

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Hisense USA Corporation
Petitioner

v.

Brightplus Ventures LLC
Patent Owner

Patent No. 7,872,705
Filing Date: July 29, 2007
Issue Date: January 18, 2011
Title: LED Backlight System for LCD Displays

Inter Partes Review No. IPR2023-01411

**Ex. 1014 – Declaration of P. Morgan Pattison, Ph.D.
in Response to Patent Owner’s Contingent Motion to Amend**

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I, P. Morgan Pattison, declare as follows:

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. 7,872,705 (“the ’705 Patent”) with respect to the Contingent Motion to Amend (the “Motion”) Filed by Patent Owner in that *Inter Partes* Review proceeding.

3. I provide this Declaration at the request of and have been retained by Kilpatrick Townsend & Stockton, LLP, which represents Hisense USA Corporation (“Hisense”) in connection with the above-captioned *Inter Partes* Review. I have been informed and understand that Hisense contends that the proposed substitute claims 35–48 submitted by Patent Owner in the Motion are invalid.

4. I am being compensated at an hourly rate of \$550 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.

5. 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.

6. My qualifications are summarized in Ex. 1003, which is my prior declaration in this proceeding, and my *curriculum vitae*, which was submitted as Ex. 1004. My understanding of the legal issues, including with respect to obviousness, are also summarized in my prior declaration. My prior declaration also provides my opinion on the appropriate level of experience for a person to be a person of ordinary skill in the art with respect to the '705 Patent.

II. Materials Considered

7. In addition to the materials identified in my prior declaration, in forming my opinions, I have considered, in addition to my knowledge and experience, Patent Owner's Motion as well as the following documents and things that I have obtained, or that have been provided to me:

EXHIBIT	DESCRIPTION
1015	US 6,650,822 to Zhou ("Zhou")

8. In addition to the documents above, in forming the opinions expressed below, I have also considered my own knowledge and experience based upon my education and work in the field of LEDs and display technology, as described in my prior declaration and in my *curriculum vitae* (Ex. 1004).

III. Patent Owner's Proposed Substitute Claims

9. I am informed and understand that Patent Owner has proposed to substitute original claims 1, 2, 6, 11, 13, 14, 16, 17, 28, 29, 31, 32, 33, and 34 of the '705 Patent with the following substitute claims (the "Substitute Claims"):

35. (proposed substitute for Claim 1) A liquid crystal display (LCD) system comprising:

- a) a LCD panel;
- b) at least ~~one~~ a first waveguide element and a second waveguide element respectively comprising a plurality a first light entry region and a second light entry regions;
- c) c) a first light-emitting source comprising a first plurality of LEDs arranged in a first strip and positioned to emit light into the ~~at least one first~~ first waveguide element at a first light entry region ~~of the plurality of light entry regions;~~
- d) a second light-emitting source comprising a second plurality of LEDs arranged in a second strip and positioned to emit light into the ~~at least one second~~ second waveguide element at a second light entry region ~~of the plurality of light entry regions;~~ and
- e) a common control circuit in electrical communication with at least one of the first plurality of LEDs and the second plurality of LEDs.

36. (proposed substitute for claim 2) The LCD system of claim 1-~~35~~, wherein the LCD panel has a viewable surface, and the at least one first and second waveguide element has a elements each have a transmissive surface, and the wherein each transmissive surface is smaller than the viewable surface. approximately the same size as the viewable surface.

37. (proposed substitute for claim 32) The LCD system of claim 1-~~35~~, embodied in a television, wherein each of the first and second waveguide elements are positioned to light a portion of the LCD panel.

38. (proposed substitute for claim 33) The LCD system of claim 1-~~35~~, embodied in a computer monitor, wherein each of the first and second waveguide elements are positioned to light a portion of the LCD panel.

39. (proposed substitute for claim 17) The LCD system of claim 1-~~35~~, wherein ~~any of the first light-emitting source and the second light-emitting source is optically coupled to the at least one waveguide element~~ are embedded within a surface of the first and second waveguide, respectively.

40. (proposed substitute for claim 34) The LCD system of claim 1-35, further comprising a third light-emitting source comprising a third plurality of LEDs arranged in a third strip and positioned to emit light into the at least one third waveguide element at a third light entry region.

41. (proposed substitute for claim 31) The LCD system of claim 1-40, further comprising ~~at least a third~~ a fourth light-emitting source comprising a plurality of LEDs arranged in a fourth strip and, positioned to emit ~~direct backlight onto the LCD panel~~ light into the fourth waveguide element at a fourth light entry region.

42. (proposed substitute for claim 6) ~~The LCD system of claim 1, wherein any of the first light-emitting source and the second light-emitting source comprises a plurality of direct LEDs.~~

A liquid crystal display (LCD) system comprising:

- a) a LCD panel;
- b) at least one a first waveguide element and a second waveguide element respectively comprising a first light entry region and a second light entry region;
- c) a first light-emitting source comprising a first plurality of LEDs arranged in a first strip and positioned to emit light into the at least one wherein the first waveguide element is positioned to receive light emitted by one or more of the LEDs of the first plurality of LEDs; at a second light entry region of the plurality of light entry regions
- d) a second light-emitting source comprising a second plurality of LEDs arranged in a second strip and positioned to emit light into the at least one wherein the second waveguide element is positioned to receive light emitted by one or more of the LEDs of the second plurality of LEDs; and at a second light entry region of the plurality of light entry regions
- e) a common control circuit in electrical communication with at least one of the first plurality of LEDs and the second plurality of LEDs.

43. (proposed substitute for claim 11) The LCD system of claim 1-42, ~~further comprising a common control circuit in electrical communication with each LED of at least one of the first plurality of LEDs and the second plurality of LEDs.~~

wherein the LCD panel has a viewable surface and the first and second waveguide elements each have a transmissive surface, wherein each transmissive surface is smaller than the viewable surface.

44. (proposed substitute for claim 13) ~~The LCD system of claim 1-42, wherein each LED of at least one of the first plurality of LEDs and the second plurality of LEDs is linearly arranged.~~ embodied in a television, wherein each of the first and second waveguide elements are positioned to light a portion of the LCD panel.

45. (proposed substitute for claim 14) The LCD system of claim 1-42, wherein the common control circuit is in electrical communication with ~~each of the first plurality of LEDs and the second plurality of LEDs,~~ the system further embodied in a computer monitor, wherein each of the first and second waveguide elements are positioned to light a portion of the LCD panel.

46. (proposed substitute for claim 28) The LCD system of claim 1-42, wherein ~~any of the first light emitting source and the second light emitting source is disposed along a center region of the LCD system behind the LCD panel, and is positioned to emit light into a back side of the at least one waveguide element.~~ the first plurality of LEDs and the second plurality of LEDs are embedded within a surface of and emit light into the first and second waveguide, respectively.

47. (proposed substitute for claim 16) The LCD system of claim 1-42, ~~wherein each of the first plurality of LEDs and the second plurality of LEDs is linearly arranged.~~

further comprising a third plurality of LEDs arranged in a third strip wherein a third waveguide is positioned to receive light emitted by one or more of the LEDs of the third plurality of LEDs.

48. (proposed substitute for claim 29) The LCD system of claim 1-47, ~~wherein any of the first light emitting source and the second light emitting source is disposed at a location selected from: (a) along an edge region of the LCD system, positioned to emit light into an edge of the at least one waveguide element, and (b) along a center region of the LCD system behind the LCD panel, positioned to emit light into a back side of the at least one waveguide element.~~

further comprising a fourth plurality of LEDs arranged in a fourth strip wherein a fourth waveguide is positioned to receive light emitted by one or more of the LEDs of the fourth plurality of LEDs.

IV. The Elements Newly Introduced in the Substitute Claims Were Each Well Known in the Art Prior to the '705 Patent.

10. In my prior declaration I broke down the elements of claims 1, 2, 5, 6, 9, 11, 13, 14, 16, 17, 22, 28, 29, 31, 32, 33, and 34 of the '705 Patent and demonstrated that each of the elements was known in the art before the July 29, 2007, priority date of the '705 Patent. In the analysis below I address the newly introduced elements of Substitute Claims 35–48 and demonstrate that each was also known in the art before the July 29, 2007, priority date of the '705 Patent.

A. Display Systems with Multiple Waveguide Elements Having Their Own Respective Light Entry Regions Were Known in the Art (Substitute Claims 35–48)

11. Backlight display systems utilizing multiple waveguide elements were well known in the art prior to the July 29, 2007, priority date of the '705 Patent. For example, U.S. Patent No. 6,650,822 to Zhou (Ex. 1015), which issued on November 18, 2003, is generally directed to a “waveguide optical device” for “flat-panel displays (FPDs),” such as “liquid crystal displays (LCDs).” Zhou, 3:46-49, 1:20-30. And to that end, Zhou discloses and teaches displays that include multiple “waveguide cores.” Zhou, 6:9-49.

12. In particular, Zhou discloses a display “composed of a light source 60, a micro-lens 61, a optical waveguide plate 25, a plurality of light switches 30, a front plate 50, and a back plate 40,” as illustrated in Figure 2. Zhou, 6:15-19.

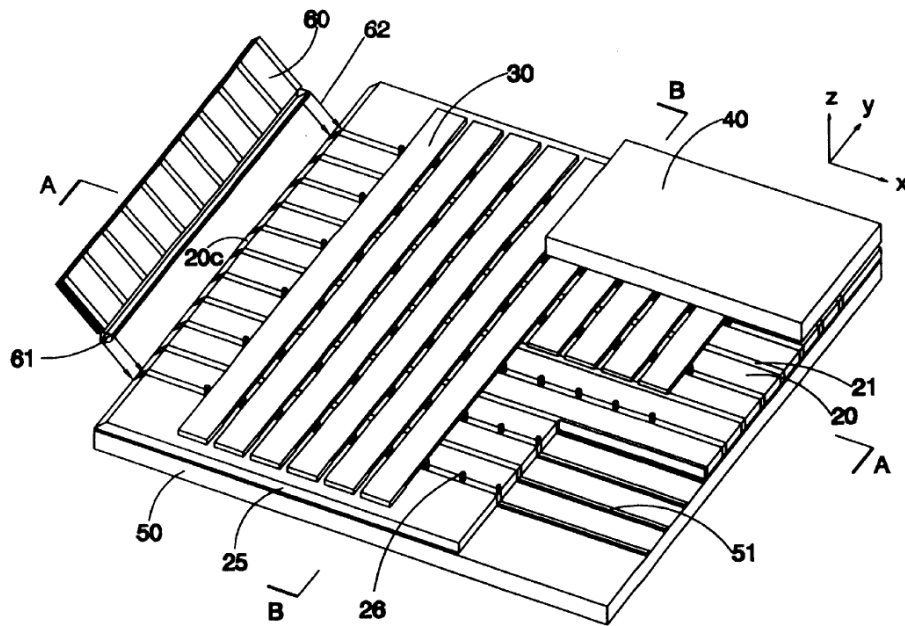


FIG. 2

13. Zhou discloses that “[t]he light source 60 is constructed as a linear array, in which pluralities of light elements are placed one next to each other.” Zhou, 6:19-21. Similarly, Zhou discloses that “[t]he optical waveguide plate 25 consists of a plurality of waveguide channels consisting of waveguide cores 20 and claddings 21, with the refractive index of the waveguide cores 20 higher than that of the claddings 21.” Zhou, 6:28-31. Zhou discloses that “[e]ach waveguide core 20 is aligned with one element of the light source 60 array.” Zhou, 6:31-32. And Zhou discloses that each waveguide core is an “optical device[] that confine[s] the propagation of light waves.” Zhou, 6:26-28. And Zhou discloses that “[a] micro-lens 61 may be used to facilitate light coupling from the light-source 60 into waveguide cores 20 of the optical waveguide plate 25.” Zhou, 6:23-26.

14. A person of ordinary skill in the art would thus understand that Zhou discloses and teaches the use of a “plurality” of “waveguide cores 20” in a flat-panel display including in relation to a plurality of light elements. Zhou, 6:19-33. Indeed, as illustrated in Figure 2 of Zhou (see above), Zhou teaches that a flat-panel display can include at least ten different “waveguide cores 20.” Zhou, Fig. 2.

15. Zhou also discloses that each “waveguide core 20” includes at least one “waveguide end 20c,” wherein light from a light element of “light source 60” enters each “waveguide 20.” Zhou, 6:50-53. As illustrated in Figures 2 and 3 of Zhou, Zhou discloses “[a] light beam 62, emitted from a light source 60, is coupled into a waveguide core 20 through a lens 61 to a waveguide end 20c.” Zhou, 6:50-53. “Inside the waveguide core 20, the light beam 62a is confined in lateral y and z directions but is allowed to propagate freely along longitudinal x direction” until it is extracted from the waveguide core 20 “on its trajectory 62b to the front of the display, and then reaches a viewer 90.” Zhou, 6:53-7:9.

16. In my opinion, and as discussed further below, a person of ordinary skill in the art would have understood that Zhou teaches various advantages of using multiple waveguide elements (i.e., waveguide cores 20) in a flat-panel display, including, but not limited to, so as to provide a uniform display. Zhou, 3:46-48. As such, in my opinion, a person of ordinary skill in the art would have understood that Zhou’s teachings with respect to the use of multiple waveguide elements could be

applied beyond the embodiment disclosed in Zhou and to other known flat-panel displays, including, but not limited to, liquid crystal displays (LCDs). Zhou, 1:20-30 (“Commercial FPD technologies include liquid crystal displays (LCDs)”), 20:21-22 (“Many variations and applications of the disclosed display are possible”), 21:26-27 (“Obviously many modifications and variations of this invention are possible”). In particular, a person of ordinary skill in the art would have understood that a display composed of Zhou’s multiple waveguide cores 20 could be utilized as a uniform backlight in an LCD system. Zhou, 16:29-35 (citing “Liquid Crystal Flat Panel Displays—Manufacturing Science and Technology”, Van Nostrand Reinhold, New York (1993)); *see* Fine, 3:41-4:62, 11:46-55 (disclosing the use of an “illumination apparatus” having “light emitting sources [] embedded in a waveguide material” as “backlight devices” for LCDs).

B. LCD Systems with LEDs Embedded in Waveguides Were Known in the Art (Substitute Claims 39 & 46)

17. LCD systems utilizing light-emitting diodes (LEDs) embedded in waveguide material were well known in the art prior to the July 29, 2007, priority date of the '705 Patent. For example, U.S. Patent No. 8,128,272 to Fine (Ex. 1007), which was filed June 7, 2006, is generally directed to illumination apparatuses, such as “in a liquid crystal display device,” that comprise “one or more light emitting sources embedded in a waveguide material.” Fine, 5:11-27.

18. In particular, Fine discloses an apparatus that can be used “for providing illumination or displaying images.” Fine, 9:31-33. Fine expressly states that its teachings “can be incorporated in a passive display device,” such as a “liquid crystal display (LCD)” that employs a “backlight assembly.” Fine, 5:22-23, 3:37-52. Indeed, Fine states that a goal of its invention “to provide substantially uniform illumination,” which Fine notes is “particularly useful when ... incorporated in a backlight unit of a passive display device.” Fine, 16:31-38.

19. Fine discloses that its apparatus includes “one or more light emitting sources 12” and “waveguide material 14,” which is “capable of propagating light generated by light source 12, such that at least a portion of the light is diffused within waveguide material 12 and exits through at least a portion of first surface 16.” Fine, 11:50-55. Fine discloses that “[l]ight source 12 can be a LED.” Fine, 13:24; Fine, 11:56-60 (“The terms ‘light source’ or ‘light emitting source’, are used herein interchangeably and refer to any self light emitting element, including, without limitation, an inorganic light emitting diode, an organic light emitting diode or any other electroluminescent element.”).

20. Fine discloses that light source 12 is “embedded” in the waveguide material 14 of Fine’s apparatus, including as illustrated in multiple Figures of Fine. Fine, 11:50-52, 12:66-67, 13:66-67, 14:10-12, 14:45-48, Figs. 1a, 1b, 2a, 2b.

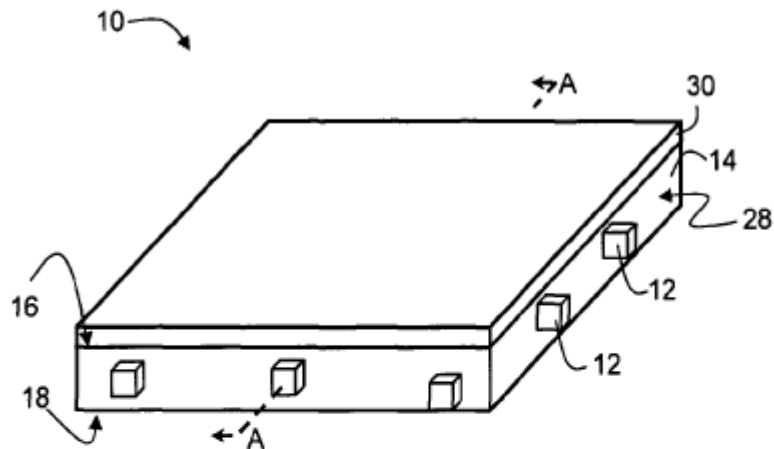


Fig. 1a

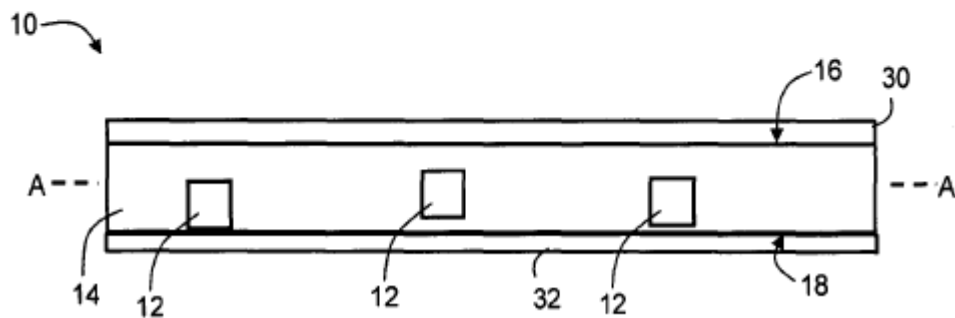


Fig. 1b

21. Fine discloses that “[t]here are several advantages for embedding the light source within the waveguide material,” including especially “when the light source is a light emitting diode.” Fine, 12:66-13:23.

V. Zhou in View of the Knowledge of a Person of Ordinary Skill in the Art Renders Obvious Substitute Claims 35–48

22. I am informed and understand that Zhou (Ex. 1015), which lists an Issue Date of November 18, 2003, on its face, is prior art to the ’705 Patent.

23. In my opinion, a person of ordinary skill in the art would have recognized that each element of Substitute Claims 35–48 was obvious in view of Zhou and the knowledge of a person of ordinary skill in the art.

24. Zhou is generally directed to “waveguide based optical device[s]” for “flat-panel displays (FPDs).” Zhou, 1:20-30, 3:37-38, 3:46–48, 6:9-14. Zhou notes that known commercial FPDs include “liquid crystal displays (LCDs), thin-film electroluminescence (TFEL) displays, plasma display panels (PDPs), field emission displays (FEDs), and light-emitting-diode (LED) matrix displays.” Zhou, 1:26-30. Zhou also notes that such FPDs can be used in replacement of “cathode ray tubes (CRTs)” in “television (TV) sets and computer monitors.” Zhou, 1:20-25. As discussed above, in my opinion, a person of ordinary skill in the art thus would have understood that Zhou’s teachings can be generally applied to FPDs, including LCDs.

25. Zhou discloses a general example of a FPD in Figure 1, which includes a “display screen 10” having a “width W and height H.” Zhou, 6:9-14, Fig. 1. A person of ordinary skill in the art would have understood that, in an LCD embodiment (Zhou, 1:26-30), this “display screen 10” would refer to an LCD panel, which could be used in a television or computer monitor display (Zhou, 1:20-25).

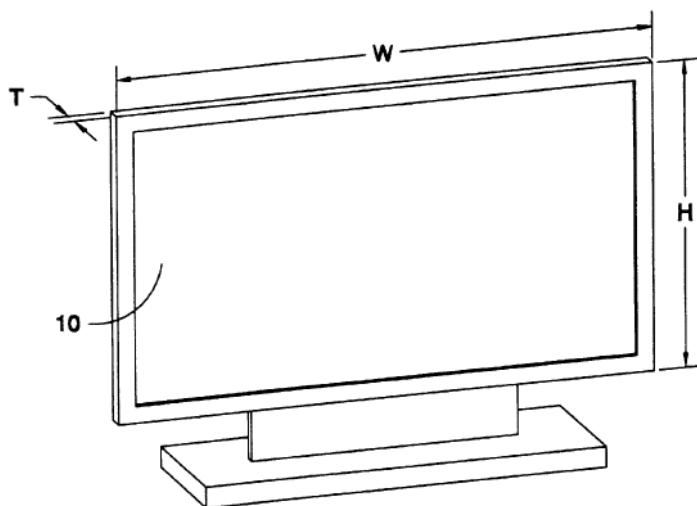


FIG. 1

26. Zhou discloses that, in a preferred embodiment, “[t]he display is composed of a light source 60, a micro-lens 61, a optical waveguide plate 25, a plurality of light switches 30, a front plate 50, and a back plate 40,” as illustrated in Figure 2. Zhou, 6:16-19, Fig. 2.

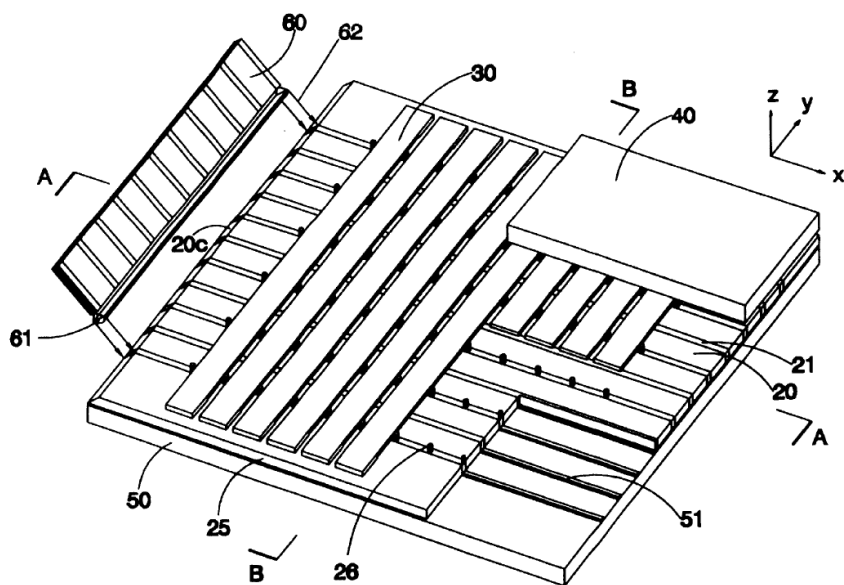


FIG. 2

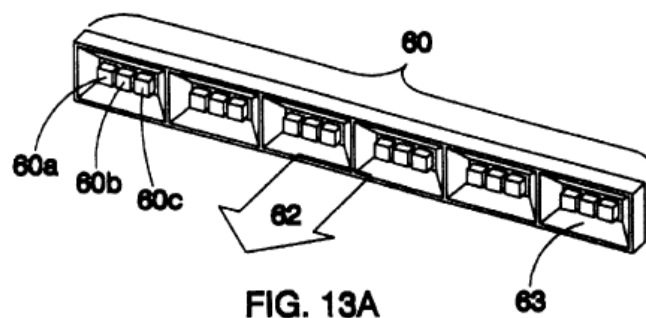
27. As illustrated in Figure 2, Zhou discloses that “optical waveguide plate 25 consists of a plurality of waveguide channels consisting of waveguide cores 20 and claddings 21, with the refractive index of the waveguide cores 20 higher than that of the claddings 21.” Zhou, 6:28-31. For example, the preferred embodiment schematically illustrated in Figure 2 includes at least ten waveguide cores 20 and corresponding claddings 21. Zhou, Fig. 2. Zhou states that the “waveguides used in this invention are optical devices that confine the propagation directions of light waves.” Zhou, 6:26-28. As such, in my opinion, a person of ordinary skill in the art would have understood that Zhou discloses a display containing at least ten different waveguide elements, as illustrated in Figure 2.

28. Relatedly, in my opinion, a person of ordinary skill in the art would have understood that the surface of each individual waveguide core 20 (including, necessarily, the transmissive surface of each individual waveguide core 20) in Zhou’s display is smaller than the viewable surface of the display screen 10, as illustrated in Figure 2 of Zhou. Likewise, in my opinion, a person of ordinary skill in the art would have understood that each individual waveguide core 20 in Zhou’s display is positioned to light only a portion of the display screen 10, as illustrated in Figure 2 of Zhou.

29. Zhou discloses that its “light source 60 is constructed as a linear array, in which pluralities of light elements are placed one next to each other.” Zhou, 6:19-

21. “For a full color display, each element of the linear array is composed of three sub-elements of red, green and blue (RGB) colors.” Zhou, 6:21-23.

30. Zhou discloses that, in a preferred embodiment, “the light source 60 is an LED array.” Zhou, 7:19-22; 15:61-62 (“Light sources are preferably made of light emitting diodes (LEDs).”). In such an embodiment, Zhou discloses that “light source 60” is comprised of a “linear array of full color LED elements,” wherein each individual LED element “consists of three sub-elements, consisting of red 60a, green 60b, and blue 60c colors, of surface emitting LEDs,” as illustrated in Figure 13 of Zhou. Zhou, 16:1-5. A person of ordinary skill in the art would thus have understood each “LED element” in this embodiment consists of three LEDs (one red 60a, one green 60b, and one blue 60c) arranged in a strip. Zhou, Fig. 13A.



31. Zhou discloses that “[e]ach waveguide core 20 is aligned with one element of the light source array 60.” Zhou, 6:32-33. In Zhou’s disclosed embodiments wherein the light source 60 is an LED array, Zhou discloses that “each LED element, consisting of red-green-blue sub-elements, are aligned with a

corresponding waveguide core 20. Thus, each waveguide core 20 carries light beams 62 of all three primary colors.” Zhou, 16:19-23. As such, in my opinion, a person of ordinary skill in the art would have understood that each “LED element” (consisting of three individual surface emitting LEDs, red-green-blue) is positioned to emit light into an individual, corresponding waveguide core 20.

32. In particular, Zhou discloses that “[a] light beam 62 emitted from a light source 60 is coupled into [each] waveguide core 20 through a lens 61 to a waveguide end 20c.” Zhou, 6:50-53, Figs. 2-3. In Zhou’s disclosed embodiments wherein the light source 60 is an LED array, a person of ordinary skill in the art would thus have understood that a light beam 62 emitted from each individual “LED element” is coupled into individual waveguide cores 20 through respective waveguide ends 20c, given that, in those embodiments, “each LED element, consisting of red-green-blue sub-elements, are aligned with a corresponding waveguide core 20.” Zhou, 16:19-23. As such, in my opinion, a person of ordinary skill in the art would have understood that each “LED element” (consisting of three individual surface emitting LEDs, red-green-blue) is positioned to emit light into an individual, corresponding waveguide core 20 at a light entry region of the waveguide core 20 (waveguide end 20c).

33. Zhou discloses that the light waves in each waveguide core 20 may thereafter be extracted from each of the waveguide cores 20, respectively, to display

an image on the “front of the display” to a “viewer 90.” Zhou, 6:38-7:12. Relatedly, Zhou discloses a “control means, including control circuits, for producing images by controlling ... light emission from [the] light source.” Zhou, 4:13-15. Further, Zhou discloses that, “[w]hen using an LED array light source, the light intensity of the LED array is preferably controlled by a parallel driven current or pulse modulation circuit,” Zhou 16:46-48, demonstrating electrical communication with the LED elements within the LED array. Indeed, Zhou teaches that each LED (i.e., the red, green, and blue “sub-elements”) in each “LED element” can be “modulated simultaneously.” Zhou, 16:50-51.

34. With respect to the requirement in Substitute Claims 39 and 46 that the claimed LEDs be “embedded” within a surface of each respective waveguide, I note that Zhou discloses that, in some embodiments, to facilitate light coupling into waveguide cores 20, light source 60 may “be integrated into a light-source module” that “can be simply attached to the surface of the waveguides.” Zhou, 12:61-65. In my opinion, a person of ordinary skill in the art would have found it obvious to so “attach” the “LED elements” of an LED light source 60 to the waveguides by embedding each LED element in its corresponding waveguide core 20.

35. As discussed, LCD systems utilizing LEDs embedded in waveguide material were well known in the art prior to the July 29, 2007, priority date of the ’705 Patent. For example, Fine discloses that “light source 12” is “embedded” in the

“waveguide material” of Fine’s display apparatuses. Fine, 11:50-52, 12:66-67, 13:66-67, 14:10-12, 14:45-48, Figs. 1a, 1b, 2a, 2b. Fine also discloses that “[l]ight source 12 can be a LED.” Fine, 13:24. And Fine discloses that “[t]here are several advantages for embedding the light source within the waveguide material,” including “when the light source is a light emitting diode.” Fine, 12:66-13:23.

36. In my opinion, a person of ordinary skill in the art would have been motivated to use the teachings and techniques described within Fine to improve the display in Zhou. Zhou is directed to improving “flat-panel displays (FPDs)” (including “liquid crystal displays (LCDs)”) that “use[] a backlight for illumination.” Zhou, 1:20-33. For example, Zhou seeks to improve the “light extraction efficiency” of such displays. Zhou, 4:33-36, 1:31-45. As noted by Zhou, in such displays, using waveguides coupled to LEDs is a means of spreading out and mixing the bright light from a small intense source or sources (LEDs) to a large lower brightness source (the display). Zhou, 2:8-23. Fine is similarly directed to improvements to “known LED based backlight devices,” including so as to deliver “superior properties” with respect to “brightness, intensity and/or color profiles.” Fine, 4:50–59, 5:2-10. And Fine states that its teachings “can be incorporated in a passive display device,” such as a “liquid crystal display (LCD)” that employs a “backlight assembly.” Fine, 5:22-23, 3:37-52. Fine specifically states that a goal of its invention “to provide

substantially uniform illumination,” which Fine notes is “particularly useful when ... incorporated in a backlight unit of a passive display device.” Fine, 16:31-38.

37. As such, in my opinion, a person of ordinary skill in the art would have been motivated to use the teachings and techniques described within Fine with respect to embedding LEDs in waveguide material to improve at least the “light extraction efficiency” sought in Zhou. Zhou, 4:33-36. Indeed, Fine teaches that “embedding” LEDs in a waveguide “allows to efficiently collect the emitted light” from the LEDs (among other “several advantages”). Fine, 12:6-13:23. And Fine also teaches that a display apparatus according to its invention will “provide substantially uniform illumination.” Fine, 16:31-38. And Zhou is specifically concerned with achieving improved “uniformity.” Zhou, 3:10-15, 4:33-36. In my opinion, a person of ordinary skill in the art would thus have recognized that the combination of Fine’s teachings with Zhou’s display system is simply the use of a known solution described in Fine (embedding LEDs in waveguide material) to modify a similar system in Zhou, and for this reason would expect a successful combination.

VI. Johnson in View of Zhou, Fine, and the Knowledge of a Person of Ordinary Skill in the Art Renders Obvious Substitute Claims 35–48

38. In my opinion, a person of ordinary skill in the art would have recognized that each element of Substitute Claims 35–48 was obvious in view of Johnson, Zhou, Fine, and the knowledge of a person of ordinary skill in the art.

39. As discussed in more detail in my prior declaration, Johnson discloses “an LED-based backlight for a liquid-crystal display (LCD).” Johnson, 1:7-9. Johnson teaches that the “[b]acklight assembly 10 provides light to an LCD stack,” which, in my opinion, a person of ordinary skill in the art would understand includes or otherwise refers to an LCD panel. Johnson, 2:49-52, Fig. 2. Johnson discloses that the backlight assembly 10 includes a “waveguide 20,” which is “designed to accept light from one or more light sources and uniformly deliver the light to LCD stack 12.” Johnson, 2:64-67, Fig. 2. With respect to such light sources, Johnson discloses that “LED array 16” (consisting of “LEDs 18”) is positioned to emit light into “waveguide 20” through a “first major surface 22,” and that, additionally, a “second LED array 30” (consisting of “LEDs 32”) may be positioned to emit light into “waveguide 20” through one or more “edge surface 28.” Johnson, 3:15-33, 6:9-15; Fig. 2. And Johnson discloses “control system 40,” including “controller 44” and “processor 44b,” that is in electrical communication (via “conductive lines 46”) with LEDs 18 in LED array 16 and LEDs 32 in second LED array 30. Johnson, 3:43-47.

40. Despite these disclosures and teachings in Johnson, I understand Patent Owner contends Johnson does not render obvious the Substitute Claims because “Johnson is silent about multiple waveguide elements.” In my opinion, however, a person of ordinary skill in the art would have at least found it obvious to use a

multiple number of Johnson's waveguides 20 in a modular fashion in a large LCD, including in view of Zhou.

41. Figure 1 of Johnson illustrates one embodiment of Johnson's invention wherein waveguide 20 and LED array 16 are substantially the same planar size as the LCD stack 12. Johnson, 2:49-3:33, Figs. 1-2. As the planar size of the LCD stack increases, however, a person of ordinary skill in the art would have recognized that complications may arise, including with respect to cost and manufacturing for employing a waveguide 20 and LED array 16 of such similar size. For example, one point of failure on the LED array 16 could result in discarding the entire LED array. As an obvious alternative, a person of ordinary skill in the art would have recognized that the individual waveguide 20 and corresponding LED array 16 of Johnson could be used in multiple, modular fashion to achieve the same scaling, including in view of Zhou. Indeed, Zhou teaches that its invention provides for an "inexpensive, simple, energy efficient, high quality" flat-panel display "that can be manufactured in sizes ranging ... to tens of feet." Zhou, 3:35-38.

42. In my opinion, a person of ordinary skill in the art thus would have recognized that the use of multiple waveguide elements (with corresponding LED light sources) in modular fashion in flat-panel displays, as taught in Zhou, was a known solution in designing and constructing flat-panel displays in a range of sizes (e.g., "tens of feet" in size), as described in Zhou, including with respect to the

similar LED-based LCD systems described in Johnson. A person of ordinary skill in the art would also have expected a successful combination of Johnson and Zhou's teachings given Zhou's detailed description of display systems utilizing such modular waveguide cores 20. The basic principles of using a single waveguide or multiple waveguides within the display to mix and spread the light from the LED sources and redirect the light toward the viewer of the display is essentially the same.

43. For example, for an LCD stack 12 four-times as wide as the one exemplified in Figures 1 and 2 of Johnson, a person of ordinary skill in the art would have recognized, including in view of Zhou, that, as an alternative to building and using a waveguide 20 and LED array 16 four-times as wide as the ones exemplified in Figures 1 and 2 of Johnson, four (4) of the waveguides 20 illustrated in Figures 1 and 2 of Johnson as well as four (4) of the LED arrays 16 could be arranged linearly, in modular fashion, similar to Zhou's waveguide cores 20, to achieve the same end. In such an approach, each of the four individual waveguides 20 would itself necessarily have a surface smaller than the surface of the entire LCD stack 12 and likewise only light a portion of the LCD stack 12.

44. Additionally, with respect to the requirement in Substitute Claims 39 and 46 that the claimed LEDs be "embedded" within a surface of each respective waveguide, in my opinion, a person of ordinary skill in the art would have been motivated to embedded Johnson's LEDs (e.g., LEDs 18 in LED array 16) within

Johnson's waveguide 20 in view of Fine. As discussed, Fine discloses "several advantages for embedding the light source within the waveguide material, including," for example, "to efficiently collect the emitted light" from the LEDs. Fine, 12:6-13:23. Efficiently collecting the emitted lighting within the waveguide is achieved since the light from the embedded LEDs will not need to travel through as many optical interfaces where index of refraction mismatches result in a portion of the light getting reflected. As such, in my opinion, a person of ordinary skill in the art would have recognized that the combination is simply the use of a known solution described in Fine to modify a similar system in Johnson, and for this reason would expect a successful combination.

VII. Suzuki in View of Zhou, Fine, and the Knowledge of a Person of Ordinary Skill in the Art Renders Obvious Substitute Claims 35–48

45. In my opinion, a person of ordinary skill in the art would have recognized that each element of Substitute Claims 35–48 was obvious in view of Suzuki, Zhou, Fine, and the knowledge of a person of ordinary skill in the art.

46. As discussed in more detail in my prior declaration, Suzuki discloses a "liquid crystal display 1" comprising "a liquid crystal display panel 2" and a "backlight unit 6" that includes a "light guide 11," which has "LED light sources 15" provided on "light entrance surfaces 12 of the light guide 11." Suzuki, [0024]-[0027], Figs. 1-3. In particular, a "plurality of LED sets" (or "RGBG" sets), each including one red LED, one blue LED, and two green LEDs, are provided in series

on the “light entrance surfaces 12” of the “light guide 11.” Suzuki, [0034]. And Suzuki discloses a “LED driving circuit” in electrical communication with LEDs in Suzuki. Suzuki, [0044]. A person of ordinary skill in the art would have understood that such a “general LED driving circuit” would be in communication with each LED in Suzuki’s “RGBG” sets to supply driving current to each LED, as opposed to leaving some LEDs isolated. Suzuki, [0044].

47. Despite these disclosures and teachings in Suzuki, I understand Patent Owner contends Suzuki does not render obvious the Substitute Claims because “Suzuki is silent about multiple waveguide elements.” In my opinion, however, a person of ordinary skill in the art would have at least found it obvious to use a multiple number of Suzuki’s light guides 11 in a modular fashion in a large LCD, including in view of Zhou.

48. Figures 1-3 of Suzuki illustrate one embodiment of Suzuki’s invention wherein light guide 11 is substantially the same planar size as LCD panel 2. Suzuki, [0024]-[0025], Figs. 1-3. As the planar size of the LCD panel 2 increases, however, a person of ordinary skill in the art would have recognized that complications may arise, including with respect to cost and manufacturing for employing a light guide 11 and LED light sources 15 of such similar size. As an obvious alternative, a person of ordinary skill in the art would have recognized that the individual light guide 11 of Suzuki could be used in multiple, modular fashion to achieve the same scaling,

including in view of Zhou. Indeed, Zhou teaches that its invention provides for an “inexpensive, simple, energy efficient, high quality” flat-panel display “that can be manufactured in sizes ranging ... to tens of feet.” Zhou, 3:35-38.

49. In my opinion, a person of ordinary skill in the art thus would have recognized that the use of multiple waveguide elements (with corresponding LED light sources) in modular fashion in flat-panel displays, as taught in Zhou, was a known solution in designing and constructing large flat-panel displays (e.g., “tens of feet” in size), as described in Zhou, including with respect to the similar LED-based LCD systems described in Suzuki. A person of ordinary skill in the art would also have expected a successful combination of Suzuki and Zhou’s teachings given Zhou’s detailed description of display systems utilizing such modular waveguide cores 20. The basic principles of using a single waveguide or multiple waveguides within the display to mix and spread the light from the LED sources and redirect the light toward the viewer of the display is essentially the same.

50. For example, for an LCD panel 2 four-times as wide as the one exemplified in Figures 1-3 of Suzuki, a person of ordinary skill in the art would have recognized, including in view of Zhou, that, as an alternative to building and using a light guide 11 four-times as wide as the one exemplified in Figures 1-3 of Suzuki, four (4) of the light guides 11 illustrated in Figures 1-3 of Suzuki—as well as four (4) of the corresponding LED light sources 15—could be arranged linearly, in

modular fashion, similar to Zhou's waveguide cores 20, to achieve the same end. In such an approach, each of the four individual light guides 11 would itself necessarily have a surface smaller than the surface of the entire LCD panel 2 and likewise only light a portion of the LCD panel 2.

51. Additionally, with respect to the requirement in Substitute Claims 39 and 46 that the claimed LEDs be "embedded" within a surface of each respective waveguide, in my opinion, a person of ordinary skill in the art would have been motivated to embedded Suzuki's LEDs within Suzuki's light guide 11 in view of Fine. As discussed, Fine discloses "several advantages for embedding the light source within the waveguide material, including," for example, "to provide substantially uniform illumination." Fine, 12:6-13:23, 16:31-38. This stated advantage comports with Suzuki's goal of improving the "uniformity in color and luminance" sought and described in Suzuki. Suzuki, [0042]. As such, in my opinion, a person of ordinary skill in the art would have recognized that the combination is simply the use of a known solution described in Fine to modify a similar system in Suzuki, and for this reason would expect a successful combination.

I hereby declare that statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. Should further information become available to me as this matter proceeds, I may revise my opinions accordingly as necessary. I declare under penalty of perjury that the foregoing Declaration is true and correct.

10/16/2024

Date



Dr. P. Morgan Pattison