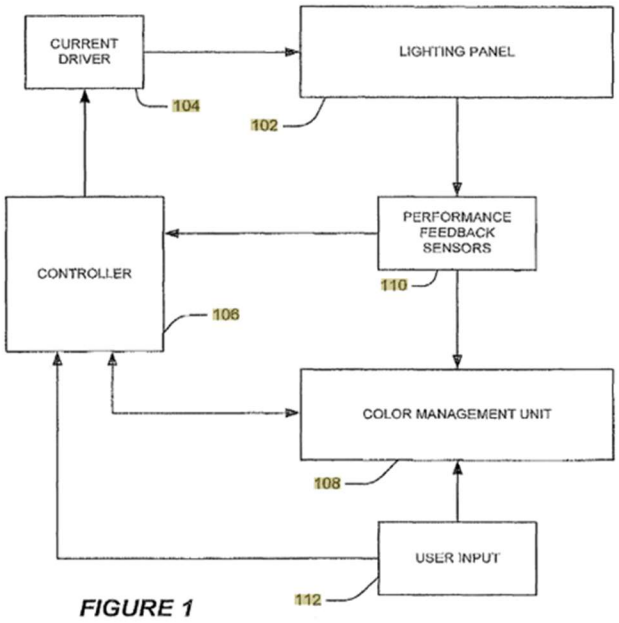


FIGURE 1

The performance feedback sensors receive information from the lighting panel and transmit it to the color management unit and the controller. The controller uses this information to regulate both the color management unit and thereby the display as well as the current driver and thereby the lighting panel. Shteynberg does not include

a display, and, therefore, it cannot disclose a "means for generating a feedback signal configured to provide display performance information to the control system."

I. Shteynberg and Arai fail to disclose or render obvious Claim 16: "The system of claim 1, wherein the second direction is substantially orthogonal to the first direction."

71. For the reasons stated above regarding element A of Claim 1, Shteynberg in view of Arai does not disclose or render obvious the elements of this claim.

J. Shteynberg and Arai fail to disclose or render obvious the preamble of Claim 17 Preamble: "A method for controlling a plurality of strings of solid state lighting devices configured to extend in a first direction and to be arranged in substantially adjacent positions relative to one another in a second direction that is different from the first direction, the method comprising."

72. I have been informed that a preamble is generally not considered to limit a claim. To the extent the preamble of claim 17 is considered limiting, for the reasons stated above regarding element A of Claim 1, Shteynberg in view of Arai does not disclose or render obvious the preamble.

K. Shteynberg fails to disclose or render obvious Claim 17A "receiving an input from a user; and."

70. For the reasons stated above regarding element C of Claim 1, Shteynberg does not disclose or render obvious the elements of this claim.

L. Shteynberg fails to disclose or render obvious Claim 17B: "supplying, based in part on the input from user, a plurality of pulsed

driver currents to the plurality of strings in a non-spatially-sequential firing order."

73. For the reasons stated above regarding elements B and C of Claim 1 and Claim 2, Shteynberg does not disclose or render obvious the elements of this claim.

74. Furthermore, the multiplexer of Shteynberg is a series of simple on/off switches, selected one at a time, the length of its cycle is a function of the current supplied to it, not user input. The currents supplied to the strings of LEDs in Shteynberg are constant, not pulsed drive currents:

> "[The] average current Ic provided by the current source (in this case, power converter 120) is equal to $I_c = \sum_{i=1}^{i=n} I_{ci}$ With a period of time "Tc" to provide current (energize) all of the LED channels (all of the series of LEDs 110_1, 110_2, 110_3, through 110_N), then the time of energizing each channel (series of LEDs 110) will be $T_{Qi} = \frac{I_{ci}T_c}{I_c}$. (EX1007 at 0055 and 0056)

The power supply of Shteynberg supplies an averaged current (as opposed to an individually determined current for each string) to the LEDs 110 based on the required energizing time provided by the controller. Thus, the power converter supplies a single current to all of the LED strings.

75. The ‘710 Patent (as stated in Claim 1C) discloses a firing order that is associated with when the plurality of driver currents are supplied to the plurality of strings. As shown above, Zhang does not disclose any method of supplying a plurality of currents to a plurality of strings. Zhang only discloses turning on one backlight module at a time. The non-sequential firing order required of the claims is not simply activating one LED string at a time in a non-sequential order. Thus, Zhang does not disclose or render obvious the firing order as taught in the ‘710 Patent.

IX. GROUND II

A. A POSITA would not be motivated to combine Shteynberg, Arai, Zhang and Kobori

76. For the same reasons stated above regarding the combination of Shteynberg, Arai and Zhang, a POSITA would not be motivated to combine Shteynberg, Arai, Zhang and Kobori. Also, because Kobori is directed to a display panel and Shteynberg is directed to ambient lighting for a building a POSITA would not be motivated to combine the references.

77. For reasons similar to those stated above regarding the combination of Zhang and Arai, a POSITA would not be motivated to combine Kobori with Zhang because different LEDs being turned on or off in a display would not lead to better light uniformity. A POSITA would also not combine Kobori with Zhang because Zhang is directed to CCFLs and Kobori is directed to LEDs. The electrical

requirements of the two systems are entirely different. Also, CCFLs have luminiferous levels and lighting characteristics. Using the luminiferous calculation disclosed in Kobori with Zhang would not lead to better light uniformity and could, in fact, be detrimental to the purpose of the invention. Accordingly, a POSITA would find Zhang unsuitable for combination with Kobori.

X. GROUND III

A. A POSITA would not be motivated to combine Shteynberg, Arai and Lee

78. As stated above, Shteynberg describes blending the emissions of red, green and blue LEDs to achieve light that is perceived by a viewer as "white" and Arai does not describe that process. "The word "white" in Arai appears only in reference to the liquid crystal display panel. A POSITA, therefore, would not combine Arai and Shteynberg.

79. Furthermore, Shteynberg teaches away from Lee. Shteynberg emphasized:

> The referenced prior art with multi-output or separate power converters and controllers for each LED string of an LED array… reduces the functionality and efficiency of the driver… Accordingly, a need remains for multistring LED driver which utilizes a single power converter and controller for an entire LED array and does not utilize these

multiple, separate power converters and controllers for each LED string." (EX1007 at 0010)

Shteynberg further states "The various embodiments of the invention provide innumerable advantages for energizing a plurality of series of LEDs, using a **single power converter and controller for an entire LED array, and does not utilize multiple, separate power converters and controllers for each LED string**." (EX1007 at 0011)(emphasis added) The prior art systems discouraged in Shteynberg are the same as those disclosed in Lee. Lee illustrates three separate LED driving circuits each driving a particular color LED string(s), "the identical color LEDs are interconnected in series between a terminal for the connection to the driving circuit 221, 222 or 223." (EX1013 at 0034). Fig. 3 clearly demonstrates that each LED driving circuit is separate and intended to control a specific string of LEDs.

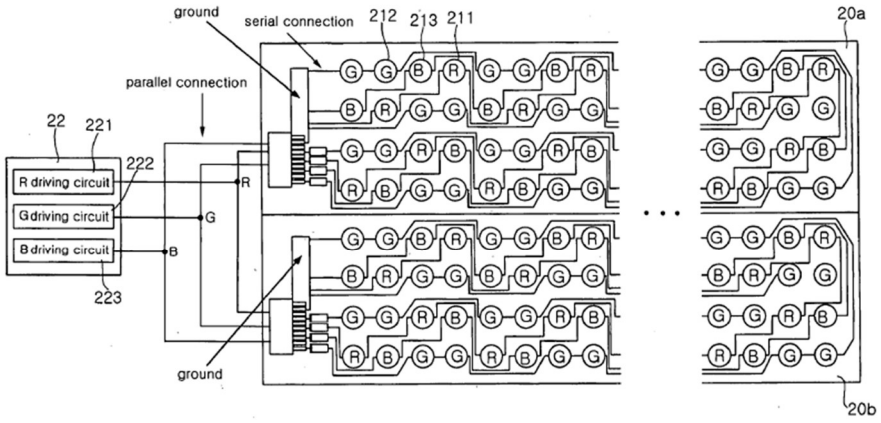
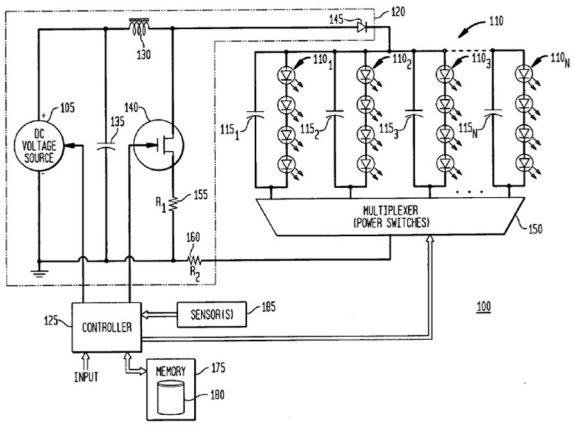


FIG. 3

Shteynberg has explicitly teaches away from the invention of Lee. Therefore, a POSITA would not seek to combine the two.

80. Also, Shteynberg specifically discloses improved LED driver efficiency, which is assumed to include driving voltage and current. Lee would not improve excessive driving voltage or current in combination with Shteynberg. A POSITA would recognize that Shteynberg already teaches a better functioning system that has less likelihood of driving excessive voltage or current. Also, a POSITA would recognize that implementing more driving circuits (as disclosed in Lee) would require additional power converters 120, controllers 125 and multiplexers 150 (as disclosed in Shteynberg), which would cause the combined system to preform worse than when separate. In addition, combining the systems would be counter to the teachings of Shteynberg, as Shteynberg discloses a single power converter supplying or driving a current to all LED strings. Those LED strings can comprise a variety of red, green, or blue LED strings. To implement individual color LED driving circuits (as disclosed in Lee) would require independent, separate LED array driver circuits (See Shteynberg Fig. 3), which is contrary to the teachings of Shteynberg.

FIG. 3



Therefore, a POSITA would not be motivated to combine Shteynberg and Lee as the inventions are incompatible and any combination would result in a system worse than what Shteynberg and Lee disclose individually. A POSITA would certainly consider Lee to be unsuitable for combination with Shteynberg.

B. Shtenyberg and Arai fail to disclose [Claim 47 Preamble] the "A method for controlling a plurality of strings of solid state lighting devices configured to extend in a first direction and arranged substantially adjacent to one another".

81. For the reasons stated above regarding the preamble of claim 17, the preamble of claim 47 is not disclosed or rendered obvious.

C. Shtenyberg, Arai, and Lee fail to disclose [Claim 47A] "the method comprising supplying a plurality of pulsed drive current to a plurality of groups of the plurality of strings".

82. For the reasons stated above regarding element B claim 17, the limitations of this claim element are not disclosed or rendered obvious.

83. Shteynberg does not disclose the supply of a plurality of pulse currents to a plurality of strings. Rather, the power converter supplies a single current, and the multiplexer does not supply a current. Since Shteynberg only supplies one current and does not disclose any grouping of the plurality of strings, Shteynberg does not disclose or render obvious this element.

84. Lee teaches three separate LED driving circuits that each drive a red, green, or blue LED string, respectively. Lee does not contemplate the operation of each driving circuit, nor how that circuit supplies current. Lee only states that the issue of excessive driving current can be solved by "interconnecting the proper number of LEDs, which can be driven by a proper voltage, in series and by interconnecting the proper number of series connections, that can be driven by a proper current, in parallel" (EX 1013 at 0050). There is no mention that each driver circuit (221, 222, and 223) supplies a plurality of **pulsed drive currents** as required by the claims of the '710 Patent. Indeed, a POSITA would not understand that Lee intends each driver circuit to supply multiple drive currents. Each driver circuit is only connected to one group (i.e., one color of LED strings) of the plurality of strings. As one example, the red driving circuit (221) shown in Fig. 3 only connects to two strings of red LEDs in parallel. Thus, the driving circuit 221 only drives (or supplies) current to one group of the strings. Lee, therefore, does not disclose

supplying a **plurality of pulsed currents** to a **plurality of groups** of the plurality of strings.

85. In Lee, each individual driving circuit supplies individual current. The LED driving unit 22 simply contains the three driving circuits and has no other disclosed functionality, "LED driving unit 22 includes the red LED driving circuit 221, the green LED driving circuit 222, and the blue LED driving circuit 223. The LED driving circuits 221, 222, and 223 function to apply electric power to the LEDs." (EX1013 at 0041). A POSITA would understand that only each individual LED driving circuit supplies current to one group of the plurality of string.

86. Lastly, as previously stated, a POSITA would understand that there would be no benefit in combining Lee and Shteynberg.

D. Shtenyberg, Arai, and Lee fail to disclose or render obvious [Claim 48] "the method of claim 47, further comprising receiving a user input, wherein supplying the plurality of pulsed drive currents is based on user input."

87. For the reasons set forth above regarding elements B and C of claim 1, elements A and B of claim 17, and the preamble and element B of claim 47, the limitations of claim 48 are not disclosed or rendered obvious.

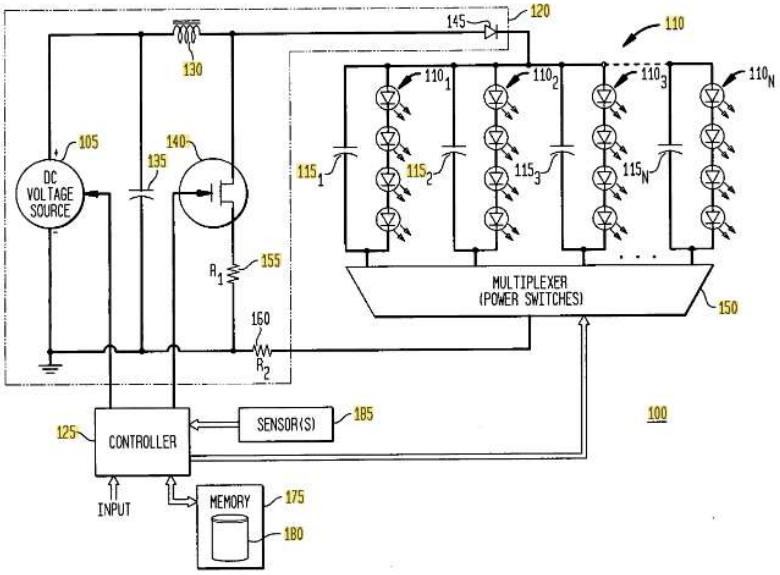
XI. GROUND IV

A. A POSITA would not be motivated to combine Shteynberg, Arai and Kawabata

88. As stated above, Shteynberg and Arai are not in the same field of endeavor as they both do not pertain to white light. Further, the word "white" does not appear at all in Kawabata. Thus, Shteynberg, Arai and Kawabata are not in the same field of endeavor. Additionally, since Shteynberg relates to providing ambient lighting for a building and the like, not providing backlighting for an LCD panel as in Arai or Kawabata, the reference are not in the same field of endeavor. Petitioner does not substantiate how such Shteynberg would be adapted to a backlight for an LCD panel as the power, switching and output demands for the two applications are very different. Accordingly, a POSITA would consider Arai and Kawabata unsuitable for combination with Shteynberg.

89. In examining the preferred embodiments of Shteynberg and Kawabata, a combination of the disclosed inventions would not be functional. First, figure 3 of Shteynberg, disclosed below, is "a circuit and block diagram illustrating a first exemplary LED array driver circuit" (EX1007 at 0030); second, figures 1A and 1B of Kawabata, disclosed below are "respectively a plan view and a cross-sectional view, taken along the line Ib-Ib shown in FIG. 1A, of a lighting unit." (EX1012 0028)

FIG. 3



Shteynberg Figure 3

FIG. 1A

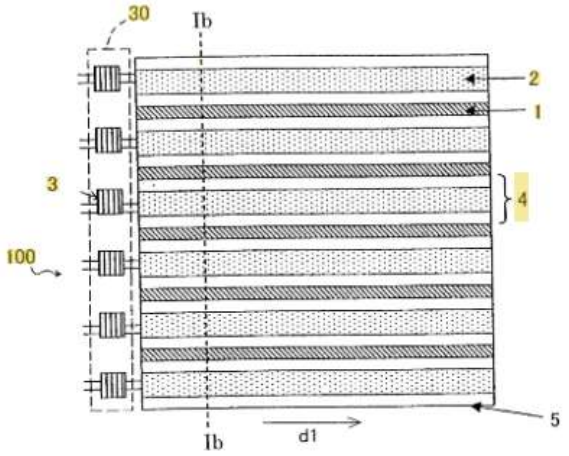
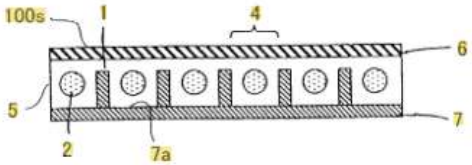


FIG. 1B



Kawabata Figures 1A and 1B

90. It is clear that the light emitting elements of Kawabata are cold cathode tubes. It states, "A cold-cathode tube may be used as the light-emitting element 2. (EX1012 at 0060) A cold-cathode tube is used as each of the light-emitting elements 2.: (EX1012 at 0062) "For example, each of the light-emitting elements (or cold-cathode tubes) 2." (EX1012 at 0070) Unlike LEDs, cold cathode tubes require high AC voltages; therefore, they require an inverter. There is no inverter in Shteynberg's disclosure, nor is it expected that an inverter would function with Shteynberg's multiplexer. Second, at the time of the invention of the '710 patent, the packaging technology for adapting LEDs to a glass tube shape like a CCFL system had not yet been developed. Thus, given the gap in technology, there is no reason to suspect that a POSITA would look to a completely different and largely incompatible system of backlighting an LCD panel to combine with an LED based system. Additionally, Kawabata's rudimentary system for activating and deactivating a CCFL lighting panel would serve no purpose the LED lighting system of Shteynberg. Accordingly, a POSITA would not find Kawabata suitable for combination with Shteynberg.

B. The combination of Shteynberg and Arai fail to disclose or render obvious Claim 1A: "a plurality of strings of solid state lighting devices…positioned at intervals in at least one second direction."

91. As discussed above regarding element A of Claim 1, the combination of Shteynberg and Arai fails to disclose or render obvious this limitation.

C. Shteynberg fails to disclose or render obvious Claim 1B: "a current supply circuit configured to selectively supply a plurality of on state drive currents to the plurality of strings responsive to a plurality of control signals."

92. As discussed above regarding element B of Claim 1, Shteynberg fails to disclose or render obvious this limitation.

D. Shteynberg fails to disclose or render obvious Claim 1C: "a control system configured to receive a user input and to selectively provide control signals to the current supply circuit responsive to the user input to selectively drive the plurality of strings."

93. As discussed above regarding element C of Claim 1, Shteynberg fails to disclose or render obvious this limitation.

E. Shteynberg and Kawabata alone or in combination fail to disclose or render obvious Claim 1D: "a control system further including firing logic configured to determine the firing order of the plurality of strings."

94. As discussed above regarding element D of Claim 1, the multiplexer of Shteynberg does not supply current, nor does the multiplexer determine the current level. Shteynberg uses the switching period to determine the current through each string (See discussion of element B of claim 1 above). Shown in Fig. 4 of Shteynberg, the multiplexer either turns on or off each LED string, for a time period T_{qn}. The length of this on/off cycle is a function of the current supplied to the multiplexer as described above, not of firing logic interpreted by the controller. Thus, there are not a plurality of currents being supplied to strings. These energizing time periods are not equivalent to the firing logic as described in the '710 Patent.

FIG. 4

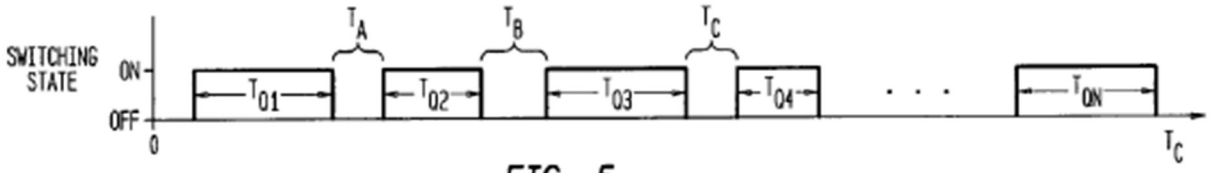


FIG. 5

95. The ‘710 Patent describes firing logic as follows:

> A control system 800 selectively provides control signals to a current driver 808 or other type of electrical power supply circuit that responsively drives multiple solid state lighting devices in a solid state lighting panel 801. The control system 800 can include firing logic 802 that can determine a firing logic 802 that can determine a firing order for the multiple strings. A firing order may determine an order in which individual strings of solid state lighting devices and/or groups of strings of solid state lighting state devices are supplied current. (EX1001 at 10:22-33).

Further, Fig. 8 of the ‘710 Patent illustrates that the firing logic is passed to the current driver 808 which supplies current signals to panel 810 according to the firing logic. As described above, a multiplexer is not a current driver. As implemented in Shteynberg, the multiplexer functions as a rapid on/off switch, it does not supply or modulate the power provided to the LED strings.

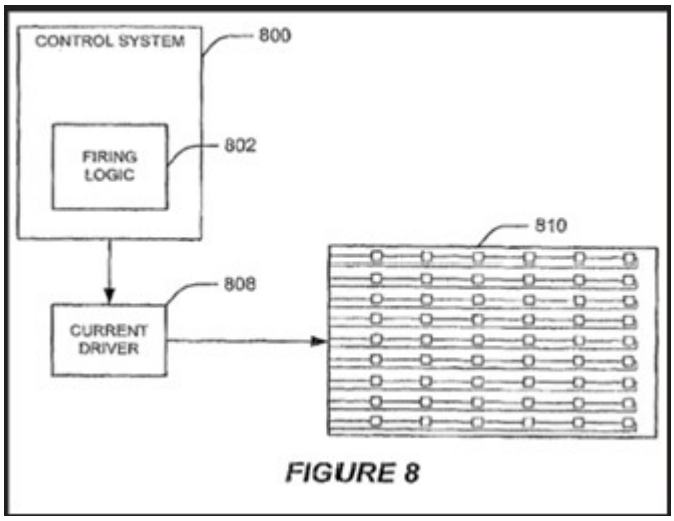


FIGURE 8

Only the power converter 120 supplies current. The power converter 120 supplies one current to all strings. It does not selectively supply current based on a timing signal from the multiplexer or determine the order in which to supply current to the LED strings. Therefore, Shteynberg does not disclose a control system including firing logic configured to determine a firing order of the plurality of strings.

96. Similar to Shteynberg, Kawabata discloses lights that are either in an on or off state. Kawabata discloses lights being activated in sequence. "Kawabata describes, with reference to figure 5, 'scan lighting'… As shown in Fig. 5 of Kawabata, each of the six light emitting elements 2 are turned on at different times. The timing rule in this example is the 'adjacent one' of the light elements 2 is turned next." (Petition at 66)

97. As noted above, a POSITA would not look to a CCFL based system for inspiration to combine with a building ambient lighting system in order to produce a backlight for an LCD panel.

98. Further, Kawabata sates "The on signal corresponds to a first signal intensity, which is the maximum voltage or current value and the off signal corresponds to a second signal intensity, which is a zero voltage or current value." (EX1012 at 0070). Kawabata only supplies a single current to each light emitting element. Therefore, Kawabata does not supply a plurality of on-state drive currents in a certain firing order."

99. Kawabata describes, similar to Shteynberg, a simple on/off pre-programmed system for lighting a panel. Each light element is activated for a portion of a vertical scanning period. Kawabata describes a system for lighting "at regular intervals" to achieve "scan lighting:"

> A drive signal (i.e., a voltage signal or a current signal) to be supplied to each of the light-emitting elements is a periodic signal, of which one period is as long as one vertical scanning period of the liquid crystal panel 300. For example, each of the light-emitting elements (or cold-cathode tubes) 2 may be turned ON in 50% of one vertical scanning period T1 and turned OFF in the remaining 50% of the period T1 as shown in FIG. 5, thereby getting light emitted from one of the light-emitting elements 2 after another at mutually different points of times (or at regular intervals). In this manner, so-called "scan lighting" is carried out. (EX1012 at 0069 and 0070)

100. Kawabata describes scan lighting as follows:

> By sequentially lighting one of these light-emitting regions after another in the vertical scanning direction (i.e., scan lighting), an image is displayed only during a predetermined period at each pixel while the liquid crystal layer is responding. As a result, a quality motion picture may be displayed. (*Id*. at 0006)

Thus, Kawabata discloses a system for lighting its elements in a sequential manner so as to provide adequate display brightness while reducing power consumption. As noted above, CCFL lamps use significantly more power than LEDs. Thus, it makes sense why Kawabata would apply such a technique to a backlighting system employing CCFLs, however, it is not relevant to LED light strips which can be run at higher brightness levels without interruption while drawing far less power than a comparable CCFL. Kawabata does not use the words "rule" or "logic" anywhere in its specification.

101. The '710 Patent states as follows:

> In some embodiments, the firing logic 802 can include rule-based logic that can generate a non-spatially-sequential firing order. For example, the rule based logic may include a rule that a second string fired after a first string is not adjacent the first string in the panel 810. In some embodiments, a rule

> may be that the first and second strings can be fired simultaneously and are not adjacent one another. (EX1001 10: 51-57)

This demonstrates that the ‘710 Patent describes more than just a simple sequential firing of lighting elements as shown in Kawabata. The ‘710 Patent also describes multiple other types of firing logic that may be used, stating:

> Some embodiments can use firing logic to determine a firing order in a **deterministic manner**. Other embodiments can include a **sequence generator that generates a firing sequence**. Some embodiments can include a **polyphase power supply configured to provide power to emitter strings in a temporally distributed manner**. Some embodiments include **receiving a synchronizing signal from a display controller**. Moreover, in some embodiments, the subsequent firing of a string can be determined by the location and/or dominant wavelength of a previously fired string. In this manner, a noticeable “sweep” effect can be reduced. (EX1001 at 8:5-16)

Kawabata does not disclose a “rule” or “logic” much less “firing logic configured to determine the firing order of the plurality of strings” as described in the passages from the ‘710 Patent above.

F. Kawabata fails to disclose or render obvious Claim 2: "wherein the firing logic comprises rule-based logic operative to generate a non-spatially sequential firing order."

102. As discussed above regarding element D of claim 1, Kawabata does not disclose firing logic within the meaning of the '710 Patent.

G. The combination of Shteynberg and Arai fails to disclose or render obvious Claim 5 "wherein ones of the plurality of strings are arranged corresponding to a plurality of bars that include portions of the plurality of strings, wherein the plurality of bars extend in the first direction and are positioned adjacent one another in a substantially parallel arrangement."

103. Adding elongated rectangular wiring boards—as disclosed in Arai—to a system for providing ambient lighting to a building—as disclosed in Shteynberg—would not create a backlight for an LCD panel. As stated above, a POSITA would not be motivated to combine Shteynberg and Arai. Further, the combination of Shteynberg and Arai would be functional as a backlight for those reasons.

H. Shteynberg fails to disclose or render obvious Claim 12: "a means for generating a feedback signal configured to provide display performance information to the control system."

104. For the reasons described above regarding Claim 12, Shteynberg does not disclose or render obvious the limitations of this claim.

I. The combination of Shteynberg and Arai fails to disclose or render obvious the preamble of Claim 17: "A method for controlling a plurality of strings of solid state lighting devices configured to extend in a first direction and to be arranged in substantially

adjacent positions relative to one another in a second direction that is different from the first direction."

105. For the reasons described above regarding the preamble of Claim 17, Shteynberg in view of Arai does not disclose or render obvious the limitations of the preamble.

J. Shteynberg fails to disclose or render obvious Claim 17A: "receiving an input from a user."

106. For the reasons described above regarding element A of claim 17, Shteynberg does not disclose or render obvious this limitation of the claim.

K. Shteynberg and Kawabata alone or in combination fail to disclose or render obvious Claim 17B: "supplying, based in part on the input from the user, a plurality of pulsed drive currents to the plurality of strings in a non-spatially sequential firing order."

107. For the reasons described above regarding element B of claim 17, Shteynberg does not disclose or render obvious this limitation of the claim.

XII. GROUND V

A. A POSITA would not be motivated to combine Shteynberg, Arai, Kawabata and Kobori

108. The arguments against the combination of Shteynberg, Arai and Kawabata are set forth above. Furthermore, a POSITA would not be motivated to combine Kobori and Kawabata since Kawabata is directed to a CCFL lighting system. The electrical requirements of a CCFL differ from an LED system. Further, LEDs and CCFLs have different luminiferous levels and lighting characteristics.

Accordingly, the combination would not lead to better lighting uniformity and a POSITA would not be motivated to combine the references. Stated differently, POSITA would not consider Kawabata suitable to combine with Kobori for these reasons.

XIII. GROUND VI

A. A POSITA would not be motivated to combine Shteynberg, Arai, Kawabata, and Lee

109. As set forth above, a POSITA would not be motivated to combine Shteynberg with Arai and Kawabata.

110. With respect to Lee, Petitioner states "a primary motivation of a POSITA would have been to avoid excessive driving voltage or current as described in Lee… Modifying the Shteynberg-Arai-Kawabata combination to include string groups, as disclosed by Lee, would meet this goal." (Petition at 54). Arai does not include disclosure as to how its light emitting elements are driven, so it is assumed that Petitioner means to combine the arrangement of Shteynberg and Kawabata with that of Lee. However, Shteynberg states:

> The referenced prior art with multi-output or separate power converters and controllers for each LED string of an LED array… reduces the functionality and efficiency of the driver… Accordingly, a need remains for multistring LED driver which utilizes a single power converter and controller for an entire LED array and does not utilize these

multiple, separate power converters and controllers for each LED string. (EX1007 at 0010).

Shteynberg clarifies that "The various embodiments of the invention provide innumerable advantages for energizing a plurality of series of LEDs, using a single power converter and controller for an entire LED array, and does not utilize multiple, separate power converters and controllers for each LED string." (*Id*. at 0011) The prior art system that Shteynberg discourages are exactly like Lee. Lee illustrates three separate LED driving circuits each driving a particular color LED string(s), "the identical color LEDs are interconnected in series between a terminal for the connection to the driving circuit 221, 222 or 223." (EX1013 at 0034]. Fig. 3 of Lee clearly demonstrates that each LED driving circuit is separate and intended to control a specific string of LEDs:

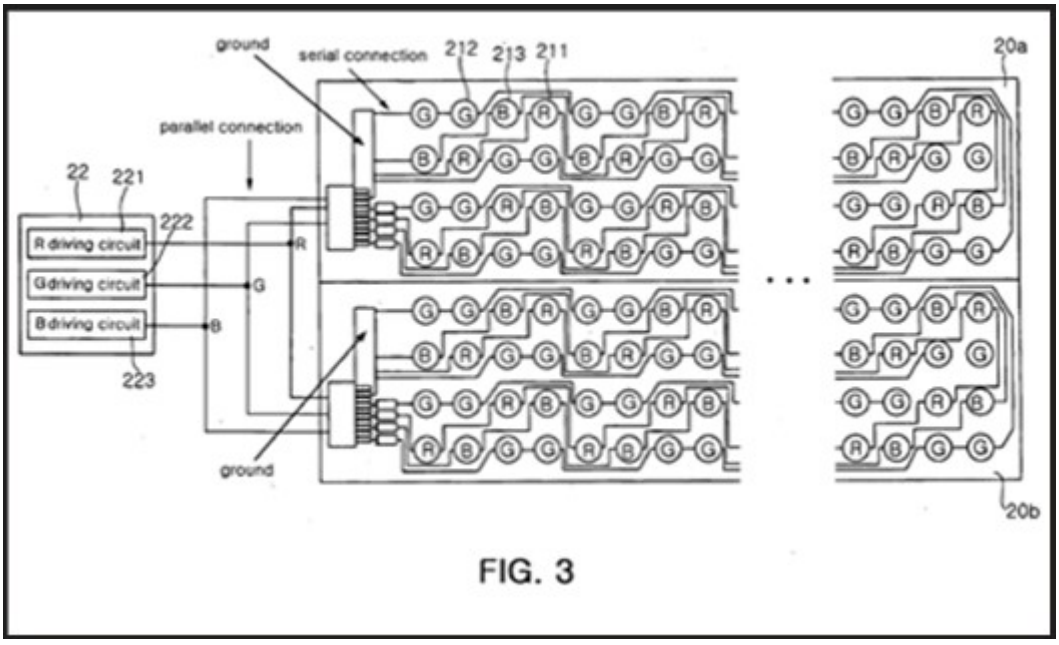
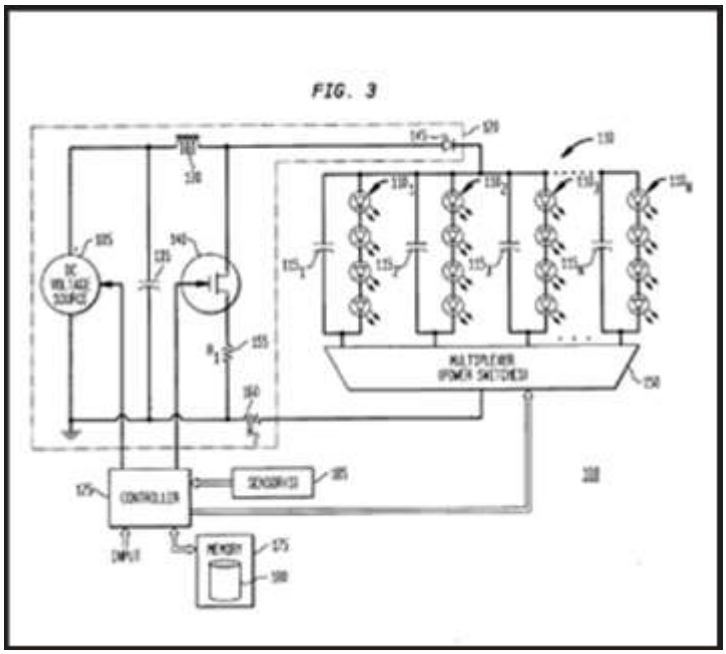


FIG. 3

111. Shteynberg represents an improvement to Lee, though. Shteynberg specifically discloses improved LED driver efficiency, which is assumed to include driving voltage and current. Thus, it is not clear why, and Petitioner offers no example of how Lee would improve excessive driving voltage or current in Shteynberg. A POSITA would recognize Shteynberg already teaches a better functioning system that has less likelihood of driving excessive voltage or current. A POSITA would recognize that implementing more driving circuits (as disclosed in Lee) would require additional power converters 120, controllers 125 and multiplexers 150 (as disclosed in Shteynberg), which would cause the combined system to preform worse than when separate.

112. In addition, combining the systems would be counter to the teachings of Shteynberg. Shteynberg discloses a single power converter supplying or driving a current to all LED strings. Those LED strings can comprise a variety of red, green, or blue LED strings. To implement individual color LED driving circuits (as disclosed in Lee) would require independent, separate LED array driver circuit (See Shteynberg Fig. 3), which departs from the teachings of Shteynberg.



Therefore, a POSITA would not be motivated to combine Shteynberg and Lee as the inventions are incompatible and any combination would result in a system worse than what Shteynberg and Lee disclose individually.

113. Kawabata is no more likely to be combined with Lee by a POSITA than Shteynberg or Arai. As discussed above, Kawabata discloses a backlighting system employing CCFLs and a sequential "sweep" of the on/off cycle of each light source. A POSITA would not seek to combine an LED based system such as Lee with a CCFL system such as Kawabata.

B. Lee and Kawabata alone or in combination fail to disclose or render obvious Claim 13A: "wherein the current supply circuit comprises a plurality of phase drivers configured to supply a plurality of on-state drive currents at a plurality of times."

114. Petitioner relies on the following disclosure from Kawabata: "Phase shifting is equivalent to having the current signals stating at different times in a firing

cycle" for to purportedly show phase drivers configured to supply a plurality of on-state drive currents at a plurality of times in a firing cycle. (Petition at 79) This requires a logical leap from "phase shifting" to "phase drivers." There is no justification for such a leap. Kawabata uses the term "phase shifting" precisely once in its disclosure, as sown below:

> For example, **each of the light-emitting elements (or cold-cathode tubes)** 2 may be turned ON in 50% of one vertical scanning period T1 and turned OFF in the remaining 50% of the period T1 as shown in FIG. 5, thereby getting light emitted from one of the light-emitting elements 2 after another at mutually different points of times (or at regular intervals). In this manner, so-called "scan lighting" is carried out. Then, the controller 30 may supply a drive signal, which has a first signal intensity high enough to turn each of the light-emitting elements 2 ON in 50% of one period thereof and a second signal intensity low enough to turn the light-emitting element 2 OFF in the remaining 50% of the one period, to one of the light-emitting elements 2 after another at different points of times. In this case, **the drive signal supplied to one of the light-emitting elements 2 should have its phase shifted from that of the drive signal supplied to adjacent one of the light-emitting elements 2**." (EX1012 at 0070)

Kawabata is clearly discussing CCFLs and not LEDs and therefore is operating under a completely different power consumption and delivery regime, this simply is not similar to the action of the phase drivers disclosed in the '710 Patent. The '710 Patent, describing its phase drivers states:

> The **current drivers 1008** can **include multiple phase drivers 1014 corresponding to N different power phases**, for example. Each of the phase drivers 1014 is configured to provide power to one or more different strings 1012 corresponding to that phase…The firing order of the strings 1012 within each phase group may be configured to be non-spatially sequential. Further, the determination regarding which strings 1012 are in each phase group may also be non-spatially sequential…By providing multiple phases, each phase driver 1014 can be configured to begin firing at a different time within the period, as determined by, for example, the firing logic. In this manner, the firing of the strings 1012 can be performed in a more uniform manner within each period. (EX1001 at 12: 25 – 41)

115. On the other hand, "phase shifting" in Kawabata is describing turning one light on and then turning on another in a pre-programed sequence. The '710 Patent, is describing a dynamic system that can adapt via feedback sensors to the

inputs of the display vis a vis the color management unit. Figures 1 and 10 of the '710 Patent illustrate this system.

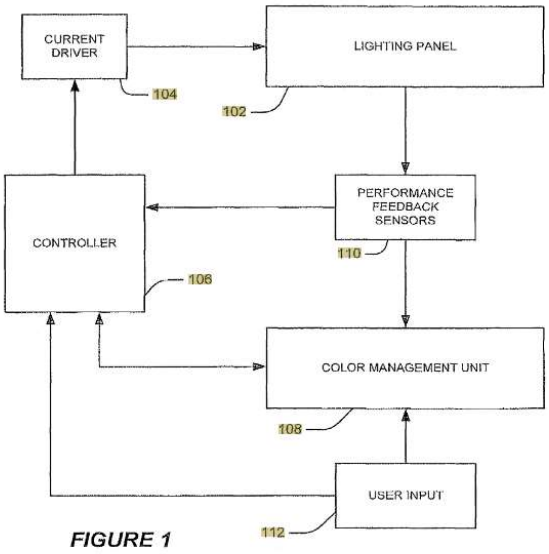


FIGURE 1

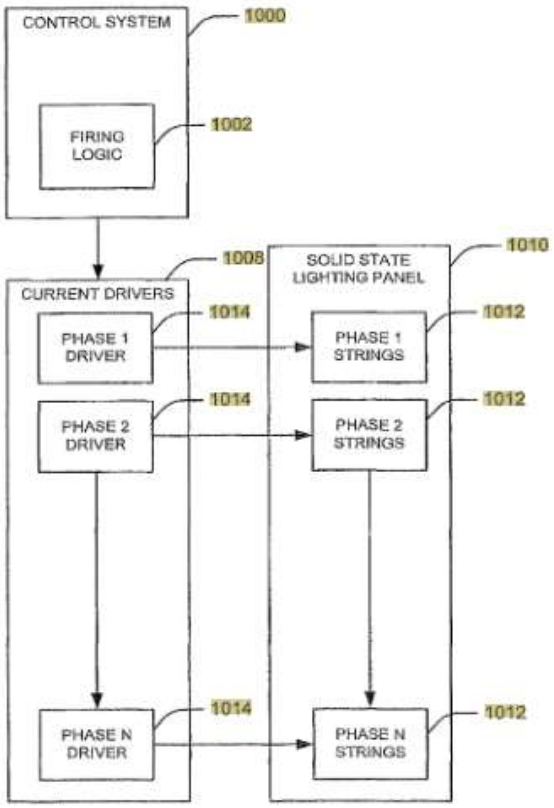


FIGURE 10

The phase drivers are part of the current drivers, which receive instruction from the control system (as per Figure 10). The control system receives information from the performance feedback sensors, the color management unit and user input to determine the appropriate behavior of the phase drivers within the current drivers. Rather than a dumb system that seeks to keep the display at a uniform level of brightness as in Kawabata employing "phase shifting", the phase drivers of the '710 Patent allow for a dynamic response to the behavior of the display on the part of the lighting panel. Petitioner has, therefore, failed to demonstrate the combination of Lee and Kawabata

disclose or imply "a plurality of phase drivers configured to supply a plurality of on-state drive currents at a plurality of times."

C. Lee and Kawabata alone or in combination fail to disclose or render obvious Claim 13B or Claim 13C: "wherein the plurality of strings of solid state lighting devices comprise a plurality of string groups, each configured to receive current from one of the plurality of phase drivers" and "wherein the control system is further configured to determine the plurality of times that each of the plurality of phase drivers begin to supply current to the plurality of string groups."

116. As discussed above, Lee and Kawabata, alone or in combination, do not disclose these elements, as they do not disclose a plurality of phase drivers.

117. I declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and 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.



Dated January 26, 2024 By _____
William K. Bohannon