

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. 8,177,382
Filing Date: March 11, 2008
Issue Date: May 15, 2012
Title: Apparatus and Methods for Multiplanar Optical Diffusers and Display
Panels for Using the Same

Ex. 1003 – Declaration of P. Morgan Pattison, Ph.D.

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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* Reviews of U.S. Patent No. 8,177,382 (“the ’382 Patent”).

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 claims 1-20 of the ’382 Patent 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.

II. Qualifications

6. My curriculum vitae (“CV”) is attached hereto as Exhibit 1004 and provides an accurate identification of my background and experience.

7. I have over (25) years of experience in the areas of light emitting diodes (LEDs), organic light emitting diodes (OLEDs), lighting, solid state lighting (SSL), displays, lasers, and optoelectronic materials and devices

8. I am the Founder and President of Solid State Lighting Services, Inc. In that capacity, I am responsible for, among other things, providing technical, strategic, and market expertise in the areas of LEDs, OLEDs, lighting, SSL, displays, and optoelectronic materials and devices. I am also involved in connecting optical device technical performance with application requirements for displays, general illumination, color discrimination applications (medical, retail), and various novel lighting applications enabled by SSL technology.

9. From January 2006 through November 2007, I worked as a Project Manager at the U.S. Department of Energy (DOE). In that capacity, I was responsible for managing DOE funded research and development projects in SSL, including LED and OLED lighting technologies. My duties included managing the solicitation and selection of R&D projects with the objective of saving energy. As part of the solicitation and selection process, I evaluated and identified priority

areas of research necessary for advancement of SSL in terms of efficiency, lighting performance, and cost.

10. From September 2000 through January 2006, I was a Graduate Student Researcher at University of California Santa Barbara (UCSB). I performed my Doctoral thesis research under Professor Shuji Nakamura (Nobel Prize in Physics 2014) on gallium-nitride (GaN) based micro-cavity light emitting diodes. The research included: epitaxial structure design and growth by MOCVD, semiconductor process development, materials characterization, and electro-optical device characterization. While at UCSB, I participated in additional areas of research, including research and development of UV LEDs, vertical cavity surface emitting lasers (VCSEL), and edge emitting laser diodes.

11. From November 1996 through May 2000, I worked as a Laser Test Engineer at Cymer Laser. I was responsible for testing and developing test methodology for production and prototype KrF and ArF excimer lasers used in deep UV photolithography for manufacturing of advanced semiconductor products. Testing included optical characterization and full system troubleshooting. I also developed new electrical and optical test methodologies to improve test cycle times, automated test procedures, and developed test documentation.

12. I earned a Ph.D. in Materials Science, Electronic and Photonic Materials from the USCBA in 2006. As stated above, my graduate work focused on

development of Fabrication and Characterization of Gallium Nitride Based Micro-Cavity LEDs. I obtained a Master's Degree in Electrical Engineering, Electronics and Photonics from UCSB in 2003, and I obtained a Bachelor's Degree in Electrical Engineering, Electronic Devices and Materials from UC San Diego in 1996.

13. I am listed as an inventor on at least 11 issued patents, including multiple patents in the field of LED materials and device design, LED lighting product design, and home automation and controls for lighting.

14. I have authored numerous peer reviewed journal articles and publications on the topics of LED materials and device design.

15. Since 2008, I have also authored annually updated R&D and technology and manufacturing roadmaps used by the DOE to guide federal lighting R&D efforts. I frequently give presentations and talks on the topic of LED technology, SSL status and R&D opportunities, and application advancements enabled by LED technology.

III. Summary of Legal Issues

16. I am not a lawyer. Thus, in expressing my opinions and considering the subject matter of the claims of the '382 Patent, I am relying upon certain legal principles that counsel has explained to me.

A. Obviousness

17. First, I understand that for an invention claimed in a patent to be found patentable, it must be, among other things, new and not obvious from what was known before the invention was made.

18. I understand the information that is used to evaluate whether an invention is new and not obvious is generally referred to as “prior art” and generally includes patents and printed publications (e.g., books, articles, product manuals, company publications, etc.).

19. I understand that in this proceeding the Petitioner, Hisense has the burden of proving that the claims of the patents-at-issue are obvious in view of the prior art by a preponderance of the evidence. I understand that “a preponderance of the evidence” is evidence sufficient to show that a fact is more likely true than it is not true.

20. I understand that in this proceeding, the information that may be evaluated is limited to patents and printed publications. My analysis below compares the claims to patents and printed publications that I understand are prior art to the patents-at-issue.

21. I have been informed and understand that a claim is obvious in light of the prior art if the difference or differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been

obvious, at the time the invention was made, to a person having ordinary skill in the art. I have been informed and understand that the Supreme Court provided an outline for analyzing obviousness in which it rejected an earlier test in favor of an “expansive and flexible approach” using “common sense.” I have also been informed and understand that the Supreme Court explained that under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed. I have also been informed and understand that the Supreme Court explained that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” I further have been informed and understand that the Court pointed to other factors that may show obviousness. These factors included the following principles:

- a. combination that unites old elements with no change in their respective functions is unpatentable. As a result, the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results,
- b. a predictable variation of a work in the same or a different field of endeavor is likely obvious if a person of ordinary skill would be able to implement the variation,

- c. an invention is obvious if it is the use of a known technique to improve a similar device in the same way, unless the actual application of the technique would have been beyond the skill of the person of ordinary skill in the art. In this case, a key inquiry is whether the improvement is more than the predictable use of prior art elements according to their established functions,
- d. an invention is obvious if there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims,
- e. inventions that were “obvious to try” — chosen from a finite number of identified, predictable solutions, with a reasonable expectation of success — are likely obvious,
- f. known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art, and
- g. an explicit teaching, suggestion, or motivation in the art to combine references, while not a requirement for a finding of obviousness, remains “a helpful insight” in determining upon which a finding of obviousness may be based.

B. Claim Construction

22. I have been informed and understand that in an *inter partes* review claim terms are construed according to their ordinary and customary meaning as understood by one of ordinary skill in the art in view of the specification and the prosecution history of the patent.

C. Level of Skill in the Art

23. I am informed and understand that a person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the alleged invention. I am informed and understand that factors that may be considered in determining the level of ordinary skill in the art may include: (A) the type of problems encountered in the art; (B) prior art solutions to those problems; (C) the rapidity with which innovations are made; (D) the sophistication of the technology; and (E) the educational level of active workers in the field

IV. The '382 Patent

24. The '382 Patent is entitled "Apparatus and methods for multiplanar optical diffusers and display panels for using the same" and was filed on March 11, 2008. I am informed that the earliest claimed priority date of the '382 Patent is March 11, 2008. I am informed that each of the prior art references I address herein was available prior to March 11, 2008, thus I have not analyzed whether each claim of the '382 Patent is entitled to that priority date.

A. Person of Ordinary Skill in the Art of the '382 Patent

25. The field of the '382 Patent relates to LED based back-lighting panels for displays, *See* '382 Patent, 1:7-9, 14-15.

26. I am informed and understand that in a corresponding litigation, the Petitioner, Hisense has argued that as of April 21, 2006, a person of ordinary skill in the art “would have had at least a graduate degree in mechanical engineering, physics, materials science, electrical engineering, or a related discipline, coupled with at least four years’ experience in designing backlighting systems for displays; the level of ordinary skill in the art is approximate and additional education could make up for a lack of experience or vice-versa.”

27. I am informed and understand that in a corresponding litigation, the Patent Owner, Brightplus has argued that as of April 21, 2006, a person of ordinary skill in the art “would possess the following qualifications: (a) A Bachelor 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 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.”

28. In my opinion, a person with any of these levels of skill in the art would find the claims of the '382 Patent to be obvious in view of the prior art

discussed here. Further, as I explain above, I have the relevant educational background and I have worked in the technical area of the '382 Patent for many years. As of March 11, 2008, which I understand to be the time of the alleged invention, I was a person of ordinary skill in the art under either level.

B. Construction of Claim Terms of the '382 Patent

29. As explained in further detail below, under any reasonable construction, the claims are obvious in view of the prior art I address herein. Thus, I do not separately offer an opinion with respect to the proper construction of the terms of the claims of the '382 Patent.

V. Materials Considered

30. In forming my opinions, in addition to my knowledge and experience, I have considered the following documents and things that I have obtained, or that have been provided to me:

Exhibit	Description
1001	U.S. Patent No. 8,177,382 (“the '382 Patent”)
1002	Prosecution History of U.S. Patent No. 8,177,382
1005	JP 2007-329016 to Kobayashi (“Kobayashi”)
1006	Certified Translation of Kobayashi
1007	US 2007/0103908 to Tabito <i>et al.</i> (“Tabito”)
1008	US 2006/0050198 to Kirita <i>et al.</i> (“Kirita”)
1009	US 2005/0243551 to Onishi <i>et al.</i> (“Onishi”)
1010	US 2005/0024754 to Epstein <i>et al.</i> (“Epstein”)
1011	WO 2008/025909 to Schiavoni <i>et al.</i> (“Schiavoni”)
1012	Certified Translation of Schiavoni
1013	US 2002/0071288 to Lim (“Lim”)

31. 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 LED and display technology, as described above and in my *curriculum vitae* (Ex. 1004).

VI. State of the Art as of March 11, 2008.

A. General Display Technology Background

32. By 2008 liquid crystal display (LCD) technology and the supporting backlighting technology were well understood. Liquid crystal displays require a light to illuminate color filters within liquid crystal shutters that create an image. In this timeframe the backlight light source technology had transitioned from mostly cold cathode fluorescent to light emitting diode (LED) technology. Edge emitting arrangements and direct backlighting arrangements of the light source technologies were both described in publicly available references, exemplified by the references described below. The different lighting arrangements engendered different performance, cost, efficiency, and display panel thickness trade-offs. Each had similar general challenges that differed in the details of the solution, but the optical concepts and techniques to solve the challenges were similar.

33. Within the backlighting module various optical components were combined to condition the light from the light source to light suitable for optimized backlighting of the liquid crystals to achieve desired display performance. As

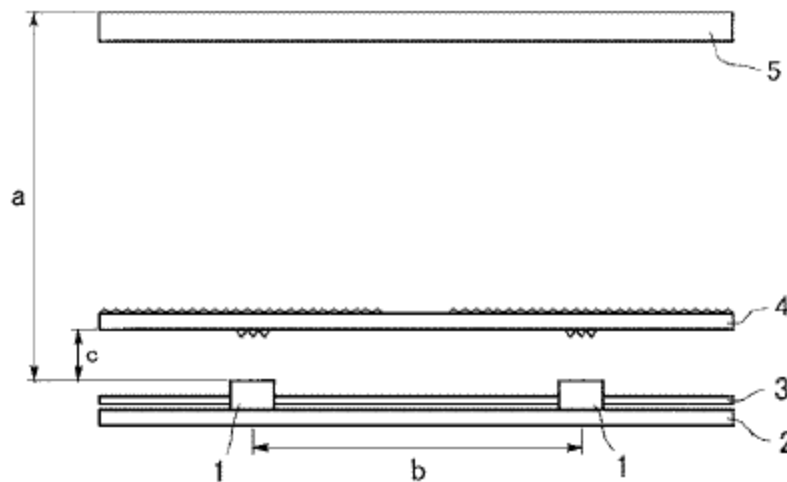
described in the following references, backlight modules (or units) could have multiple diffusers, collimators (referred to as brightness enhancing films), and reflective elements and components. These various components were often off-the-shelf components and the optical features in these components consisted of well understood techniques to provide the desired performance. Conventional optical understanding was used to determine the relationships between the various components because, within the backlighting module, each optical interface would induce reflection and refraction according to basic principles of optics. Optical elements and components could be combined, much like combining multiple simple lenses to create a compound lens with performance based on the relationship of the two simple lenses. Standard optical engineering understanding was necessary to integrate the various optical elements to achieve desired performance.

34. Within the backlight module desired performance would be a combination of efficiency, cost, thickness, and display performance aspects which include brightness, color gamut, viewing angle, and uniformity. So, display engineers made various combinations of known optical elements to achieve the desired balance of these performance aspects.

B. Kobayashi

35. I am informed that Kobayashi is prior art to the '382 Patent.

Kobayashi describes “a backlight unit for display devices and LED is used as a light source”. Kobayashi at Abstract. Kobayashi describes “at least two diffusing plates 4 and 5 arranged on the light emitting side of the LED1” Kobayashi, [0018]. Kobayashi further discloses a specific ratio, i.e., a function, between a “distance from the surface of the LED 1 to the lensed diffusing plate 4” and a “distance between the center of two adjacent LEDs 1.” Kobayashi, [0019] and [0020]:

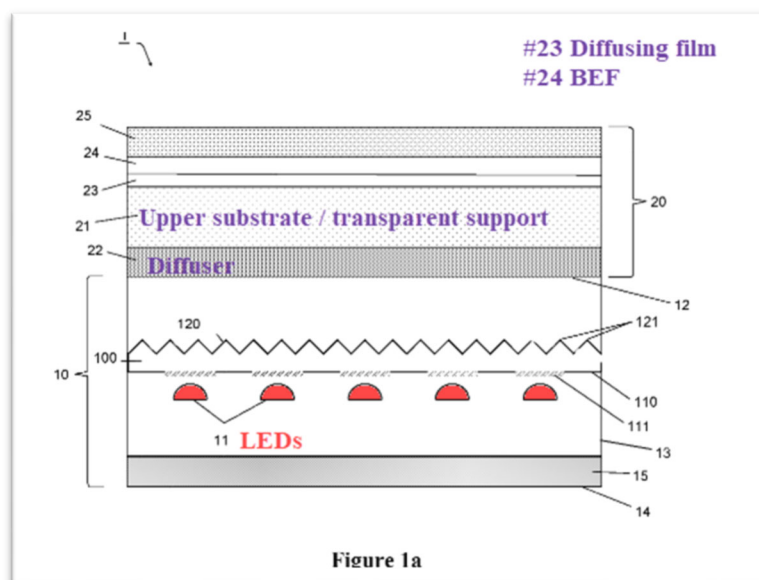


Kobayashi at Fig. 1.

C. Schiavoni

36. I am informed that Schiavoni is prior art to the '382 Patent. Schiavoni describes “an optical system (100) for a lighting device having one or more sources (11) of visible and/or ultraviolet radiation which consist of light-emitting diodes, especially for backlighting a liquid-crystal display screen[.]” Schiavoni at Abstract.

Schiavoni describes at least two diffusion planes. “[A] first substantially planar optical element (100) transparent to said radiation and intended to be installed between said sources and a substantially planar diffuser [22] that makes the normal luminance uniform, the first optical element being approximately parallel to the diffuser and being capable of contributing to making the normal luminance output by the diffuser uniform.” Schiavoni at Abstract. Schiavoni makes clear that the first optical element 100 and the planar diffuser both include diffusing layers. *See, e.g.,* Schiavoni at p. 17.

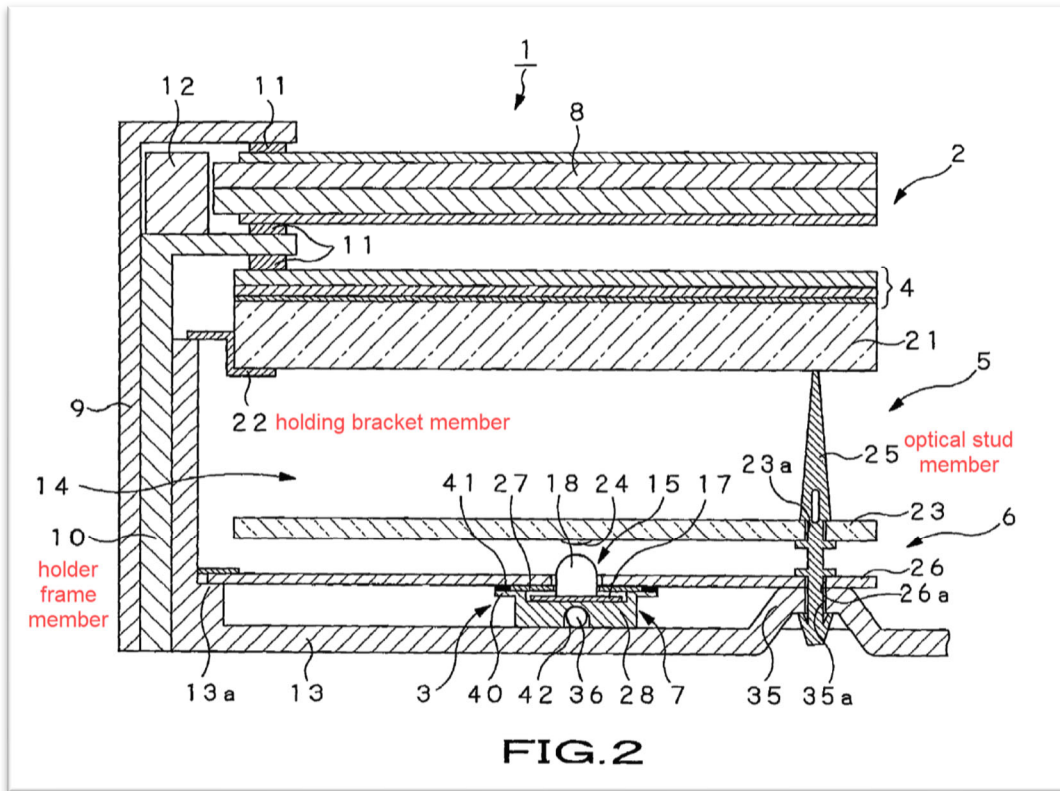


Schiavoni at Fig. 1a (annotated).

D. Tabito

37. I am informed that Tabito is prior art to the '382 Patent. Tabito discloses a LED backlit light transmitting LCD with a reflecting plate 26, diffusing plate 23, light diffusing conducting plate 21, and optical converting section 4 being

supported by optical stud members 25, holder frame member 10, and holding bracket member 22. *See* Tabito, [0081]; Fig. 2.

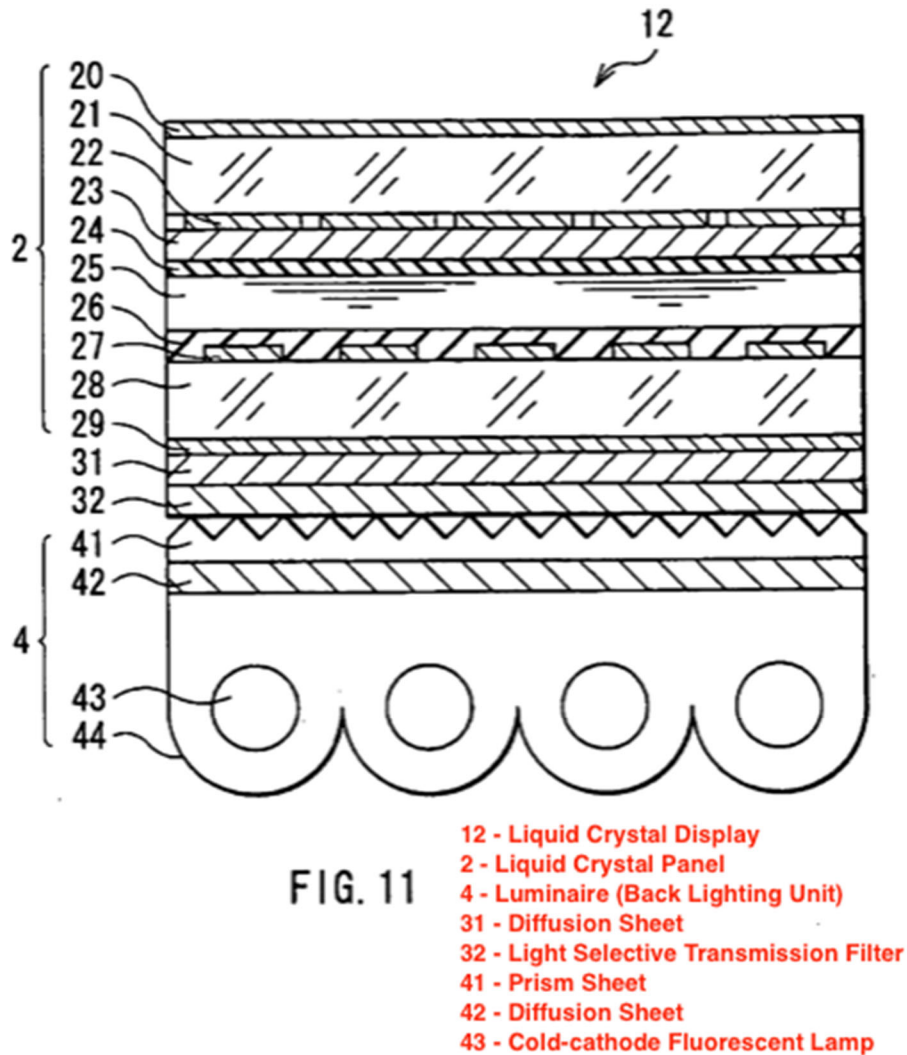


Tabito, Fig. 2 (annotated).

E. Kirita

38. I am informed that Kirita is prior art to the '382 Patent. Kirita discloses a light source arranged by a liquid crystal panel (Kirita, [0003]) that may use LED light sources (Kirita, [0010]) transmitting from a luminaire to a light selective transmission filter 32 and diffusion sheet 31 between prism sheet 41 and the liquid crystal panel 2, where the light selection transmission filter allows select

wavelengths of light (colors) to pass from the luminaire 4 through the liquid crystal panel 2. Kirita, [0075]. This is shown in annotated Figure 11, below.



Kirita, Fig. 11 (annotated).

F. Onishi

39. I am informed that Onishi is prior art to the '382 Patent. Onishi discloses extrusion molding structures on the diffuser plate that can be “used for a

direct type lighting system having a plurality of light sources.” Onishi, [0057] (“Since the light diffusion plate has the parallel principal planes, it is also appropriate for a continuous molding such as an extrusion molding.”). Further, given these extrusion structures are convexoconcave, they comprise both extrusion peaks and grooves. Onishi, [0221].

G. Epstein

40. I am informed that Epstein is prior art to the '382 Patent. Epstein disclose that the refractive diffuser comprises a plurality of crossed linear prismatic lenselets. *See* Epstein, [0213] (“Examples 24 through 29 are examples of films having a plurality of pyramidal prisms.”); [0214] (“prisms 1640 are symmetric, isosceles prisms having straight face verbatims in both the XZ and YZ planes. Each prism 1640 has a first face 1641, a second face 1642, a third face 1643 and a fourth face 1644. The four faces meet at apex 1645.”); [0215] (“Example 25 in FIG. 30A, prisms 1740 are symmetrical, four sided prisms having curved or arced faces in both the XZ and YZ planes.”).

H. Lim

41. I am informed that Lim is prior art to the '382 Patent. Lim discloses a relationship “between a diffusion plate and a lamp in accordance with the distance between lamps having the same visible angle.” Lim, [0057]. Lim acknowledges that “the farther the interval between the lamps realizing the same color is, the

longer the interval between the lamp and the diffusion plate is. Lim, [0058]. “[A]s shown in FIG. 4B, [of Lim] the closer the interval between the lamps is, the narrower the interval between the lamp and diffusion plate.” Lim, [0059].

VII. The Prior Art Renders Every Element of Claims 1-20 of the ’382 Patent Obvious.

42. In the analysis below I break down the elements of claims 1-2, 4, and 7-20 of the ’382 Patent and demonstrate that each of these elements were known in the art before the March 11, 2008, priority date of the ’382 Patent.

A. Display Backlighting Panels Using a Plurality of Solid State Lighting Devices were Known in the Art (Claims 1A, 13A, 17A, 17B)

43. The claims of the ’382 Patent all relate to display backlighting panels that rely on a plurality of solid state lighting devices to provide light. These types of backlighting panels were known in the art.

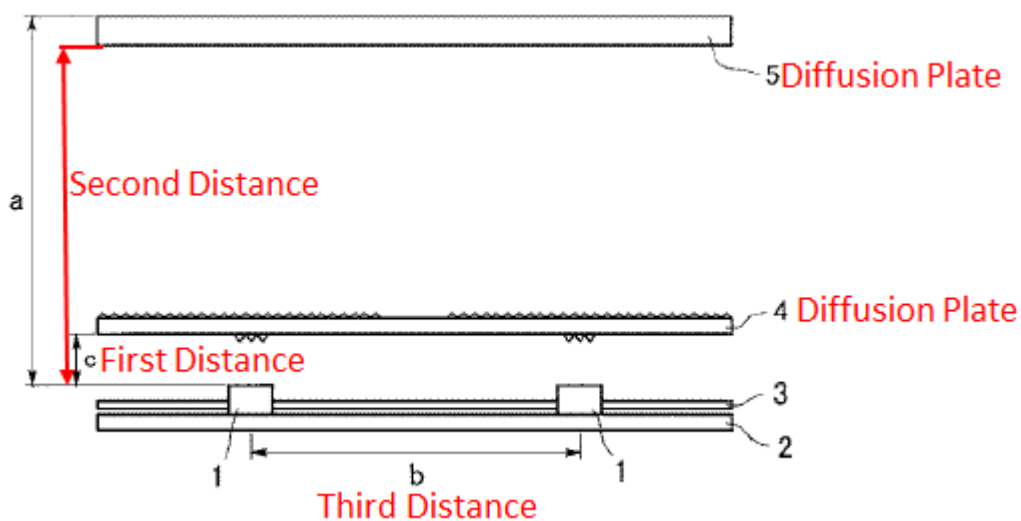
44. For example, Kobayashi describes “a backlight unit for a display device and in which an LED is used as a light source.” Kobayashi at Abstract. LED(s) are solid state lighting devices. Kobayashi describes using a “plurality of LEDs 1 ... arranged in equal spacings on a base 2.” Kobayashi at Abstract. Figure 1 also shows two LEDs.

Schiavoni, Fig. 1a (annotated).

B. Multiplane Light Diffusers Positioned Above Solid State Light Emitters and Including Two Diffusion Planes at Different Distances from the Solid State Light Emitters were Known in the Art (Claims 1B, 1C, 1D, 12A, 12B, 12C, 13B, 13C, 17C, 17D)

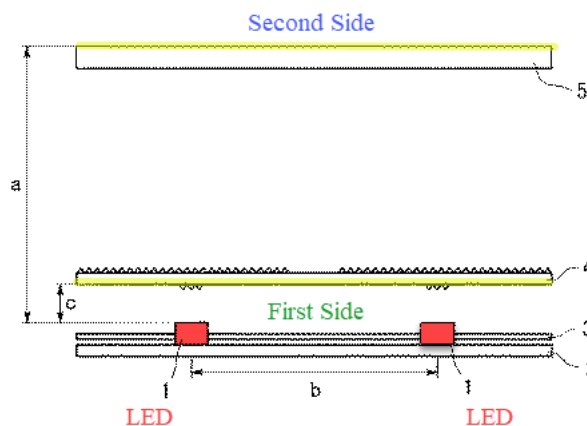
46. The claims of the '382 Patent further require a multiplane light diffuser that has two different diffusion planes each placed above one another and thus at different distances from the solid state light emitters. Such multi-plane light diffusers were known in the art.

47. Kobayashi describes two diffusion planes. Kobayashi, [0018]. Each diffuser plate 4 and 5 is a diffusion plane and they are each at different distances from the plurality of LEDs. Diffuser plate 4 is a “first plane” and diffuser plate 5 is a “second plane” of a multiplane light diffuser. The distances of the diffuser plates 4 and 5 from the plurality of LEDs 1 are “c” and “a” respectively as shown in Figure 1 below, and they are different distances.



Kobayashi at Fig. 1 (annotated)

48. Kobayashi discloses a diffuser plate 4 which is a “first plane” and diffuser plate 5 which is a “second plane” of a multiplane light diffuser. The first and second planes are configured to diffuse and transmit light. *See* Kobayashi, Abstract. Kobayashi’s diffuser plate 4, i.e., the “first plane”, has a first side that is configured to receive light from the LEDs. *See* Kobayashi, [0047] and Fig. 1. Kobayashi’s diffusion plate 5, i.e., the “second plane,” has a second side that is configured to transmit diffused light. *See* Kobayashi, Abstract, and annotated FIG. below.



Kobayashi at Fig. 1 (annotated).

49. Kobayashi’s diffusion plate 4 has a first side, the side closest to LEDs 1, as shown below, and as discussed above, the diffusion plate 4 defines a diffusion plane. *See* Kobayashi at Abstract (“a diffusing plate 4 with a lens having a total

light transmittance of 80 to 98% and a light diffusivity of 0.5 to 30% is placed on the side close to the LED”).

50. Similarly, Schiavoni describes a multiplane light diffuser that includes “a first substantially planar optical element (100) transparent to said radiation and intended to be installed between said sources and a substantially planar diffuser [22] that makes the normal luminance uniform....” Schiavoni at Abstract.

Schiavoni makes clear that the first optical element 100 and the planar diffuser 22 both include diffusing layers. *See, e.g.*, Schiavoni at p. 1 (“The first optical element is usually a rigid diffuser intended to homogenize the normal luminance”); Schiavoni at p. 17 (“The diffusing layer 22, 111 is deposited by any technique known to those skilled in the art, such as by screen printing, by coating with a paint, by dip-coating, by spin-coating, by spraying, or by flow-coating.”). These diffusing layers are shown in Figure 1a:

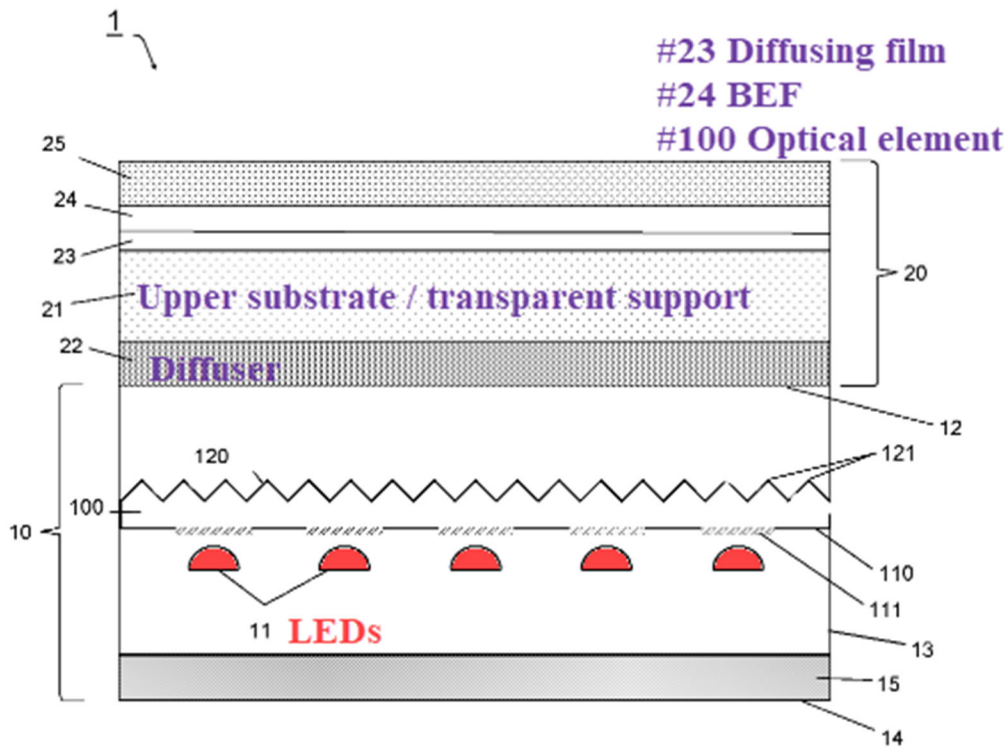


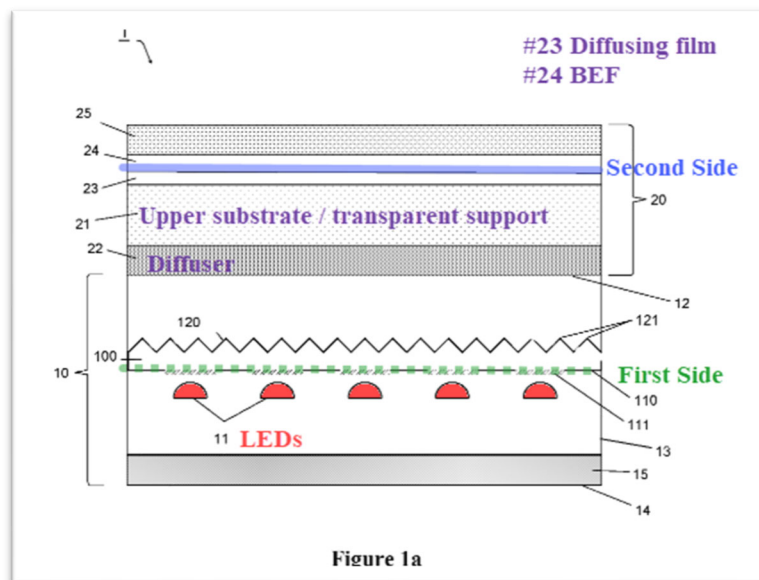
Figure 1a

Schiavoni, Fig. 1a (annotated).

51. As shown above, optical element 100 and substantially planer diffuser 22 are different distances from the LEDs. Schiavoni describes that “a first optical element 100 is placed between the sources 11 and the rigid diffuser 21,” and that rigid diffuser 21 is “formed of a transparent support 21 preferably made of glass and a diffusing layer 22, ... arranged on the lower face (side of the enclosure) or top of the substrate 21, these two elements 21, 22 making it possible to homogenize the light.” Schiavoni, 15-16.

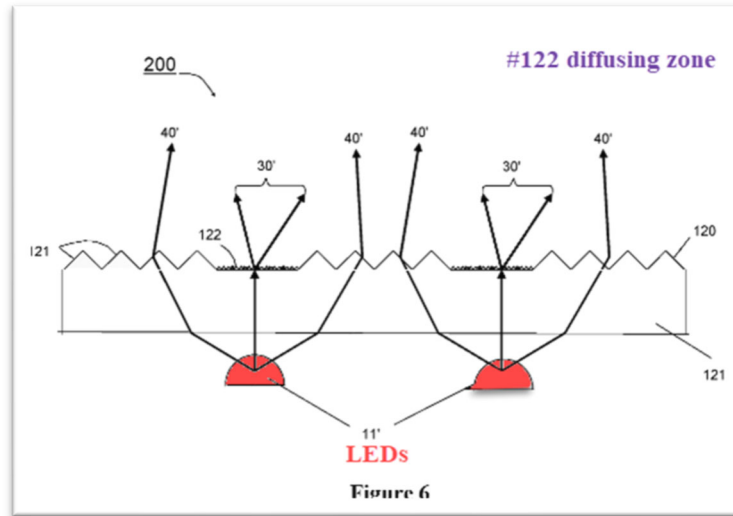
52. Optical element 100 comprises a first side corresponding to a first plane configured to receive light from the plurality of LEDs and that diffusing

layer 22 comprises a second side corresponding to a second plane that is configured to transmit diffused light. *See, e.g.*, Schiavoni at 16 (“The diffusing layer 22, 111 can comprise a binder and diffusing particles, whose nature of the material and their volume make it possible to let the wavelengths of the visible domain pass while diffusing the light.”).



Schiavoni at Fig. 1a (annotated).

53. The substantially planar optical element 100 comprises a diffuser plate 111 that includes the first side of the multiplane light diffuser. *See, e.g.*, Schiavoni at 16 (“The diffusing layer 22, 111 can comprise a binder and diffusing particles, whose nature of the material and their volume make it possible to let the wavelengths of the visible domain pass while diffusing the light.”). The diffuser plate 111 comprises a first side 110 with the diffuser plate 111 defining the first diffusion plane. *See* Schiavoni, Figs. 1a and 6.



Schiavoni at Fig. 6 (annotated).

C. Determining the Spacing Between the Solid State Light Emitters and a First Diffusion Plane of the Multi-Plane Diffuser (a “First Distance”) As a Function of the Distance Between the Solid State Light Emitters (a “Third Distance”) was Known in the Art (Claim 1E, 13F, 17G)

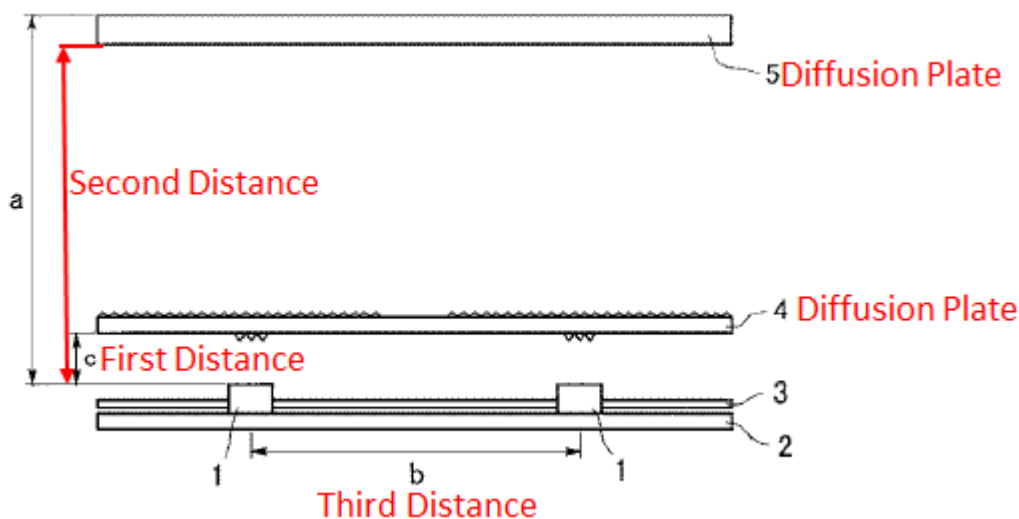
54. The claims of the '382 Patent further require a “first distance” as the distance between the solid state lighting elements and a first diffusion plane and a “third distance” that is the distance between the solid state light emitting elements. The claims further require that “the first distance is a function of the third distance.” The claims do not define this “function.” It was known as of the priority date of the '382 Patent that the distance between lighting elements and a diffuser plate is related to the distance between the lighting elements. A person of ordinary skill in the art would recognize this relationship, because the ideal backlight

appears as a uniform light rather than a group of points of light. Such a relationship was also disclosed throughout the prior art.

55. Kobayashi defines the following three distances in [0019]:

a	“the distance from the surface of the LED 1 to the light emitting surface of the diffusing plate at the most exiting side”
b	“distance between the center of two adjacent LEDs 1”
c	“distance from the surface of the LED 1 to the lensed diffusing plate 4”

These distances are also shown graphically in Figure 1 below:



Kobayashi at Fig. 1 (annotated).

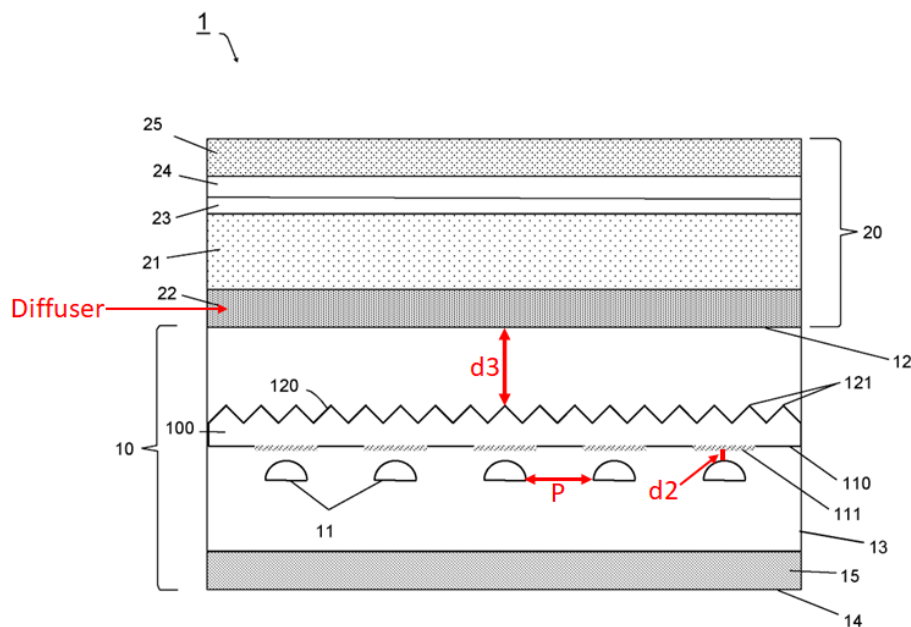
56. Thus, Kobayashi describes (1) that c is the first distance, (2) that distance a minus the thickness of diffusion plate 5 is the second distance, and (3) that b is the third distance as recited by the claims of the '382 Patent. Kobayashi further describes that the “ratio of c / b is preferably in the range of 2×10^{-3} to 0.4.” Kobayashi at [0020]. Thus, Kobayashi describes the distance c from the LEDs to the first diffusion plane divided by the distance between adjacent LEDs b

is preferably equal to a value between 0.002 and 0.4, which according to basic algebraic properties means that c is preferably equal to distance b multiplied by a value between 0.002 and 0.4. Thus, Kobayashi teaches that distance c (the first distance) is a function of distance b (the third distance).

57. Similar to Kobayashi, Schiavoni defines the following four distances:

h1	Plastic/glass substrate, about 3mm thick with grooves, “the prism type with a triangular section ... of height h1” Schiavoni at 16.
d2	“The distance d2 between the sources 11 and the optical system 100” Schiavoni at 16.
d3	“The distance d3 between the optical system 100 and the diffuser 21” Schiavoni at 16.
P	“spacing P between said lit extended source and another adjacent extended source or between said lit row and an adjacent row of point sources” Schiavoni at 23.

These distances are also shown graphically in Figure 1a below.



Schiavoni at Fig. 1a (annotated).

58. Thus, as described by Schiavoni, the third distance is P, the spacing between the light sources. Schiavoni at 23. The first distance is d2, “[t]he distance ... between the sources 11 and the optical system 100.” Schiavoni at 16. Schiavoni thus describes the spacing, P, between the optical sources and further describes the distance d2 between the optical sources and the optical system 100. Schiavoni does not directly disclose a relationship between these distances, but Schiavoni in combination with Lim describes that “the first distance [d2] is a function of the third distance [P].”

59. Lim further discloses a relationship “between a diffusion plate and a lamp in accordance with the distance between lamps having the same visible angle.” Lim, [0057]. Lim acknowledges that “the farther the interval between the lamps realizing the same color is, the longer the interval between the lamp and the diffusion plate is. Lim, [0058]. Additionally, “as shown in FIG. 4B, the closer the interval between the lamps is, the narrower the interval between the lamp and diffusion plate.” Lim, [0059].

FIG.4A

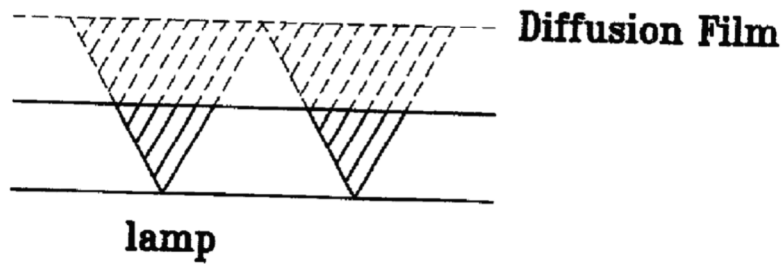
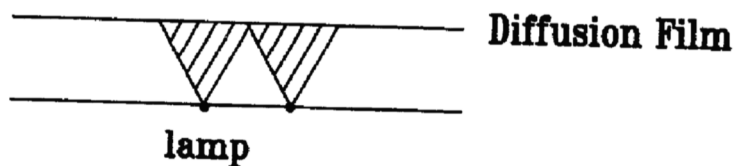


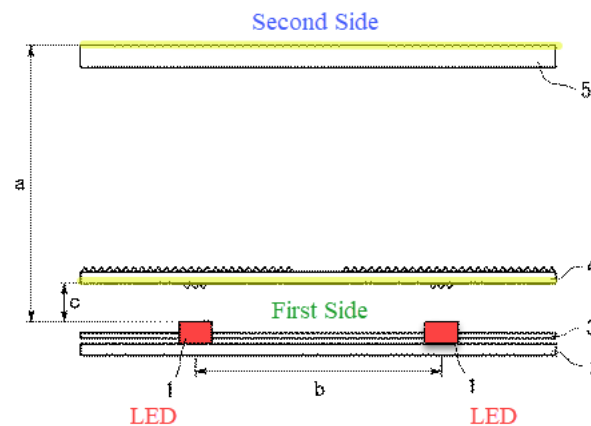
FIG.4B



Lim at Figs. 4A-4B. A person of ordinary skill in the art would have been motivated to modify the spacing shown in Schiavoni to use the express relationship Lim describes between the distance separation of individual LEDs and the distance to the diffusion plate. Doing so would be nothing more than positioning components that are already expressly described in Schiavoni according to a relationship that is described in Lim.

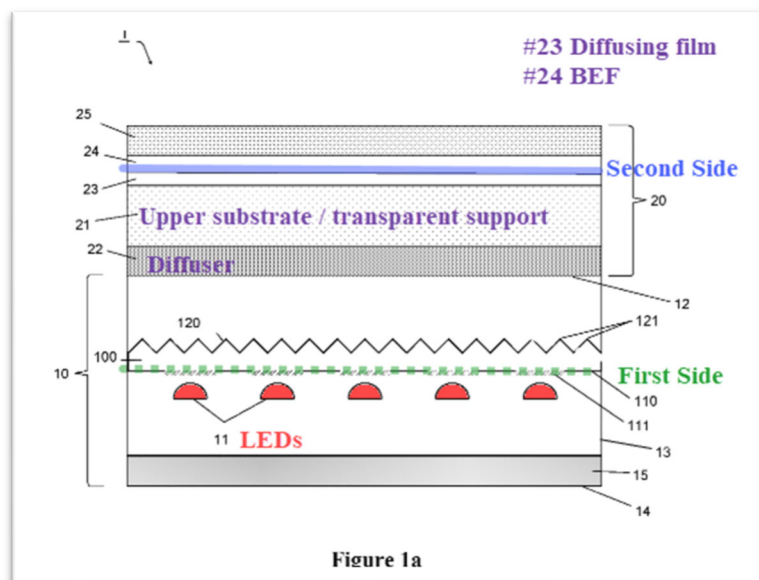
D. A Multiplane Light Diffuser Comprising a Diffuser Sheet on the Second Side of the Multiplane Light Diffuser and Positioned a Second Distance from the Solid State Light Emitters was Known in the Art (Claim 2).

60. Kobayashi describes a diffuser plate 5 which is a “second plane” of a multiplane light diffuser and the second plane is positioned a second distance (a minus the thickness of the diffusion plate 5) from the LEDs. *See* Kobayashi, [0019]. Kobayashi further describes that a “diffusion film” may be included on the diffuser plate 5. Kobayashi, [0043] (“backlight unit of the present invention may further be used with a diffusion film, a prism condensing film, a reflective polarizing film, a printed sheet such as a dial plate, a liquid crystal panel or the like placed on the diffusing plate 5.”). The diffusion film comprises a diffuser sheet and defines a second diffusion plane of the multiplane light diffuser.



Kobayashi at Fig. 1 (annotated)

61. Similarly, Schiavoni describes a diffusing layer 22 that is supported by glass substrate 21. *See* Schiavoni at p. 20 (“The glass substrate 21 is thus used as a support substrate for the diffusing layer 22....”); p. 26 (“comprises above the diffuser possibly a diffusing film 23”). As shown below, the diffusing layer 22 contains a second side of the multiplane light diffuser and is a second distance from the plurality of LEDs.



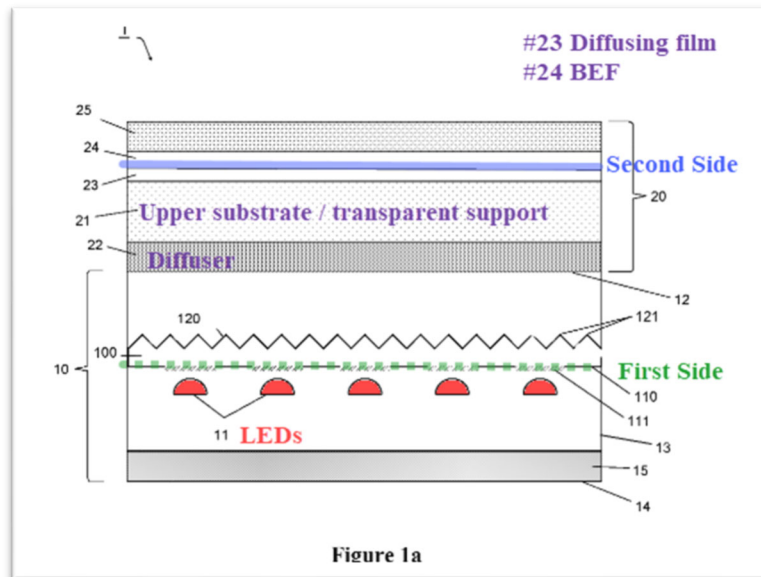
Schiavoni at Fig. 1a (annotated).

E. A Diffuser Sheet Comprising a Diffuser Film, a Brightness Enhancing Film, a Polarizing Film and a Substantially Clear Plate Configured to Support the Diffuser Film, the Brightness Enhancing Film, the Polarizing Film was Known in the Art (Claim 7)

62. Kobayashi discloses that its diffuser sheet may be comprised of “a diffusing film, prism collection film, reflective polarizing film, printed sheet such as a letter plate, liquid crystal panel, etc., on the diffusing plate 5.” Kobayashi,

[0044]. Since these films are “on the diffusing plate 5,” the diffusing plate 5 supports them, and the diffusing plate 5 is a substantially clear plate. *See* Kobayashi, [0031] (“at least two diffusing plates made of a thermoplastic transparent resin mixed with a light diffusing agent”). A person of ordinary skill in the art would recognize that the “prism collection film” is a brightness enhancing film.

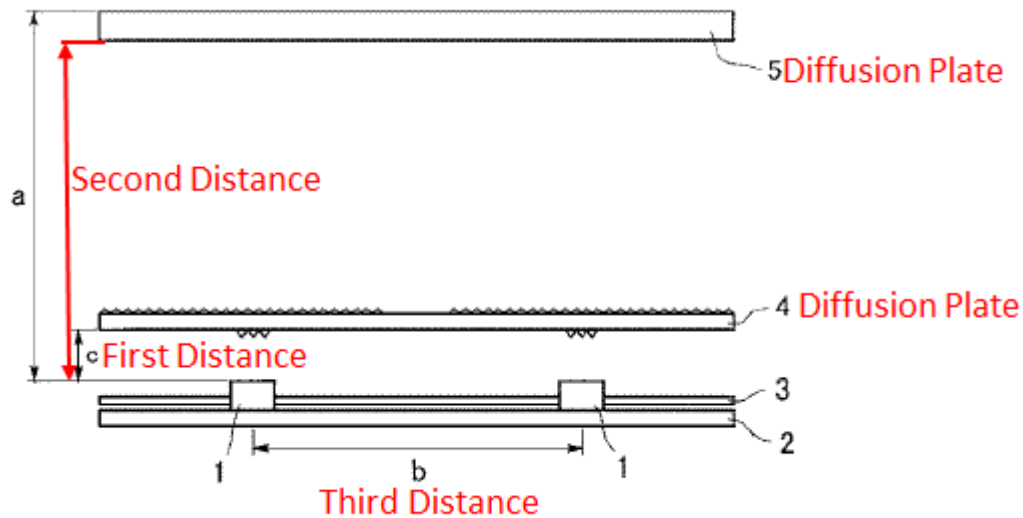
63. Schiavoni describes optical structure 20 where a diffuser is “formed of a transparent support 21 preferably made of glass and a diffusing layer 22” with diffusing film 23 on the diffuser. Schiavoni at 15. Schiavoni additionally notes that “the diffusing structure further comprises, after the diffuser, an element for redirecting the light towards the normal to the substrate, of the ‘BEF’ type (‘Brightness Enhancing Film’)... And, preferably, it also comprises a reflective polarizer placed on the ‘BEF’ type element.” Schiavoni at 13. This is illustrated below.



Schiavoni at Fig. 1a. (annotated).

F. It was Known in the Art for the First Distance Between the Solid State Light Emitters and a First Diffusion Plane to be Approximately One Half the Third Distance Between Adjacent Solid State Light Emitters (Claim 8)

64. Kobayashi discloses a third distance b “between the center of two adjacent LEDs 1” and a first distance c “from the surface of the LED 1 to the lensed diffusing plate 4.” Kobayashi, [0019]. Kobayashi further discloses that the first distance (i.e., c) “is 0.1 mm *or more*” and that the third distance (i.e., b) is “10 to 100 mm.” Kobayashi, [0020]. As shown in the figure below, c is measured from the LEDs to the bottom of the diffusion plate 4.



Kobayashi at Fig. 1 (annotated). Kobayashi further discloses that “[t]he thickness of the diffusing plate 4 with lenses is preferably in the range of 0.5 to 8.0 mm, including the lens top.” Kobayashi, [0038].

65. Kobayashi discloses or suggests that to a person of ordinary skill in the art that the first distance is approximately one half the third distance. Kobayashi describes that the first distance is “is 0.1 mm *or more*” while the third distance is “10 to 100 mm.” Kobayashi, [0020]. Thus, Kobayashi makes clear that the first distance could be more than 0.1 mm, including up to 5 mm, which would be approximately one half of a third distance of 10 mm.

66. In addition, Kobayashi discloses that the thickness of “diffusing plate 4 with lenses is preferably in the range of 0.5 to 8.0 mm, including the lens top.” Kobayashi, [0038]. A person of ordinary skill in the art would recognize that if the

first distance were measured to the top of the lens, then the first distance would be approximately one half the third distance.

67. Further, as required by this claim, “the first distance comprises approximately one half the third distance,” means that the ratios of the first distance to the third distance is 0.5. Kobayashi teaches that “[t]he ratio of c/b is preferably in the range of 2×10^{-3} to 0.4.” Kobayashi, [0020]. Kobayashi does not teach an adverse affect of the ratio between c/b being greater than 0.4, but Kobayashi does teach that a smaller ratio, e.g., “[l]ess than 2×10^{-3} is undesirable because the eye-catching lamp image is unlikely to disappear, causing uneven brightness, which is not preferable.” Kobayashi, [0020].

68. From each of these teachings, a person of ordinary skill in the art would understand that Kobayashi teaches a first distance that comprises approximately one half the third distance, i.e., that the ratio of c/b would comprise approximately 0.5.

69. Similarly, Lim discloses that the first distance of 5mm is one half the third distance of 10mm. Lim, [0047] (“a distance between the respective lamps or chips is designed to be within 10 mm, inclusive, and another distance between an LED lamp (or chip) and a diffusion plate is designed to be within 5 mm, inclusive.”).

G. It was Known in the Art for the Second Distance Between the Solid State Light Emitters and the Second Diffusion Plane to Comprises a Distance in a Range Between the Third Distance and 1.5 times the Third Distance (Claim 9)

70. Kobayashi discloses that a , is “10 mm or more” and the third distance, b , is “10 to 100 mm.” Kobayashi, [0020]. When both a and b are 10 mm, then $a/b=1$. In such an embodiment the third distance is almost exactly the same as the second distance (a minus the thickness of the diffusion plate 5). Further Kobayashi describes that “the ratio of a/b is preferably in the range of 0.2 to 1.0.” To the extent the use of “between” does not encompass the third distance, a person of ordinary skill in the art would have been motivated to make this distance slightly larger to be between the third distance and 1.5 times the third distance.

71. A person of ordinary skill in the art would have understood that as the LEDs are closer together their emission profiles will overlap creating a more uniform emission pattern, but more LEDs will be used adding to cost. With closer spacing of the LEDs the secondary diffuser can be closer as well since less optical mixing is necessary in the space between the first and second diffuser plates. The relationship of the spacings will also depend on the specific types of diffusers used. Considering cost, emission uniformity, and thickness a person of ordinary skill in the art would be motivated to explore different distances of the multiple diffuser arrangement. In addition, LEDs could have different emission profiles influencing the relationship between the emitted LED light and the effect and

disposition of the diffusers. That these distances between components were interrelated was well-known in the art, and the choice of a specific combinations of distances was nothing more than a design choice with predictable outcomes.

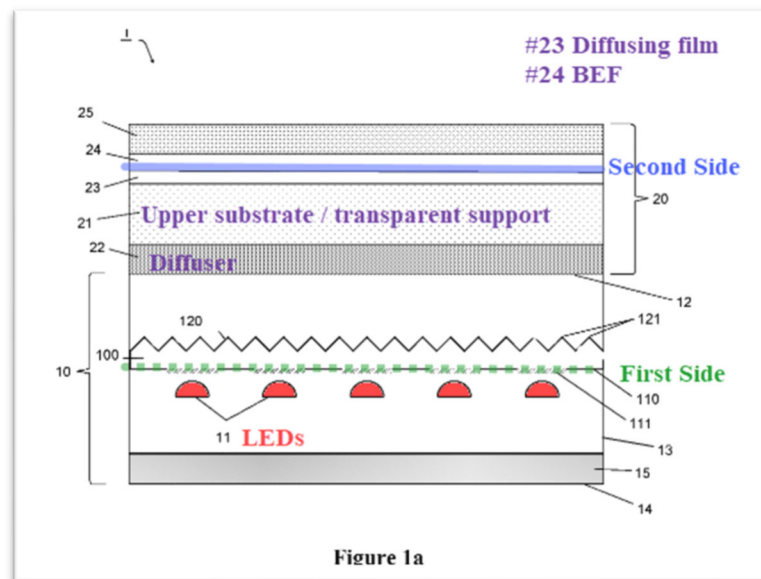
H. Means for Transmitting First Diffused Light from the First Diffusion Plane to the Second Diffusion Plane were Known in the Art (Claims 11, 13D, 13E)

72. The '382 Patent explains and discloses the use of supports and side walls to maintain a gap 160 that is used as a means to transmit light from the first plane to the second plane. *See* '382 Patent, Col. 7, ll. 30-34. The '382 patent does not disclose any other means that could supply this claim element.

73. Like the '382 Patent, Kobayashi also discloses a gap for transmitting first diffused light from the first diffusion plane, diffusing plate 4, to the second diffusion plane, diffusing plate 5. First diffused light is supplied from the “diffuser near the LED [which] is a diffuser with a lens having a total light transmittance of 80 to 98%, a light diffusivity of 0.5 to 30%,” while the “diffuser plate on the side farther than the LED has a total light transmittance of 40 to 80%.” Kobayashi, [0032]. Further, Kobayashi describes that “when each of the diffusion plates 4 and 5 is configured as a set, a plurality of the diffusion plates 4 and 5 may be used in an overlapping manner....” Kobayashi, [0042].

74. Schiavoni discloses light transmitting from the LEDs through the first diffusion plane. Schiavoni at 3. Schiavoni discloses transmitting first diffused light

from the first diffusion plane (light emitted from optical element 100) to the second diffusion plane (i.e. the transparent support and the diffusing layer 22). *See e.g.*, Fig. 1a.



Schiavoni at Fig. 1a. (annotated).

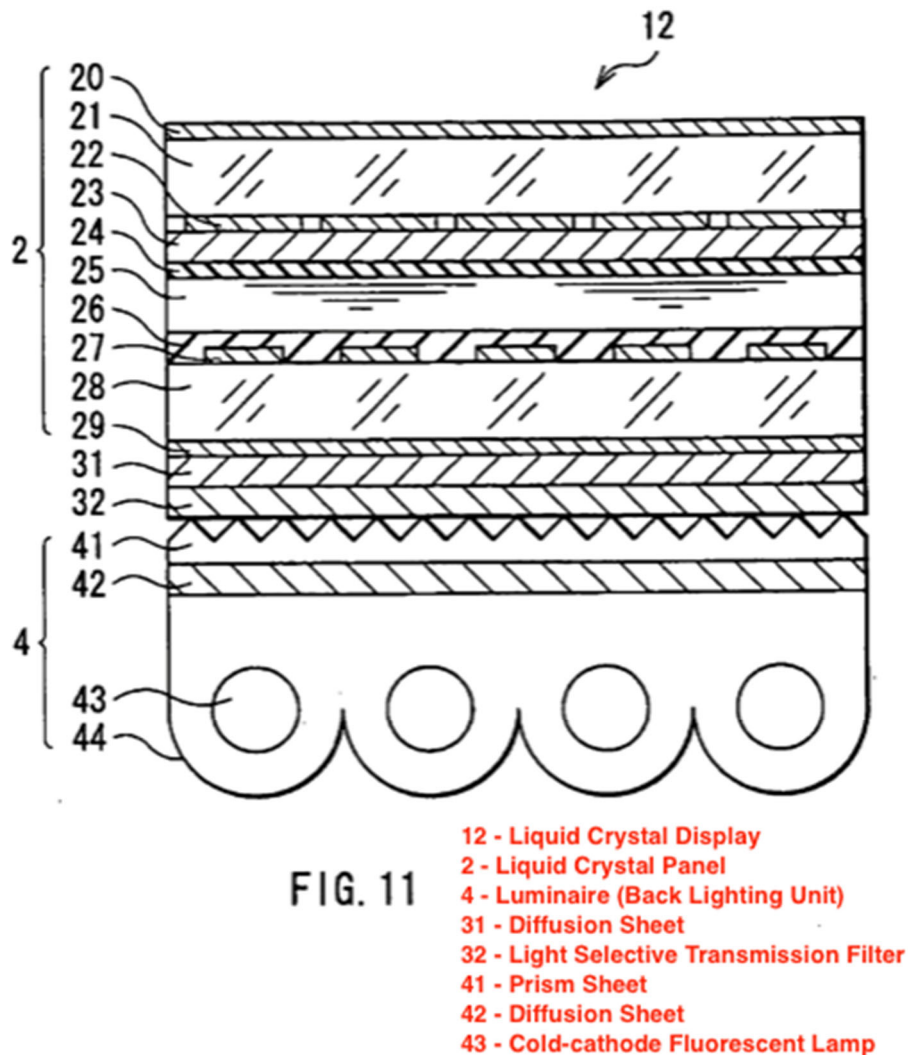
I. A Multiplane Light Diffuser Comprising a Diffuser Sheet that is Supported by A Substantially Transparent Sheet or a Second Diffuser Plate was Known in the Art (Claims 14 and 15)

75. Kobayashi discloses that the diffuser sheet may be comprised of “a diffusing film, prism collection film, reflective polarizing film, printed sheet such as a letter plate, liquid crystal panel, etc., on the diffusing plate 5.” Kobayashi, [0044]. Since these films are “on the diffusing plate 5,” the diffusing plate 5 supports them, and the diffusing plate 5 is transparent. *See* Kobayashi, [0031] (“at least two diffusing plates made of a thermoplastic transparent resin mixed with a light diffusing agent”).

76. Schiavoni describes a diffusing layer 22 that is supported by glass substrate 21. *See* Schiavoni at 20 (“The glass substrate 21 is thus used as a support substrate for the diffusing layer 22....”). Further, Schiavoni describes the glass substrate as “a transparent support 21 preferably made of glass and a diffusing layer 22” with diffusing film 23 on the diffuser. Schiavoni at 15.

J. A Diffuser Plate Comprising a Light Filter Color and Transmitting Scattered Diffusion Light from a Plate Including a Light Filter Color was Known in the Art (Claims 10 & 16)

77. The claims of the '382 Patent Kirita discloses LED light sources (Kirita, [0010]) transmitting from a luminaire to a light selective transmission filter 32 and diffusion sheet 31 between prism sheet 41 and the liquid crystal panel 2, where the light selection transmission filter allows select wavelengths of light (colors) to pass from the luminaire 4 through the liquid crystal panel 2. Kirita, [0075] (“Next, among the light emitted from the luminaire 4, light in the specific wavelength regions based on the wavelength selective transmission characteristics is selectively transmitted and emitted to the liquid crystal panel 2 by the light selective transmission filter 32.”); [0072] (“By arranging the light selective transmission filter 32 formed as above between the luminaire 4 and the diffusion sheet 31 shown in FIG. 4, the liquid crystal display 1 of this embodiment can be manufactured.”). This is shown in annotated Figure 11, below.

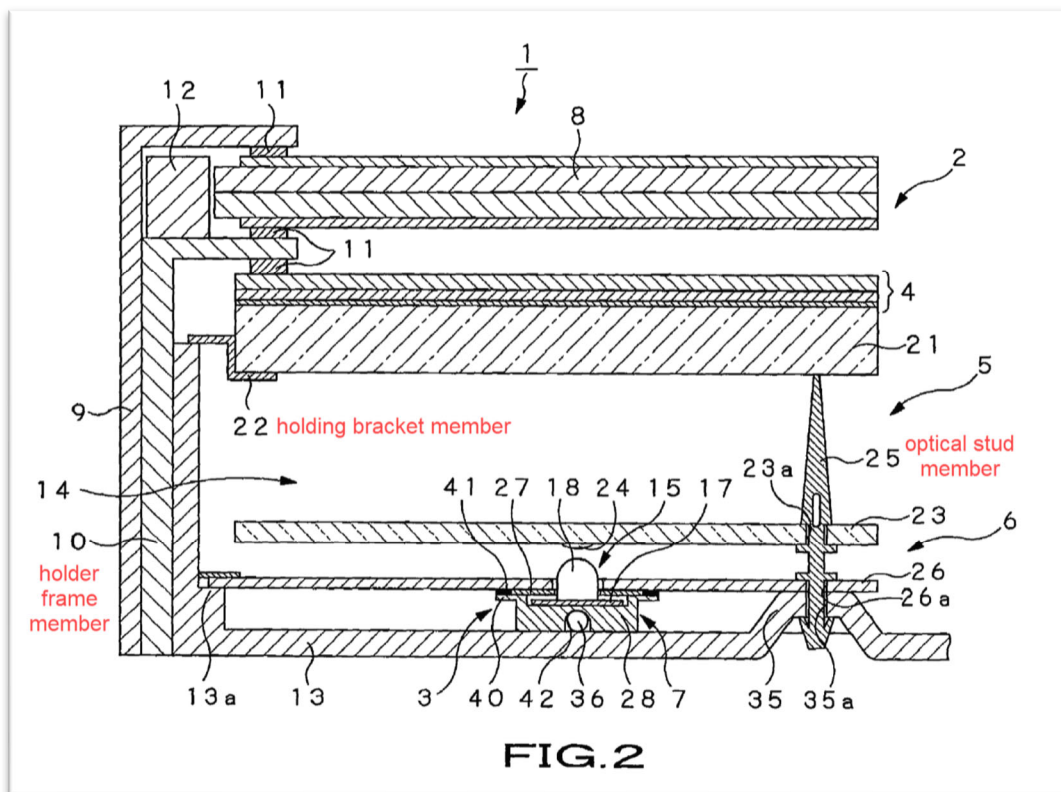


Kirita, Fig. 11 (annotated).

K. Diffuser Supports Comprising “a Proximal End that is Configured to be Positioned Proximate the Plurality of Solid State Light Emitters; and a Distal End that is Configured to Support the Diffuser Sheet” were Known in the Art (Claims 4A, 4B, 5, 6, 17E)

78. Tabito discloses a light transmitting LCD with a reflecting plate 26, diffusing plate 23, light diffusing conducting plate 21, and optical converting

section 4 being supported by optical stud members 25, holder frame member 10, and holding bracket member 22. *See* Tabito, [0081]; Fig. 2



Tabito, Fig. 2 (annotated). The optical stud members are diffuser supports. *See, e.g.*, Tabito, [0090] (“The light diffusing plate 23 is then assembled to each optical stud member 25 by fitting the light diffusing plate at the fitting holes 23a from the distal end 25h.”).

79. Tabito describes that “each optical stud member 25 is made up by a shaft-shaped base part 25a, a fitting part 25b, formed to the distal end of the shaft-shaped base part 25a, a flange-shaped first receiving plate part 25c, formed as one with the lateral surface of the shaft-shaped base part 25a, with a preset spacing

from the fitting part 25b, and a flange-shaped second receiving plate part 25d, formed as one with the lateral surface of the shaft-shaped base part 25a, with a preset spacing from the first receiving plate part 25c.” Tabito, [0084]. The wider portion of base which is closest to the receiving plate 25d is a proximal end and is positioned proximate to the LEDs.

80. Tabito describes the distal end 25h of the optical stud member 25 supporting numerous functional optical sheets. Tabito, [0092] (“The light diffusing conducting plate 21, comprised of a laminate of functional optical sheets, is assembled to the distal end 25h of each optical stud member 25, with the bottom side of the light diffusing conducting plate 21 abutting against the distal end 25.”).

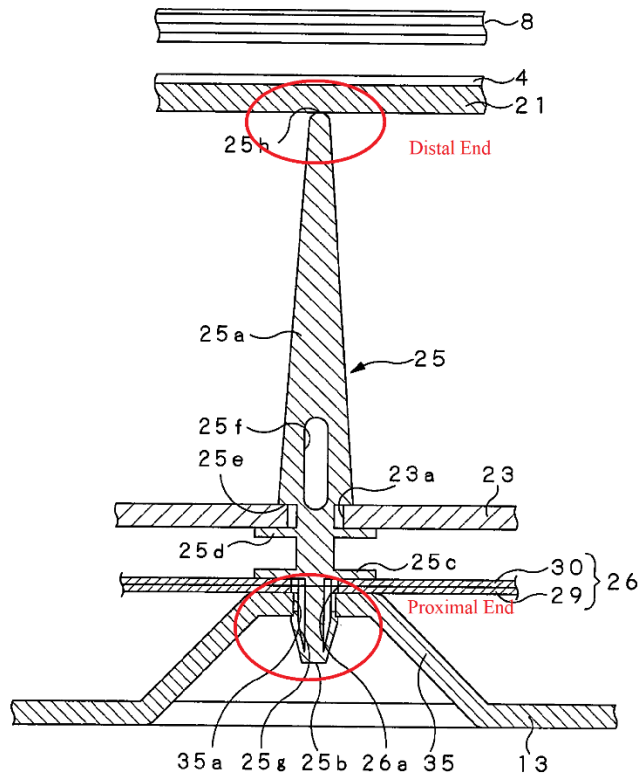


FIG. 6

Tabito, Fig. 6. Tabito shows holes 23a in its diffuser plate 23, which are configured to receive the plurality of diffuser supports. See Tabito, [0082]. Tabito further describes step 25d in the optical stud members 25.

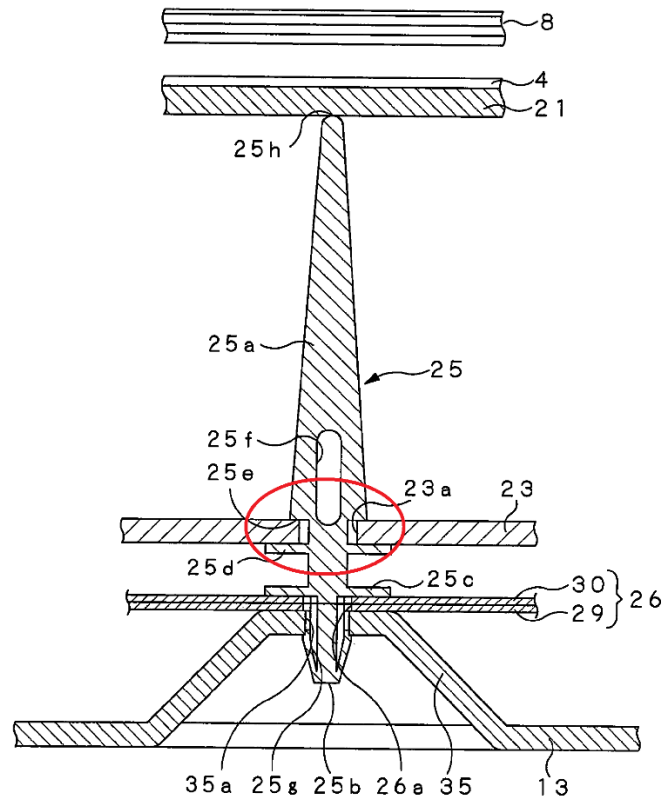


FIG. 6

Tabito, Fig. 6 (annotated).

L. LCD Panels Receiving the Diffused Light from the Multiplane Diffuser and Selectively Transmitting the Received Light as Display Content were Known in the Art (Claim 17F)

81. Kobayashi is designed as a backlight unit for display devices. *See, e.g.,* Kobayashi, Abstract (“This is a backlight unit for display devices, and LED is used as a light source to provide a unit that reduces the eye-catching lamp image.”).

82. LCD displays were well-known in the art and expressly disclosed by Tabito. *See, e.g.,* Tabito, Abstract (“Disclosed is a light transmitting liquid crystal

display apparatus used with advantage with a television receiver having a large-sized display not less than 30 inch. A backlight section (3) sending out illuminating light is formed by a plural number of rows made up of many light emitting units (15) arranged on the back Surface of a liquid crystal display panel (8).”). Schiavoni discloses an LCD Panel was known in the art. Schiavoni, p. 1 (“On direct lighting screens, the light sources, placed inside the lighting device, illuminate in a direction substantially perpendicular to the LCD screen”).

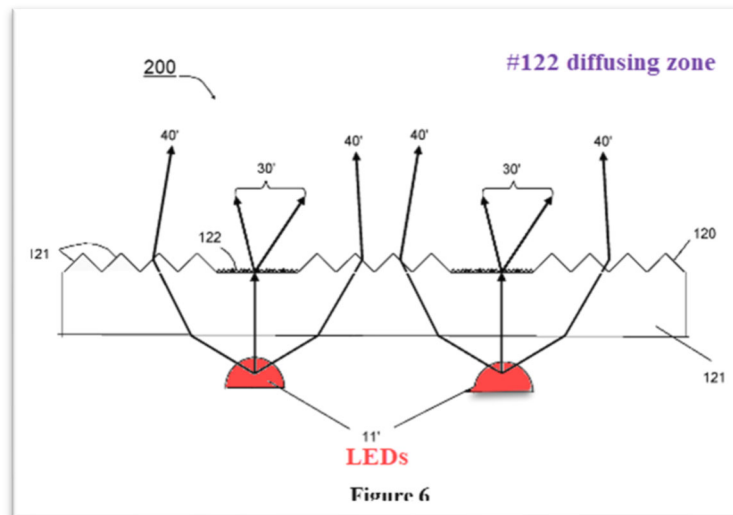
83. An LCD display is configured to receive the second diffused light and selectively transmit received light as display content. The claim here is simply describing the normal operations of an LCD display as would have been understood by a person of ordinary skill in the art at the time.

M. The Diffuser Plate Comprises a Structured Refractive Diffuser that Includes a Plurality of Extrusion Peaks that are Divided by a Plurality of Extrusion Grooves were Known in the Art (Claim 18)

84. Kobayashi discloses that the “diffuser plate 4 with a lens has a lens shape on at least one surface, and such lens shapes include a general concave / convex R lens shape, prism shape, pyramid shape, saddle lens shape, Fresnel lens shape, and moth-eye lens shape.” Kobayashi, [0034]. Further, the “method for applying the lens shape to the diffusing plate 4 is preferably ... an extrusion method.” Kobayashi, [0036].

85. In discussing optical element 100, 200, Schiavoni notes that the planar and structured sections could have different refractive indexes, indicating optical element 100, 200 is refractive. Schiavoni at 7 (“[i]f two elements are used, the second element may preferentially be a refractive index material[.]”).

86. Additionally, Schiavoni discloses a structured diffuser with both “an elongated pattern (two-dimensional, “2D”) in particular a prism” and “a three-dimensional pattern (“3D”) hollow or in relief, in particular of the pyramidal type,” Schiavoni at 7, where the “repeated pattern can be over the entire associated main face or only in areas preferably offset with respect to the sources. In the area or areas, the elongated elements can be essentially contiguous.” Schiavoni at 9.

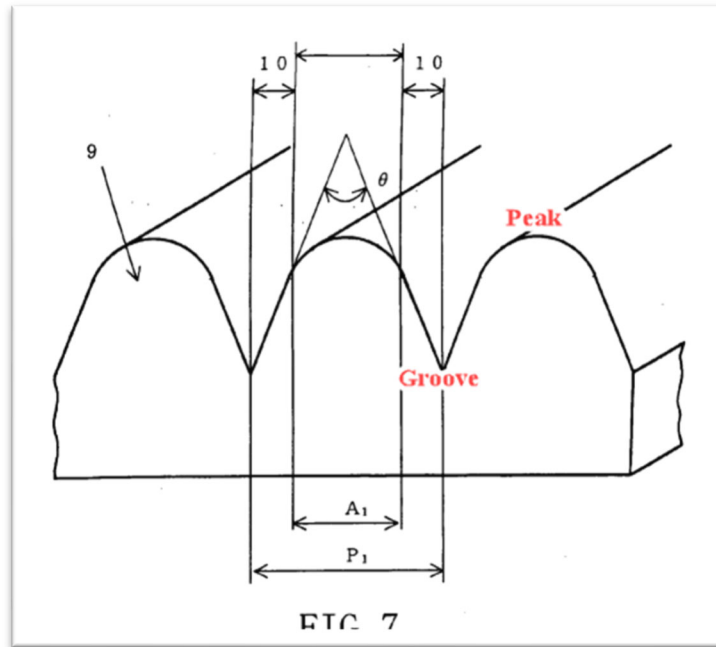


Schiavoni at Fig. 6 (annotated).

87. Onishi discloses extrusion molding structures on the diffuser plate. Onishi, [0057] (“Since the light diffusion plate has the parallel principal planes, it

is also appropriate for a continuous molding such as an extrusion molding.”).

Further, given these extrusion structures are convexoconcave, they comprise both extrusion peaks and grooves created by the peaks and grooves in the cutting die. *See, e.g.,* Onishi, [0221] (“Firstly, in order to mold a prism plane composed of a prism portion having an apex angle 40 degrees and flat portions disposed equally between each prism portion by a ratio of 30% to the whole plane and a convexoconcave portion formed of prism having an apex angle 140 degrees, respectively, a die having a plurality of grooves corresponding to each prism shape is manufactured by cutting work. Where, the plurality of grooves provided at intervals of 50 μm . The surface shape of the die manufactured by cutting work is formed of symmetry corresponding to the prism shape. The depth of the symmetric grooves is fixed in the plane”). Extrusion peaks and grooves are further illustrated in Figure 7.



Onishi at Fig. 7 (annotated).

N. The Extrusion Peaks Including a Peak Angle in a Range of About 120 Degrees to 170 Degrees were Known in the Art (Claim 20)

88. Onishi discloses convexoconcave extrusion structures with apex angles of 140°. (“Next, ... To mold a prism plane composed of a prism portion having an apex angle 40 degrees and flat portions disposed equally between each prism portion by a ratio of 30% to the whole plane and a convexoconcave portion formed of prism having *an apex angle 140 degrees...*”).

O. The Structured Refractive Diffuser Comprising a Plurality of Crossed Linear Prismatic Lenselets was Known in the Art (Claim 19)

89. Kobayashi discloses that the “diffuser plate 4 with a lens has a lens shape on at least one surface, and such lens shapes include a general concave /

convex R lens shape, prism shape, pyramid shape, saddle lens shape, Fresnel lens shape, and moth-eye lens shape.” Kobayashi, [0034].

90. Similarly, Schiavoni describes that its system includes a structured refractive diffuser, explaining “The system 100 consists of a plastic or preferably a glass substrate, 3 mm thick. Its upper face 120 is texturized, for example by printing a laminated glass, to obtain the grooves 121 of the prism type with a triangular section, with an apex angle of preferably 90° , of height h_1 equal to 1 mm for example.” Schiavoni, p. 16.

91. Neither Kobayashi nor Schiavoni expressly disclose that the refractive diffuser comprises a plurality of crossed linear prismatic lenselets, but such a shape is disclosed in Epstein. *See* Epstein, [0213] (“Examples 24 through 29 are examples of films having a plurality of pyramidal prisms.”); [0214] (“prisms 1640 are symmetric, isosceles prisms having straight face verbatims in both the XZ and YZ planes. Each prism 1640 has a first face 1641, a second face 1642, a third face 1643 and a fourth face 1644. The four faces meet at apex 1645.”); [0215] (“Example 25 in FIG. 30A, prisms 1740 are symmetrical, four sided prisms having curved or arced faces in both the XZ and YZ planes.”).

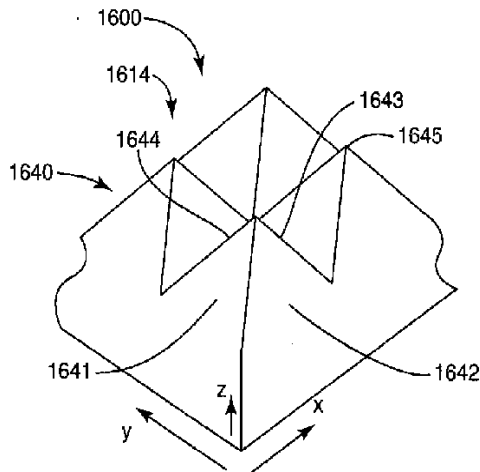


Fig. 29A

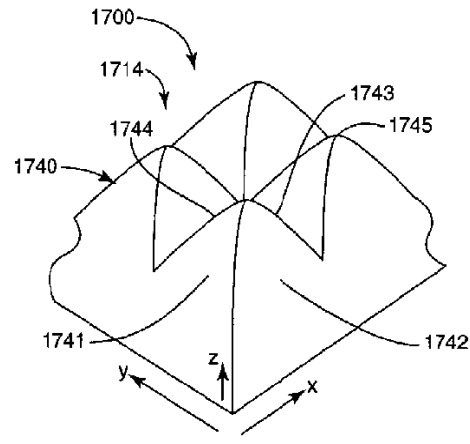


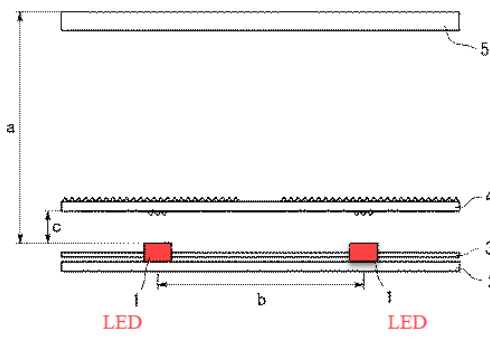
Fig. 30A

Epstein, Fig. 29A & 30A

VIII. Kobayashi Renders Obvious to a Person of Ordinary Skill in the Art Claims 1-3, 7, 9, and 11-15 of the '382 Patent.

92. As described above, each element of claims 1-2, 7-9, and 11-15 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have recognized that each element of claims 1-2, 7-9, and 11-15 was obvious in view of Kobayashi.

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
['382 Claim 1 Preamble] A solid state lighting device, comprising:	"a backlight unit for a display device and in which an LED is used as a light source." Kobayashi, Abstract
['382 Claim 1A] a plurality of solid state light emitters that are configured to emit light; and	"Multiple LEDs 1 are placed on the base 2 at equal intervals" Kobayashi, Abstract Fig. 1

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
	
'382 Claim 1B] a multiplane light diffuser including a first diffusion plane that is a first distance from the plurality of solid state emitters and a second diffusion plane that is a second distance from the plurality of solid state emitters that is different from the first distance,	“The backlight of the present invention has a plurality of LEDs 1 as shown in FIG. 1; a base 2 arranged on the back side of the LED 1, at least two diffusing plates 4 and 5 arranged on the light emitting side of the LED 1” Kobayashi, [0018]; Fig. 1.
['382 Claim 1C] the multiplane light diffuser including first side that corresponds to the first plane and that is configured to receive the light emitted from the plurality of solid state light emitters and a second side that corresponds to the second plane and that	Kobayashi, abstract, [0047]; Fig. 1.

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
is configured to transmit diffused light,	
['382 Claim 1D] wherein the multiplane light diffuser comprises a diffuser plate that includes the first side of the multiplane light, the diffuser plate configured to define the first diffusion plane, and	“a diffusing plate 4 with a lens having a total light transmittance of 80 to 98% and a light diffusivity of 0.5 to 30% is placed on the side close to the LED” Kobayashi, Abstract; Fig. 1.
'382 Claim 1E] wherein the plurality of solid state emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, and wherein the first distance is a function of the third distance.	“Usually, a plurality of LEDs are arranged two-dimensionally on the main surface of the substrate 2 at regular intervals. In the present invention, b is the distance between the center of two adjacent LEDs 1, a is the distance from the surface of the LED 1 to the light emitting surface of the diffusing plate at the most exiting side, and c is the distance from the surface of the LED 1 to the lensed diffusing plate 4” Kobayashi, [0019] Fig. 1
['382 Claim 2] The device of claim 1, wherein the multiplane light diffuser comprises: a diffuser sheet that includes the second side of the multiplane light diffuser and is positioned the second distance from the plurality of solid state	Kobayashi, [0043] “backlight unit of the present invention may further be used with a diffusion film, a prism condensing film, a reflective polarizing film, a printed sheet such as a dial plate, a liquid crystal panel or the like placed on the diffusing plate 5.” Fig. 1

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
light emitters, the diffuser sheet configured to define the second diffusion plane.	
['382 Claim 3] The device of claim 2, wherein the diffuser sheet comprises: a substantially transparent plate; and a diffuser film supported by the substantially transparent plate.	“a diffusing film, prism collection film, reflective polarizing film, printed sheet such as a letter plate, liquid crystal panel, etc., on the diffusing plate 5.” Kobayashi, [0044]. “at least two diffusing plates made of a thermoplastic transparent resin mixed with a light diffusing agent” Kobayashi, [0031]
['382 Claim 7] The device of claim 2, wherein the diffuser sheet comprises a diffuser film, a brightness enhancing film, a polarizing film and a substantially clear plate configured to support the diffuser film, the brightness enhancing film, the polarizing film.	“a diffusing film, prism collection film, reflective polarizing film, printed sheet such as a letter plate, liquid crystal panel, etc., on the diffusing plate 5.” Kobayashi, [0044]. “a diffusing plate 5 with a total light transmittance of 40 to 80%” Kobayashi, Abstract
['382 Claim 9] The device of claim 2, wherein the second distance comprises a	“Preferably, a is 10 mm or more and b is 10 to 100 mm. If a is less than 10 mm, the eye-catching lamp image is unlikely to disappear and is undesirable. In addition, if b is less than 10 mm, the number of LEDs 1 becomes

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
distance in a range between the third distance and 1.5 times the third distance.	excessive, and if b is more than 100 mm, even if the number of diffusing plates 4 with lenses is increased, it is difficult to eliminate luminance unevenness, which is not preferable. Also, the ratio of a/b is preferably in the range of 0.2 to 1.0. If a/b is less than 0.2, the brightness unevenness is unlikely to resolve, and if it exceeds 1.0, the distance from LED 1 to the diffusing plate is sufficient, and it is difficult to demonstrate the superiority of the units of the present invention.” Kobayashi, [0020]
[’382 Claim 11] The device of claim 1, further comprising means for transmitting first diffused light from the first diffusion plane to the second diffusion plane.	“The transmittance of the diffusing plate used in the present invention is 80 to 98% of the total light transmittance of the lensed diffusing plate 4 near the LED 1, and 40 to 80% of the total light transmittance of the diffusing plate 5 on the far side than the LED 1. The total light transmittance is measured in accordance with [JIS K-7105].” Kobayashi, [0032]. Kobayashi, [0042]
[’382 Claim 12A] The device of claim 1, wherein the multiplane light diffuser comprises: the first diffuser plate positioned at a first distance from the plurality of solid state emitters;	“Usually, a plurality of LEDs are arranged two-dimensionally on the main surface of the substrate 2 at regular intervals. In the present invention, b is the distance between the center of two adjacent LEDs 1, a is the distance from the surface of the LED 1 to the light emitting surface of the diffusing plate at the most exiting side, and c is the distance from the surface of the LED 1 to the lensed diffusing plate 4” Kobayashi, [0019]
[’382 Claim 12B] a second diffuser plate positioned at a second distance from the plurality of solid state emitters; and	“Usually, a plurality of LEDs are arranged two-dimensionally on the main surface of the substrate 2 at regular intervals. In the present invention, b is the distance between the center of two adjacent LEDs 1, a is the distance from the surface of the LED 1 to the light emitting surface of the diffusing plate at the most exiting

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
	side, and c is the distance from the surface of the LED 1 to the lensed diffusing plate 4” Kobayashi, [0019]
[’382 Claim 12C] a diffuser sheet supported by the second diffuser plate, wherein the first distance is less than the second distance.	Kobayashi, Fig. 1. “The backlight unit of the present invention may further be used with a diffusing film, prism collection film, reflective polarizing film, printed sheet such as a letter plate, liquid crystal panel, etc., on the diffusing plate 5.” Kobayashi, [0043]
[’382 Claim 13 Preamble] A method of providing diffused light comprising:	See claim 1[pre], 1[a], and 1[b].
[’382 Claim 13A] emitting light from a plurality of solid state light emitters arranged in a planar configuration;	See claim 1[a].
[’382 Claim 13B] receiving the emitted light at a first side of a first diffusion plane that is a first distance from the plurality of solid state light emitters;	See claim 1[b].
[’382 Claim 13C] transmitting first diffused light from a structured refractive diffuser plate at a second side of the first diffusion plane;	See claims 1[b] and 1[c]. Kobayashi, Abstract, [0028], [0034], Fig. 1

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
['382 Claim 13D] receiving the first diffused light from the first diffusion plane at a first side of a second diffusion plane that is a second distance from the plurality of solid state light emitters; and	<i>See</i> claims 11 and 13[c]. Kobayashi, [0019]
['382 Claim 13E] transmitting second diffused light from a second side of the second diffusion plane,	<i>See</i> claim 11.
['382 Claim 13F] wherein the plurality of solid state light emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, wherein the first distance is a function of the third distance.	<i>See</i> claim 1[e].
['382 Claim 14] The method of claim 13, wherein transmitting the first diffused light comprises transmitting the first diffused light from a diffuser plate and wherein transmitting	<i>See</i> claims 2, 7, and 11.

Claims of the '382 Patent	Kobayashi in view of the Knowledge of a Person of Ordinary Skill
the second diffused light comprises transmitting the second diffused light from a diffuser sheet that is supported by a substantially transparent sheet.	
['382 Claim 15] The method of claim 13, wherein transmitting the first diffused light comprises transmitting light from a first diffuser plate and wherein transmitting the second diffused light comprises transmitting light from a diffuser sheet that is supported by a second diffuser plate.	<i>See claim 7.</i> “a diffusing film, prism collection film, reflective polarizing film, printed sheet such as a letter plate, liquid crystal panel, etc., on the diffusing plate 5.” Kobayashi, [0044].

IX. The Combination of Kobayashi in View of Kirita Renders Obvious to a Person of Ordinary Skill in the Art Claims 10 and 16 of the '382 Patent

93. As described above, each element of claims 10 and 16 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have been motivated to combine Kirita's light color filter to Kobayashi.

94. Both Kobayashi and Kirita disclose backlight assemblies for displays, however, Kobayashi does not expressly disclose a light filter color, i.e., a color-

selective filter. In a similar field, Kirita discloses a “light selective transmission filter 32.” Kirita, [0063]. As Kirita explains, “[b]y providing the light selective transmission filter 32, the color purity of illumination light can be improved.” Kirita, [0063]. Thus, “the NTSC [National Television System Committee] ratio can be improved, and the color reproduction range can be expanded.” Kirita, [0063]. A person of ordinary skill in the art would have been motivated to apply Kirita’s light selective transmission filter 32 to the design of Kobayashi to obtain these benefits, i.e., improved purity of the illumination light provided by the backlight, improved NTSC ratio, and expanded reproduction range.

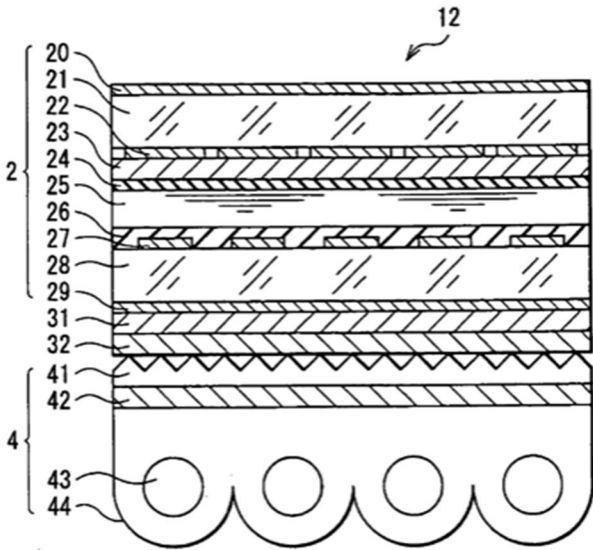
95. This combination would further improve the resultant image the viewer sees. Kobayashi notes that numerous optical elements treated in various manners, including in a manner allowing a diffuser to absorb select wavelengths (ultraviolet absorber) may be added to Kobayashi’s system. Kobayashi, [0042]-[0043]. Thus, Kobayashi provides an additional motivation to include Kirita’s light selective transmission filter 32 in Kobayashi’s system. This combination is nothing more than the use of a known improvement in a similar field of endeavor. In my opinion this combination would have been within the skillset of a person of ordinary skill in the art as of March 11, 2008.

96. As part of the LCD backlight design process color and uniformity are related and both need to be considered. Kirita and Kobayashi both describe the use

of LEDs in a backlight configuration with multiple optical elements or components within the backlight module. Diffusors can influence the color qualities of the emitters and color filters can be engineered as part of the compound diffuser system. A person of ordinary skill in the art would be motivated to combine the features described by these references.

97. The claim chart below further demonstrates that the combination of Kobayashi and Kirita render obvious to a person of ordinary skill in the art each element of claims 10 and 16 of the '382 Patent.

Claims of the '382 Patent	Kobayashi in view of Kirita and the Knowledge of a Person of Skill in the Art
['382 Claim 10] The device of claim 1, wherein the diffuser plate comprises a plate including a light filter color.	“Next, among the light emitted from the luminaire 4, light in the specific wavelength regions based on the wavelength selective transmission characteristics is selectively transmitted and emitted to the liquid crystal panel 2 by the light selective transmission filter 32.” Kirita, [0075] “By arranging the light selective transmission filter 32 formed as above between the luminaire 4 and the diffusion sheet 31 shown in FIG. 4, the liquid crystal display 1 of this embodiment can be manufactured.” Kirita, [0072] Kirita, [0010]; Fig. 11

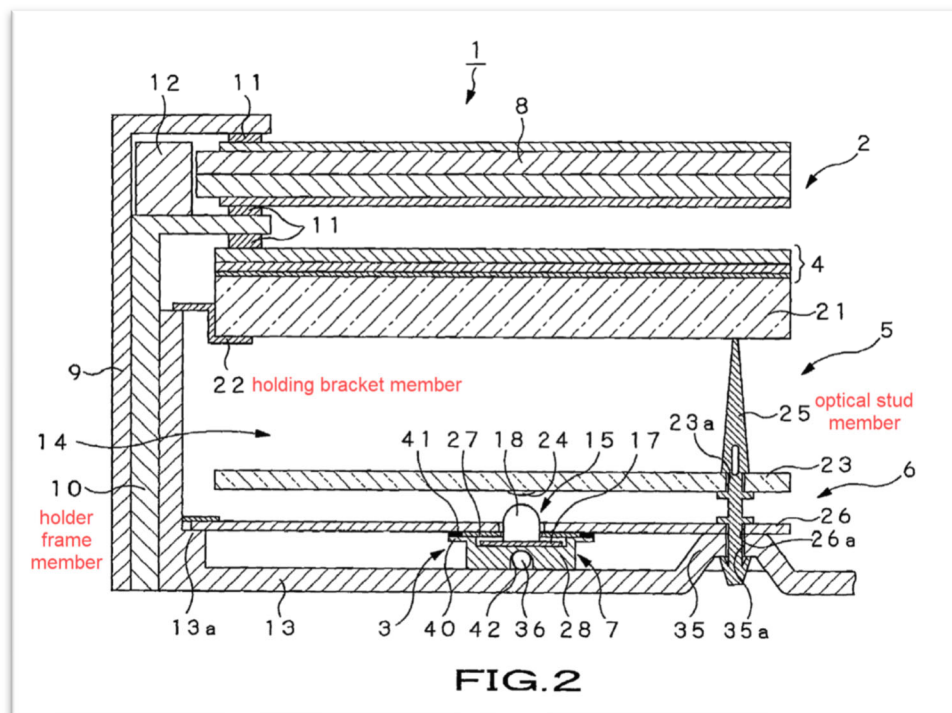
Claims of the '382 Patent	Kobayashi in view of Kirita and the Knowledge of a Person of Skill in the Art
	 FIG. 11 12 - Liquid Crystal Display 2 - Liquid Crystal Panel 4 - Luminaire (Back Lighting Unit) 31 - Diffusion Sheet 32 - Light Selective Transmission Filter 41 - Prism Sheet 42 - Diffusion Sheet 43 - Cold-cathode Fluorescent Lamp
['382 Claim 16] The method of claim 13, wherein transmitting the first diffused light comprises transmitting scattered diffusion light from a plate including a light filter color.	<i>See claim 10.</i> <i>See Kirita, [0010], [0075]</i>

X. The Combination of Kobayashi in View of Tabito Renders Obvious to a Person of Ordinary Skill in the Art Claims 4-6 and 17 of the '382 Patent

98. As described above, each element of claims 4 and 17 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have

been motivated to combine Tabito's mechanical mounting system to the diffusers of Kobayashi.

99. Kobayashi describes light emitting elements and a diffuser structure but does not expressly disclose the mounting for that diffuser structure. Like Kobayashi, Tabito discloses a similar LCD backlighting structure including a reflecting plate 26, diffusing plate 23, light diffusing conducting plate 21, and optical converting section 4, all of which are supported by optical stud members 25, holder frame member 10, and holding bracket member 22. *See* Tabito, [0081]; Fig. 2



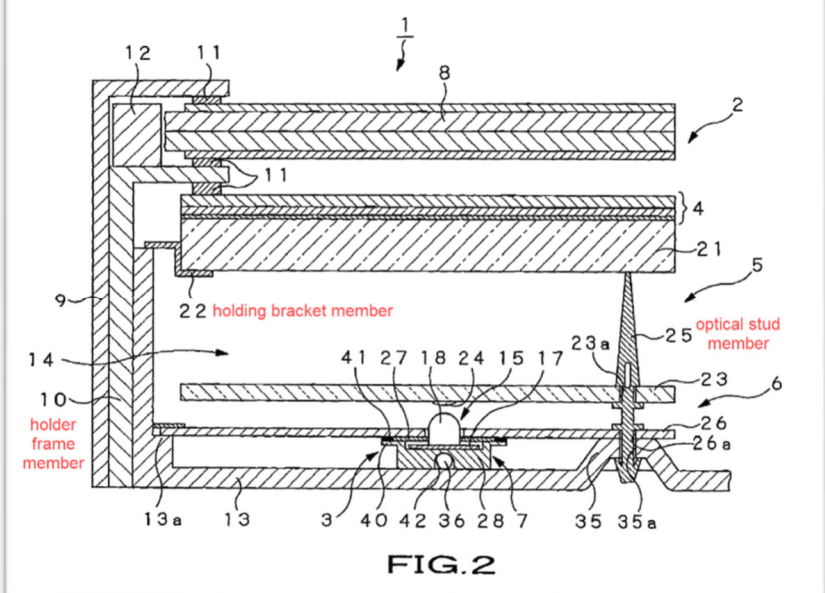
Tabito, Fig. 2 (annotated). Tabito's method of supporting diffusing plates would also be suitable for use in supporting Kobayashi's diffuser plates. A person of ordinary

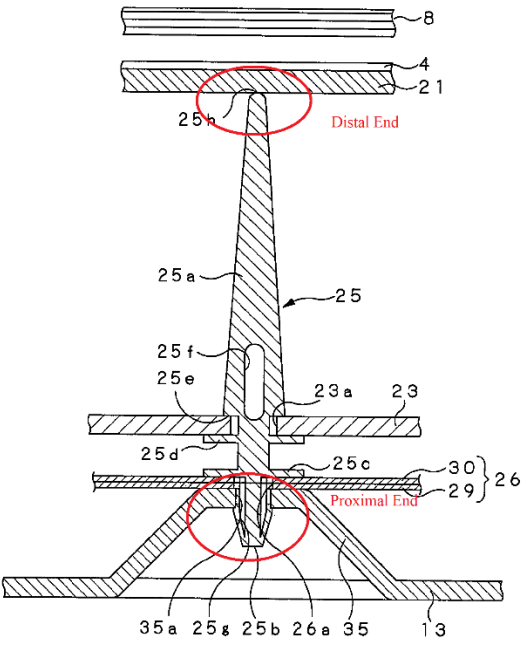
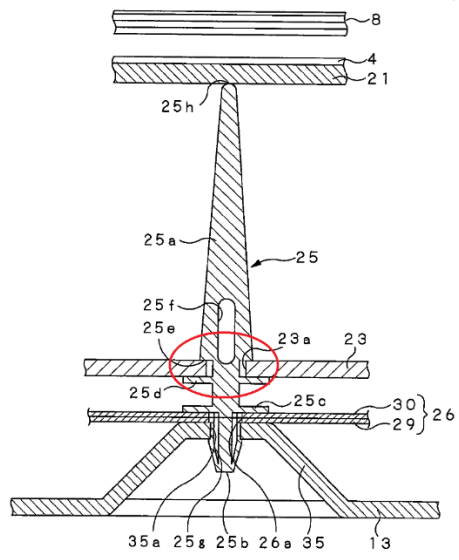
skill in the art would have been motivated to apply Tabito's supports to Kobayashi to provide a more rigid mounting and support for the backlighting elements described in Kobayashi.

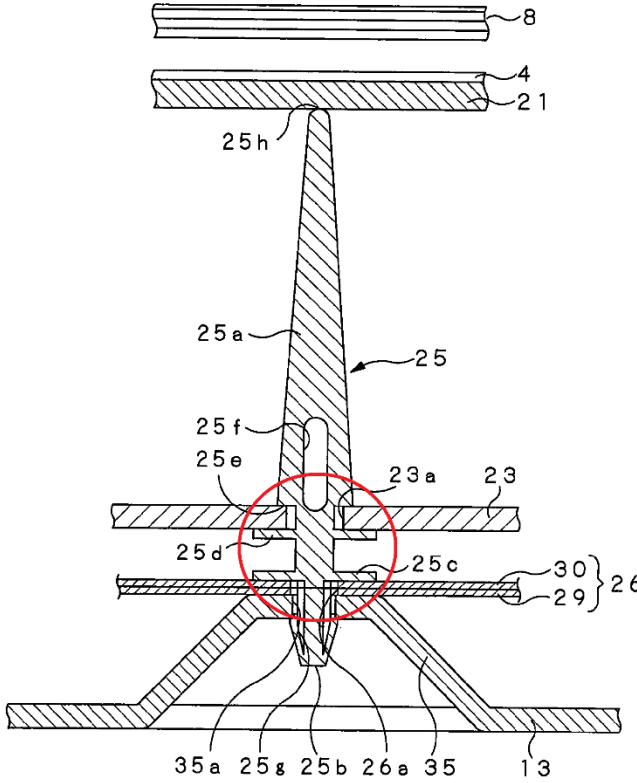
100. Both Kobayashi and Tabito are in the same field of backlight assembly units for display devices, and both Kobayashi and Tabito aim to improve brightness inconsistencies in backlit display devices using similar structures. Kobayashi, Abstract; Tabito, [0006]. Thus, a person of ordinary skill in the art would have been motivated to combine Tabito's structure to Kobayashi to improve the strength and resiliency of supports for the backlight of the display. In my opinion this combination would have been well within the skillset of a person of ordinary skill in the art as of March 11, 2008.

101. The claim chart below further demonstrates that the combination of Kobayashi and Tabito renders obvious to a person of ordinary skill in the art each element of claims 4 and 17 of the '382 Patent.

Claims of the '382 Patent	Kobayashi in view of Tabito and the Knowledge of a Person of Ordinary Skill in the Art
['382 Claim 4A] The device of claim 2, comprising a plurality of diffuser supports, wherein the diffuser supports comprise:	"The light diffusing plate 23 is then assembled to each optical stud member 25 by fitting the light diffusing plate at the fitting holes 23a from the distal end 25h." Tabito, [0090] Tabito, 0081]; Fig. 2

Claims of the '382 Patent	Kobayashi in view of Tabito and the Knowledge of a Person of Ordinary Skill in the Art
	 FIG. 2
[’382 Claim 4B] a proximal end that is configured to be positioned proximate the plurality of solid state light emitters; and a distal end that is configured to support the diffuser sheet.	“each optical stud member 25 is made up by a shaft-shaped base part 25a, a fitting part 25b, formed to the distal end of the shaft-shaped base part 25a, a flange-shaped first receiving plate part 25c, formed as one with the lateral surface of the shaft-shaped base part 25a, with a preset spacing from the fitting part 25b, and a flange-shaped second receiving plate part 25d, formed as one with the lateral surface of the shaft-shaped base part 25a, with a preset spacing from the first receiving plate part 25c.” Tabito, [0084]. The light diffusing conducting plate 21, comprised of a laminate of functional optical sheets, is assembled to the distal end 25h of each optical stud member 25, with the bottom side of the light diffusing conducting plate 21 abutting against the distal end 25.” Tabito, [0092]

Claims of the '382 Patent	Kobayashi in view of Tabito and the Knowledge of a Person of Ordinary Skill in the Art
	 FIG. 6 Tabito, Fig. 6 (annotated)
['382 Claim 5] The device of claim 4, wherein the diffuser plate comprises a plurality of diffuser plate holes that are configured to receive the plurality of diffuser supports.	Holes 23a in its diffuser plate 23, which are configured to receive the plurality of diffuser supports. See Tabito, [0082].  FIG. 6

Claims of the '382 Patent	Kobayashi in view of Tabito and the Knowledge of a Person of Ordinary Skill in the Art
	Tabito, Fig. 6 (annotated).
['382 Claim 6] The device of claim 4, wherein the plurality of diffuser supports comprise steps for supporting, at the first distance from the plurality of solid state light emitters, the diffuser plate via the plurality of holes.	Tabito describes step 25d in the optical stud members 25. See Tabito, [0085], [0090].  FIG. 6 Tabito, Fig. 6 (annotated).
['382 Claim 17 Preamble] A display comprising:	“a backlight unit for a display device.” Kobayashi, Abstract.
['382 Claim 17A] a backlighting panel comprising	“a backlight unit for a display device.” Kobayashi, Abstract.
['382 Claim 17B] a plurality of solid state light emitters arranged in a	See Claim 1[a] and 1[e].

Claims of the '382 Patent	Kobayashi in view of Tabito and the Knowledge of a Person of Ordinary Skill in the Art
substantially planar configuration including a third distance between adjacent ones of the plurality of solid state light emitters,	
['382 Claim 17C] a first diffusion plane that is configured to receive light from the plurality of solid state light emitters and to transmit first diffused light, the first diffusion plane including a diffuser plate that is positioned a first distance from the plurality of solid state light;	<i>See claims 1[b] and 11.</i>
['382 Claim 17D] a second diffusion plane that is configured to receive the first diffused light and to transmit second diffused light	<i>See claims 1[b] and 1[c].</i>
['382 Claim 17E] a plurality of diffuser supports configured to support a first diffuser plane structure at a first distance from the plurality of solid state light emitters and to	<i>See claims 1[c], 4, and 8</i> <i>Tabito, [0081], [0090]; Fig. 2</i>

Claims of the '382 Patent	Kobayashi in view of Tabito and the Knowledge of a Person of Ordinary Skill in the Art
support a second diffuser plane structure at a second distance from the plurality of solid state light emitters, wherein the second distance is greater than the first distance; and	
['382 Claim 17F] a LCD display panel that is configured to receive the second diffused light and selectively transmit received light as display content,	<i>See</i> claims 10, 13[c], 13[d]. “This is a backlight unit for display devices, and LED is used as a light source to provide a unit that reduces the eye-catching lamp image” Kobayashi, Abstract “Disclosed is a light transmitting liquid crystal display apparatus used with advantage with a television receiver having a large-sized display not less than 30 inch. A backlight section (3) sending out illuminating light is formed by a plural number of rows made up of many light emitting units (15) arranged on the back Surface of a liquid crystal display panel (8).” Tabito, Abstract
['382 Claim 17G] wherein the first distance is a function of the third distance.	<i>See</i> claim 1[e].

XI. The Combination of Kobayashi and Tabito in view of Onishi Renders Obvious to a Person of Ordinary Skill in the Art Claims 18 and 20 of the '382 Patent

102. As described above, each element of claims 18 and 20 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have

been motivated to modify the Kobayashi-Tabito combination to further include the extrusion peaks described in Onishi.

103. A person of ordinary skill in the art would have been motivated to combine Onishi to the Kobayashi-Tabito combination. Both Kobayashi and Tabito disclose backlight assemblies for displays. Kobayashi does not expressly disclose that its diffuser plate comprises a plurality of extrusion peaks that are divided by a plurality of extrusion grooves or that the extrusion peaks include a peak angle in a range of about 120 degrees to 170 degrees. Onishi describes convexoconcave extrusion structures that will produce a diffusion plate with extrusion peaks that are divided by a plurality of extrusion grooves (Onishi, [0057]) including “a convexoconcave portion formed of prism having an apex angle 140 degrees.” Onishi, [0221].

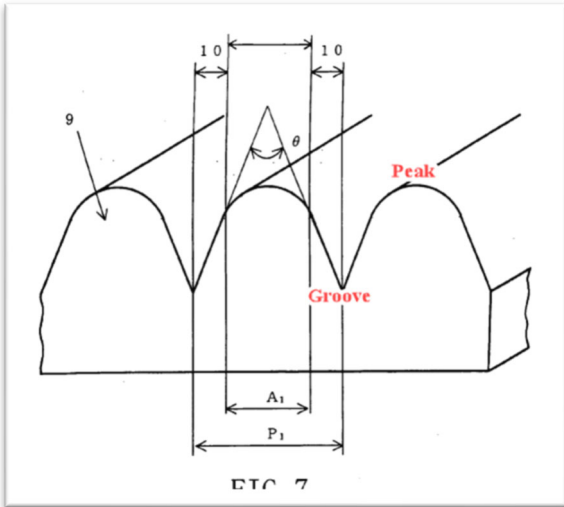
104. A person of ordinary skill in the art would have been motivated to combine Onishi’s extruded prismatic structures to Kobayashi’s diffusing plate 4. Kobayashi describes including a “prism shape, pyramid shape ... [and] Fresnel shape” lens combinations on the lensed diffuser 4. Kobayashi, [0034]. Onishi describes additional extruded prismatic structures in connection with a diffuser plate. *See* Onishi, [0057]. A person of ordinary skill in the art would have been motivated to modify Kobayashi to include these prismatic structures to improve the total light transmittance of the light diffusion plane. *See* Onishi, [0057] (“the

convex structures are periodically formed so that desirable optical property can be obtained at any point on the incident plane... the total light transmittance of the light diffusion plate is dependent on only the incident angle but independent of the incident position so that it is not necessary to finely align the light diffusion plate with the other members such as the light source.”).

105. This combination is nothing more than combining a known improvement in display backlighting as disclosed by Onishi and applying that improvement to the backlight diffusers disclosed by Kobayashi. In my opinion this combination would have been within the skillset of a person of ordinary skill in the art as of March 11, 2008.

106. Optical diffuser components could employ a range of feature types to achieve the desired diffuser performance. A person of ordinary skill in the art would understand that diffusers with different feature types could be used with the diffuser configuration described by Kobayashi. Onishi is prior art that describes a specific possible feature type to use to diffuse light. A person of ordinary skill in the art would be motivated to use such as diffuser type for the objective of achieving a uniform light output for a display.

107. The claim chart below further demonstrates that the combination of Kobayashi, Tabito, and Onishi renders obvious to a person of ordinary skill in the art each element of claims 18 and 20 of the '382 Patent.

Claims of the '382 Patent	Kobayashi and Tabito in view of Onishi and the Knowledge of a Person of Ordinary Skill in the Art
['382 Claim 18] The device of claim 1, wherein the diffuser plate comprises a structured refractive diffuser that includes a plurality of extrusion peaks that are divided by a plurality of extrusion grooves.	See claim 13[c]. “diffuser plate 4 with a lens has a lens shape on at least one surface, and such lens shapes include a general concave / convex R lens shape, prism shape, pyramid shape, saddle lens shape, Fresnel lens shape, and moth-eye lens shape.” Kobayashi, [0034]. “Firstly, in order to mold a prism plane composed of a prism portion having an apex angle 40 degrees and flat portions disposed equally between each prism portion by a ratio of 30% to the whole plane and a convexoconcave portion formed of prism having an apex angle 140 degrees, respectively, a die having a plurality of grooves corresponding to each prism shape is manufactured by cutting work. Where, the plurality of grooves provided at intervals of 50 μm. The surface shape of the die manufactured by cutting work is formed of symmetry corresponding to the prism shape. The depth of the symmetric grooves is fixed in the plane” Onishi, [0221] Onishi, [0057]; Fig. 7 
['382 Claim 20] The device of claim 18,	See claims 1, 18, and 19

Claims of the '382 Patent	Kobayashi and Tabito in view of Onishi and the Knowledge of a Person of Ordinary Skill in the Art
wherein ones of the plurality of extrusion peaks include a peak angle in a range of about 120 degrees to 170 degrees.	Kobayashi, [0034] “Firstly, in order to mold a prism plane composed of a prism portion having an apex angle 40 degrees and flat portions disposed equally between each prism portion by a ratio of 30% to the whole plane and a convexoconcave portion formed of prism having an apex angle 140 degrees, respectively, a die having a plurality of grooves corresponding to each prism shape is manufactured by cutting work. Where, the plurality of grooves provided at intervals of 50 μm. The surface shape of the die manufactured by cutting work is formed of symmetry corresponding to the prism shape. The depth of the symmetric grooves is fixed in the plane” Onishi, [0221]

XII. The Combination Kobayashi Tabito, and Onishi in View of Epstein Renders Obvious to a Person of Ordinary Skill in the Art Claim 19 of the '382 Patent

108. As described above, each element of claim 19 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have been motivated to modify the Kobayashi-Tabito-Onishi combination to further include the plurality of crossed linear prismatic lenselets described in Epstein.

109. A person of ordinary skill in the art would have been motivated to combine Epstein to the Kobayashi-Tabito-Onishi combination. As discussed above, Kobayashi discloses a display for backlight assemblies. Kobayashi does not expressly disclose that the structured refractive diffuser comprises a plurality of crossed linear prismatic lenselets. However, Epstein is similarly in the field of

LCD displays. *See* Epstein, Abstract. Epstein discloses “symmetrical, four sided prisms having curved or arced faces in both the XZ and YZ planes” for use in LCD displays. *See* Epstein, [0214].

110. A person of ordinary skill in the art would have been motivated to apply these structures to Kobayashi’s diffusing plate 4. This combination is nothing more than combining a known improvement in the same field (display technology) to Kobayashi’s device in the same technical area. Further, a person of ordinary skill in the art would have been motivated to make this combination to provide improved lighting characteristics and viewing angles. As Epstein describes use of its “disclosed structures also have the advantage of reducing the effects of glare, since they enable the image to be viewed from positions outside of the areas receiving unwanted specularly reflected light from the various surfaces and interfaces of the display.” Epstein, [0005]. A person of ordinary skill in the art would have been motivated to apply Epstein’s structures to Kobayashi’s diffusing plate 4 to take advantage of these improvements. In my opinion this combination would have been within the skillset of a person of ordinary skill in the art as of March 11, 2008.

111. Epstein presents another range of possible diffusor features again for the application of providing uniform light to a LCD. A person of ordinary skill in the art would consider the use of diffusors with the features described by Epstein

as part of the compound diffuser arrangement described by Kobayashi in order to improve quality of light and reduce the impact of glare.

112. The claim chart below further demonstrates that the combination of Kobayashi, Tabito, Onishi, and Epstein renders obvious to a person of ordinary skill in the art each element of claim 19 of the '382 Patent.

Claims of the '382 Patent	Kobayashi, Tabito, and Onishi in View of Epstein and the Knowledge of a Person of Ordinary Skill in the Art
['382 Claim 19] The device of claim 18, wherein the structured refractive diffuser comprises a plurality of crossed linear prismatic lenselets.	“diffuser plate 4 with a lens has a lens shape on at least one surface, and such lens shapes include a general concave / convex R lens shape, prism shape, pyramid shape, saddle lens shape, Fresnel lens shape, and moth-eye lens shape.” Kobayashi, [0034]. “Examples 24 through 29 are examples of films having a plurality of pyramidal prisms.” Epstein, [0213] “prisms 1640 are symmetric, isosceles prisms having straight face verbatims in both the XZ and YZ planes. Each prism 1640 has a first face 1641, a second face 1642, a third face 1643 and a fourth face 1644. The four faces meet at apex 1645.”; [0215] (“Example 25 in FIG. 30A, prisms 1740 are symmetrical, four sided prisms having curved or arced faces in both the XZ and YZ planes.” Epstein, [0214]

XIII. The Combination of Schiavoni in View of Lim Renders Obvious to a Person of Ordinary Skill in the Art Claims 1-3, 7-8, and 11-15 of the '382 Patent

113. As described above, each element of claims 1-2, 7-8, and 11-15 was known in the art. Further, in my opinion, a person of ordinary skill in the art would

have been motivated to modify Schiavoni based on the specific ratios disclosed in Lim.

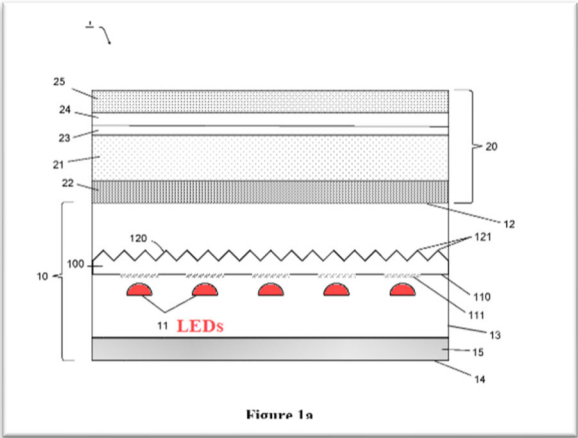
114. A person of ordinary skill in the art would have been motivated to modify Schiavoni's optical element (100), a substantially planar diffuser [22], and spacing of light sources (11) to include the spacing disclosed by Lim. Schiavoni discloses a backlighting system including a multi-plane light diffuser and describes specific distances between the light sources and the optical system 100 and the diffuser 21 and a spacing "P" between the light sources. Schiavoni, [0022]-[0023]. Lim similarly discloses a diffusion plate and a lighting source, and expressly discloses a relationship "between a diffusion plate and a lamp in accordance with the distance between lamps having the same visible angle." Lim, [0057]. Lim acknowledges that "the farther the interval between the lamps realizing the same color is, the longer the interval between the lamp and the diffusion plate is. Lim, [0058]. Additionally, "as shown in [Lim's] FIG. 4B, the closer the interval between the lamps is, the narrower the interval between the lamp and diffusion plate." Lim, [0059]. Lim further discloses that the first distance of 5mm is one half the third distance of 10mm. Lim, [0047] ("a distance between the respective lamps or chips is designed to be within 10 mm, inclusive, and another distance between an LED lamp (or chip) and a diffusion plate is designed to be within 5 mm, inclusive.").

115. A person of ordinary skill in the art would have been motivated to modify the backlighting system of Schiavoni to include the spacing relationship described by Lim because this enables the overall backlight structure to be designed with fewer diffuser plates and have a thinner structure. Schiavoni, [0057]-[0059]. This combination is nothing more than the application of a known distance relationship in a backlighting structure as taught by Lim to another known backlighting structure as taught by Schiavoni. This combination would have been within the skillset of a person of ordinary skill in the art and is nothing more than modifying the positioning of elements already described in Schiavoni to account for spacing considerations expressly disclosed in Lim.

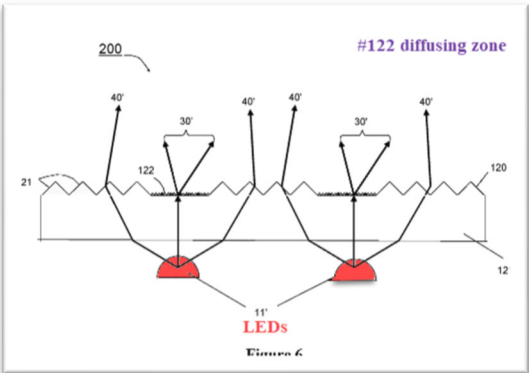
116. The specific diffusing capabilities of the diffuser elements and the specific optical distribution of the LED light sources would require adjustments to the spacing of the various elements to achieve optimal optical uniformity, cost, and thickness of the backlighting module. As Lim shows, and as was well known in the practice of optical engineering, the distance of an optical element from a light source or group of light sources affects the interaction of the optical element with the light source, as shown by Lim figures 4A and 4B. The optical spread of the light sources, the influence of back reflected light, the level of diffusion provided by the diffuser element would all be additional elements for consideration that bely the use of a simplistic spatial relationship for actual engineering purposes. A

person of ordinary skill in the art would be motivated to explore the engineering options described by references in the current art and would expect to find optimal configurations for the desired characteristics based on the specific features of the various components. In other words, the use of the distance relationships expressly disclosed by Lim in the Schiavoni system is nothing more than a design choice.

117. The claim chart below further demonstrates that the combination of Schiavoni and Lim renders obvious to a person of ordinary skill in the art each element of claims 1-2, 7-8, and 11-15 of the '382 Patent.

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
['382 Claim 1 Preamble] A solid state lighting device, comprising:	“an optical system (100) for a lighting device having one or more sources (11) of visible and/or ultraviolet radiation which consist of light-emitting diodes[.]” Schiavoni, Abstract
['382 Claim 1A] a plurality of solid state light emitters that are configured to emit light; and	“an optical system (100) for a lighting device having one or more sources (11) of visible and/or ultraviolet radiation which consist of light-emitting diodes[.]” Schiavoni, Abstract Schiavoni, 2; Fig. 1a 

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
'382 Claim 1B] a multiplane light diffuser including a first diffusion plane that is a first distance from the plurality of solid state emitters and a second diffusion plane that is a second distance from the plurality of solid state emitters that is different from the first distance,	“The diffusing layer 22, 111 is deposited by any technique known to those skilled in the art, such as by screen printing, by coating with a paint, by dip-coating, by spin-coating, by spraying, or by flow-coating.” Schiavoni, 17 “a first optical element 100 is placed between the sources 11 and the rigid diffuser 21,” and that rigid diffuser 21 is “formed of a transparent support 21 preferably made of glass and a diffusing layer 22, ... arranged on the lower face (side of the enclosure) or top of the substrate 21, these two elements 21, 22 making it possible to homogenize the light.” Schiavoni, 15-16 Schiavoni, Abstract, 1; Fig. 1a
['382 Claim 1C] the multiplane light diffuser including first side that corresponds to the first plane and that is configured to receive the light emitted from the plurality of solid state light emitters and a second side that corresponds to the second plane and that is configured to transmit diffused light,	Schiavoni, 16; Fig. 1a
['382 Claim 1D] wherein the multiplane light diffuser comprises a diffuser plate that includes the first side of the multiplane light, the diffuser plate configured to define the first diffusion plane, and	Schiavoni, 16; Figs. 1a, 6

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
	 FIGURE 6
'382 Claim 1E] wherein the plurality of solid state emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, and wherein the first distance is a function of the third distance.	“The distance d1 between the reflector 15 and the sources 11 is less than or equal to 15 mm, in this example substantially equal to 10 mm. The distance d2 between the sources 11 and the optical system 100 is less than or equal to 10 mm, in this example substantially equal to 5 mm. The distance d3 between the optical system 100 and the diffuser 21 is less than or equal to 15 mm, in this example substantially equal to 10 mm. The total height of the enclosure 10 is in this example approximately 28 mm. The system 100 consists of a plastic or preferably a glass substrate, 3 mm thick.” Schiavoni, 16. “spacing P between the extended source and an adjacent extended source or between said row and an adjacent row of point sources” Schiavoni , 22 Schiavoni, Fig. 1a “between a diffusion plate and a lamp in accordance with the distance between lamps having the same visible angle.” Lim, [0057].

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
	“the farther the interval between the lamps realizing the same color is, the longer the interval between the lamp and the diffusion plate is. Lim, [0058]. “[A]s shown in FIG. 4B, the closer the interval between the lamps is, the narrower the interval between the lamp and diffusion plate.” Lim, [0059]. Lim, Figs. 4A, 4B The image contains two diagrams, FIG. 4A and FIG. 4B, illustrating the relationship between a lamp and a diffusion film. FIG. 4A shows a lamp at the bottom with two wide, overlapping triangular regions of light spreading upwards through a diffusion film. FIG. 4B shows a lamp at the bottom with two narrow, overlapping triangular regions of light spreading upwards through a diffusion film. Both diagrams are labeled with 'lamp' at the bottom and 'Diffusion Film' on the right side.
[’382 Claim 2] The device of claim 1, wherein the multiplane light diffuser comprises: a diffuser sheet that includes the second side of the multiplane light diffuser and is positioned the second distance from the plurality of solid state light emitters, the diffuser sheet	“The glass substrate 21 is thus used as a support substrate for the diffusing layer 22....” Schiavoni, 20 Schiavoni, Fig. 1a

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
configured to define the second diffusion plane.	
'382 Claim 3] The device of claim 2, wherein the diffuser sheet comprises: a substantially transparent plate; and a diffuser film supported by the substantially transparent plate.	Schiavoni's diffuser is "formed of a transparent support 21 preferably made of glass and a diffusing layer 22" with diffusing film 23 on the diffuser. Schiavoni, p. 15.
['382 Claim 7] The device of claim 2, wherein the diffuser sheet comprises a diffuser film, a brightness enhancing film, a polarizing film and a substantially clear plate configured to support the diffuser film, the brightness enhancing film, the polarizing film.	Schiavoni at 13, 15, Fig. 1a
['382 Claim 8] The device of claim 2, wherein the plurality of solid state emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, and wherein the first distance comprises approximately one half the third distance.	See claim 1[e] "a distance between the respective lamps or chips is designed to be within 10 mm, inclusive, and another distance between an LED lamp (or chip) and a diffusion plate is designed to be within 5 mm, inclusive." Lim, [0047]
['382 Claim 11] The device of claim 1, further comprising	Schiavoni, 3; Fig, 1a

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
means for transmitting first diffused light from the first diffusion plane to the second diffusion plane.	
['382 Claim 12A] The device of claim 1, wherein the multiplane light diffuser comprises: the first diffuser plate positioned at a first distance from the plurality of solid state emitters;	“The diffusing layer 22, 111 is deposited by any technique known to those skilled in the art, such as by screen printing, by coating with a paint, by dip-coating, by spin-coating, by spraying, or by flow-coating.” Schiavoni, 17
['382 Claim 12B] a second diffuser plate positioned at a second distance from the plurality of solid state emitters; and	Schiavoni, 15-16; Fig. 1a
['382 Claim 12C] a diffuser sheet supported by the second diffuser plate, wherein the first distance is less than the second distance.	Schiavoni, 15-16; Fig. 1a
['382 Claim 13 Preamble] A method of providing diffused light comprising:	See claim 1[pre], 1[a], and 1[b].
['382 Claim 13A] emitting light from a plurality of solid state light emitters arranged in a planar configuration;	See claim 1[a].
['382 Claim 13B] receiving the emitted light at a first side of a first diffusion plane that is a first distance from the plurality of solid state light emitters;	See claim 1[b].

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
['382 Claim 13C] transmitting first diffused light from a structured refractive diffuser plate at a second side of the first diffusion plane;	<i>See</i> claims 1[b] and 1[c]. “a first substantially planar optical element (100) transparent to said radiation and intended to be installed between said sources and a substantially planar diffuser [22] that makes the normal luminance uniform.” Schiavoni, Abstract “upper face 120 [of optical element 100] is texturized, for example by printing a laminated glass, to obtain the grooves 121 of the prism type with a triangular section, with an apex angle of preferably 90°, of height h1 equal to 1 mm for example.” Schiavoni, 16.
['382 Claim 13D] receiving the first diffused light from the first diffusion plane at a first side of a second diffusion plane that is a second distance from the plurality of solid state light emitters; and	<i>See</i> claims 11 and 13[c]
['382 Claim 13E] transmitting second diffused light from a second side of the second diffusion plane,	<i>See</i> claim 11
['382 Claim 13F] wherein the plurality of solid state light emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, wherein the first distance is a function of the third distance.	<i>See</i> claim 1[e]
['382 Claim 14] The method of claim 13, wherein transmitting the first diffused	<i>See</i> claims 2, 7, 11

Claims of the '382 Patent	Schiavoni in view of Lim and the Knowledge of a Person of Skill in the Art
light comprises transmitting the first diffused light from a diffuser plate and wherein transmitting the second diffused light comprises transmitting the second diffused light from a diffuser sheet that is supported by a substantially transparent sheet.	
['382 Claim 15] The method of claim 13, wherein transmitting the first diffused light comprises transmitting light from a first diffuser plate and wherein transmitting the second diffused light comprises transmitting light from a diffuser sheet that is supported by a second diffuser plate.	<i>See claim 7</i>

XIV. The Combination of Schiavoni and Lim in View of Kobayashi Renders Obvious to a Person of Ordinary Skill in the Art Claim 9 of the '382 Patent

118. As described above, each element of claim 9 was known in the art.

Further, in my opinion, a person of ordinary skill in the art would have been motivated to modify the Schiavoni-Lim combination based on the specific ratios of LED distance to planes of the multiplane diffuser described in Kobayashi.

119. The Schiavoni-Lim combination discloses light emitting elements and a multi-plane diffuser structure, and Lim discloses a diffusion plate and a lighting source, and expressly discloses a relationship “between a diffusion plate and a lamp in accordance with the distance between lamps having the same visible angle.” Lim, [0057]. The Schiavoni-Lim combination does not expressly disclose the second distance comprises a distance in a range between the third distance and 1.5 times the third distance. However, as discussed above, Kobayashi similarly discloses the combination of a light emitting elements and a multi-plane diffuser structure. Kobayashi suggests that the second distance is equal to the first distance, and thus that the second distance comprises a distance in a range between the third distance and 1.5 times the third distance.

120. A person of ordinary skill in the art would have been motivated to apply the express ratio disclosed in the Kobayashi to the Schiavoni-Lim combination to provide a higher quality light output, as described in both Kobayashi and Lim. *See* Kobayashi, [0020]; Lim, [0057]-[0059]. This modification is nothing more than positioning components that are already disclosed in Schiavoni according to distances explicitly disclosed in Kobayashi to achieve a predictable result. A person of ordinary skill in the art would have been motivated to make this modification, and the combination would be well within the technical skillset of a person of ordinary skill in the art at the time.

121. Schiavoni, Lim, and Kobayashi teach a range of configurations and spacings between the LED light sources and the diffuser elements. A person of ordinary skill in the art would understand that these ranges are highly dependent on the specifics of the total system, including all of the optical elements and the specific performance of the LEDs including optical distribution and output power. The choice of spacings would also depend on the desired display performance, cost, efficiency, and display thickness. A person of ordinary skill in the art would understand the trade-offs involved and would use available optical elements and spacing options to achieve the target performance. Selection of the specific distances similar to those described in Kobayashi would have been nothing more than a design choice.

122. The claim chart below further demonstrates that the combination of Schiavoni, Lim, and Kobayashi renders obvious to a person of ordinary skill in the art each element of claim 9 of the '382 Patent.

Claims of the '382 Patent	Schiavoni and Lim in view of Kobayashi and the Knowledge of a Person of Skill in the Art
['382 Claim 9] The device of claim 2, wherein the second distance comprises a distance in a range between the third distance and 1.5 times the third distance.	“between a diffusion plate and a lamp in accordance with the distance between lamps having the same visible angle.” Lim, [0057] “Preferably, a is 10 mm or more and b is 10 to 100 mm. If a is less than 10 mm, the eye-catching lamp image is unlikely to disappear and is undesirable. In addition, if b is less than 10 mm, the number of LEDs 1 becomes excessive, and if b is more than 100 mm, even if the

Claims of the '382 Patent	Schiavoni and Lim in view of Kobayashi and the Knowledge of a Person of Skill in the Art
	number of diffusing plates 4 with lenses is increased, it is difficult to eliminate luminance unevenness, which is not preferable. Also, the ratio of a/b is preferably in the range of 0.2 to 1.0. If a/b is less than 0.2, the brightness unevenness is unlikely to resolve, and if it exceeds 1.0, the distance from LED 1 to the diffusing plate is sufficient, and it is difficult to demonstrate the superiority of the units of the present invention. The ratio of a/b further preferably ranges from 0.5 to 0.7. c is 0.1 mm or more, and if it is less than 0.1 mm, the Diffusing plate 4 with lenses may come into contact with the LEDs 1 when the Diffusing plate 4 with lenses is bent, which is not preferable. The ratio of c/b is preferably in the range of 2×10^{-3} to 0.4. Less than 2×10^{-3} is undesirable because the eye-catching lamp image is unlikely to disappear, causing uneven brightness, which is not preferable. More preferably, it is in the range of 0.02 to 0.2, and considering the balance of the units, this range is particularly good.” Kobayashi, [0020] Lim, [0057]-[0059].

XV. The Combination of Schiavoni and Lim in View of Kirita Renders Obvious to a Person of Ordinary Skill in the Art Claims 10 and 16 of the '382 Patent

123. As described above, each element of claims 10 and 16 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have been motivated to modify the Schiavoni-Lim combination to include the light filter color described in Kirita.

124. A person of ordinary skill in the art would have been motivated to combine Kirita to the Schiavoni-Lim combination. As discussed, both Schiavoni and Lim describe backlight assemblies for displays. However, Schiavoni and Lim do not expressly disclose a light filter color, i.e., a color-selective filter. In a similar field, Kirita discloses a “light selective transmission filter 32.” Kirita, [0063]. A person of ordinary skill in the art would have been motivated to apply Kirita’s light selective transmission filter 32 to the Schiavoni-Lim combination to obtain the benefits discussed in Kirita, i.e., improved purity of the illumination light provided by the backlight, improved NTSC ratio, and expanded reproduction range.

125. Color quality is an important display performance consideration and the use of color filters was well known as a means to isolate the individual colors and maximize color gamut for display control within the liquid crystal portion of the display. This modification is nothing more than applying a known filter explicitly disclosed in Kirita to similar systems described in Schiavoni and Lim to achieve a predictable result. A person of ordinary skill in the art would have been motivated to make this modification, and the combination would be well within the technical skillset of a person of ordinary skill in the art at the time.

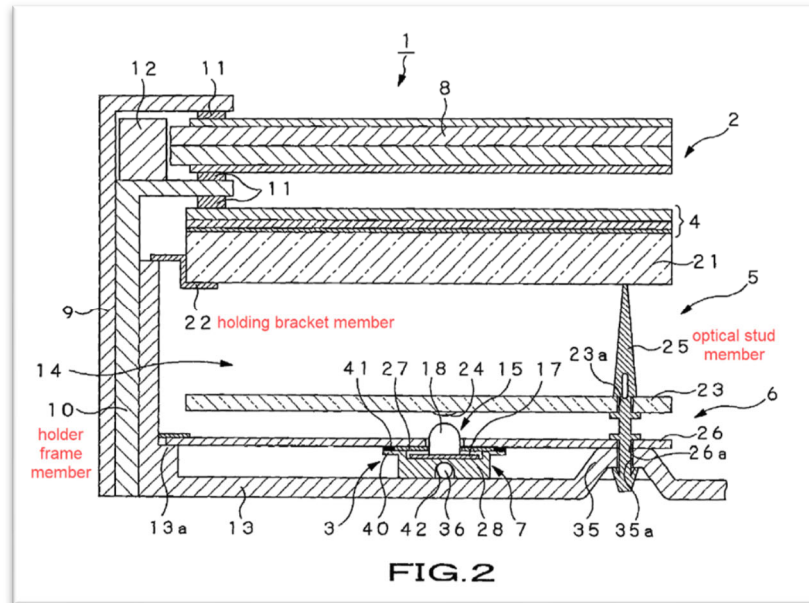
126. The claim chart below further demonstrates that the combination of Schiavoni, Lim, and Kirita renders obvious to a person of ordinary skill in the art each element of claim 10 and 16 of the ’382 Patent.

Claims of the '382 Patent	Schiavoni and Lim in view of Kirita and the Knowledge of a Person of Skill in the Art
['382 Claim 10] The device of claim 1, wherein the diffuser plate comprises a plate including a light filter color.	“Next, among the light emitted from the luminaire 4, light in the specific wavelength regions based on the wavelength selective transmission characteristics is selectively transmitted and emitted to the liquid crystal panel 2 by the light selective transmission filter 32.” Kirita, [0075] “By arranging the light selective transmission filter 32 formed as above between the luminaire 4 and the diffusion sheet 31 shown in FIG. 4, the liquid crystal display 1 of this embodiment can be manufactured.” Kirita, [0072] Kirita, [0010]; Fig. 11 FIG. 11 12 - Liquid Crystal Display 2 - Liquid Crystal Panel 4 - Luminaire (Back Lighting Unit) 31 - Diffusion Sheet 32 - Light Selective Transmission Filter 41 - Prism Sheet 42 - Diffusion Sheet 43 - Cold-cathode Fluorescent Lamp

XVI. The Combination of Schiavoni and Lim in View of Tabito Renders Obvious to a Person of Ordinary Skill in the Art Claims 4-6 and 17 of the '382 Patent

127. As described above, each element of claims 4 and 17 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have been motivated to modify the Schiavoni-Lim combination to include the mechanical mounting system of Tabito to the diffusers of Schiavoni.

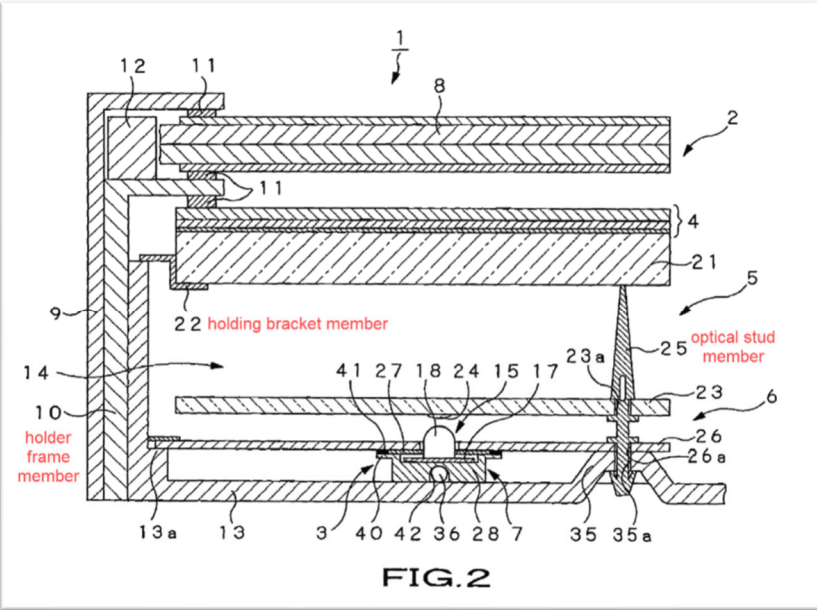
128. The Schiavoni-Lim combination discloses light emitting elements and a diffuser structure but does not expressly disclose the mounting for that diffuser structure. Like Schiavoni and Lim, Tabito discloses a backlighting structure for a display including a reflecting plate 26, diffusing plate 23, light diffusing conducting plate 21, and optical converting section 4, all of which is supported by optical stud members 25, holder frame member 10, and holding bracket member 22. *See* Tabito, [0081]; Fig. 2

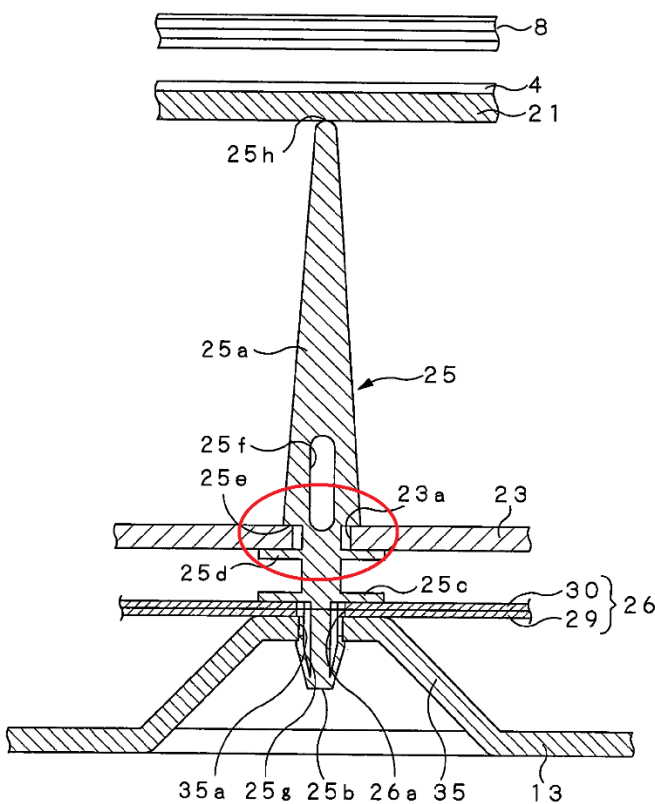


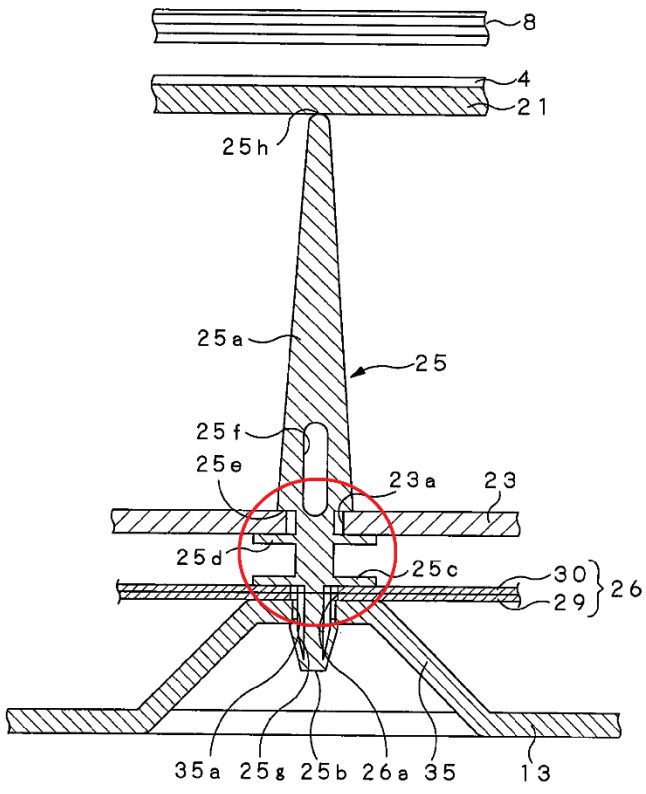
Tabito, Fig. 2 (annotated). Tabito's method of supporting diffusing plates would also be suitable for use in supporting Schiavoni's diffuser plates. A person of ordinary skill in the art would have been motivated to apply Tabito's supports to the Schiavoni-Lim combination to provide a more rigid mounting and support for the backlighting elements described in the Schiavoni-Lim combination.

129. Schiavoni, Lim, and Tabito are in the same field of backlight assembly units for display devices, and Schiavoni, Lim, and Tabito aim to improve brightness inconsistencies in backlit display devices using similar structures. A person of ordinary skill in the art would have been motivated to combine Tabito's structure to the Schiavoni-Lim combination to improve the strength and resiliency of supports for the backlight of the display. This combination would have been within the skillset of person of ordinary skill in the art at the time.

130. The claim chart below further demonstrates that the combination of Schiavoni, Lim, and Tabito renders obvious to a person of ordinary skill in the art each element of claim 4 and 17 of the '382 Patent.

Claims of the '382 Patent	Schiavoni and Lim in view of Tabito and the Knowledge of a Person of Skill in the Art
['382 Claim 4A] The device of claim 2, comprising a plurality of diffuser supports, wherein the diffuser supports comprise:	"The light diffusing plate 23 is then assembled to each optical stud member 25 by fitting the light diffusing plate at the fitting holes 23a from the distal end 25h." Tabito, [0090] Tabito, [0081]; Fig. 2 
['382 Claim 4B] a proximal end that is configured to be positioned proximate the plurality of solid state light emitters; and a distal end that is configured to support the diffuser sheet.	"each optical stud member 25 is made up by a shaft-shaped base part 25a, a fitting part 25b, formed to the distal end of the shaft-shaped base part 25a, a flange-shaped first receiving plate part 25c, formed as one with the lateral surface of the shaft-shaped base part 25a, with a preset spacing from the fitting part 25b, and a flange-shaped second receiving plate part 25d, formed as one with the lateral surface of the shaft-shaped base part 25a, with a preset spacing from the first receiving plate part 25c." Tabito, [0084].

Claims of the '382 Patent	Schiavoni and Lim in view of Tabito and the Knowledge of a Person of Skill in the Art
	The light diffusing conducting plate 21, comprised of a laminate of functional optical sheets, is assembled to the distal end 25h of each optical stud member 25, with the bottom side of the light diffusing conducting plate 21 abutting against the distal end 25.” Tabito, [0092] Tabito, Fig. 6
[’382 Claim 5] The device of claim 4, wherein the diffuser plate comprises a plurality of diffuser plate holes that are configured to receive the plurality of diffuser supports.	Holes 23a in its diffuser plate 23, which are configured to receive the plurality of diffuser supports. See Tabito, [0082].  FIG. 6 Tabito, Fig. 6 (annotated).
[’382 Claim 6] The device of claim 4,	Tabito describes step 25d in the optical stud members 25. See Tabito, [0085], [0090].

Claims of the '382 Patent	Schiavoni and Lim in view of Tabito and the Knowledge of a Person of Skill in the Art
wherein the plurality of diffuser supports comprise steps for supporting, at the first distance from the plurality of solid state light emitters, the diffuser plate via the plurality of holes.	 FIG. 6 Tabito, Fig. 6 (annotated).
['382 Claim 17 Preamble] A display comprising:	“an optical system (100) for a lighting device having one or more sources (11) of visible and/or ultraviolet radiation which consist of light-emitting diodes, especially for backlighting a liquid-crystal display screen[.]” Schiavoni, Abstract.
['382 Claim 17A] a backlighting panel comprising	“an optical system (100) for a lighting device having one or more sources (11) of visible and/or ultraviolet radiation which consist of light-emitting diodes, especially for backlighting a liquid-crystal display screen[.]” Schiavoni, Abstract.
['382 Claim 17B] a plurality of solid state light emitters arranged in a substantially planar	See Claim 1[a] and 1[e].

Claims of the '382 Patent	Schiavoni and Lim in view of Tabito and the Knowledge of a Person of Skill in the Art
configuration including a third distance between adjacent ones of the plurality of solid state light emitters,	
['382 Claim 17C] a first diffusion plane that is configured to receive light from the plurality of solid state light emitters and to transmit first diffused light, the first diffusion plane including a diffuser plate that is positioned a first distance from the plurality of solid state light;	<i>See</i> claims 1[b] and 11.
['382 Claim 17D] a second diffusion plane that is configured to receive the first diffused light and to transmit second diffused light	<i>See</i> claims 1[b] and 1[c].
['382 Claim 17E] a plurality of diffuser supports configured to support a first diffuser plane structure at a first distance from the plurality of solid state light emitters and to support a second	<i>See</i> claims 1[c], 4, and 8 Tabito, [0081], [0090]; Fig. 2

Claims of the '382 Patent	Schiavoni and Lim in view of Tabito and the Knowledge of a Person of Skill in the Art
diffuser plane structure at a second distance from the plurality of solid state light emitters, wherein the second distance is greater than the first distance; and	
['382 Claim 17F] a LCD display panel that is configured to receive the second diffused light and selectively transmit received light as display content,	<i>See</i> claims 10, 13[c], 13[d]. “On direct lighting screens, the light sources, placed inside the lighting device, illuminate in a direction substantially perpendicular to the LCD screen” Schiavoni, 1 “Disclosed is a light transmitting liquid crystal display apparatus used with advantage with a television receiver having a large-sized display not less than 30 inch. A backlight section (3) sending out illuminating light is formed by a plural number of rows made up of many light emitting units (15) arranged on the back Surface of a liquid crystal display panel (8).” Tabito, Abstract
['382 Claim 17G] wherein the first distance is a function of the third distance.	<i>See</i> claim 1[e].

XVII. The Combination of Schiavoni, Lim, and Tabito in View of Onishi Renders Obvious to a Person of Ordinary Skill in the Art Claims 18 and 20 of the '382 Patent

131. As described above, each element of claims 18 and 20 was known in the art. Further, in my opinion, a person of ordinary skill in the art would have

been motivated to modify the Schiavoni-Lim-Tabito combination to further include the extrusion peaks described in Onishi.

132. A person of ordinary skill in the art would have been motivated to combine Onishi to the Schiavoni-Lim-Tabito combination. As discussed, each of Schiavoni, Lim, and Tabito describes backlight assemblies for displays. However, the Schiavoni-Lim-Tabito combination does not expressly disclose that its diffuser plate comprises a plurality of extrusion peaks that are divided by a plurality of extrusion grooves or that the extrusion peaks include a peak angle in a range of about 120 degrees to 170 degrees. Onishi describes convexoconcave extrusion structures that will produce a diffusion plate with extrusion peaks that are divided by a plurality of extrusion grooves (Onishi, [0057]) including “a convexoconcave portion formed of prism having an apex angle 140 degrees.” Onishi, [0221].

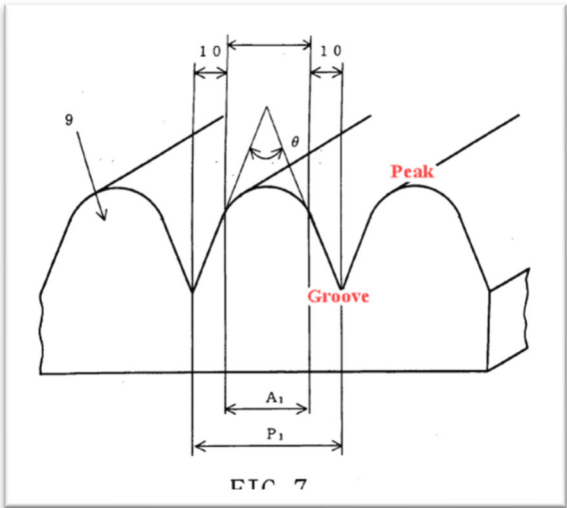
133. A person of ordinary skill in the art would have been motivated to combine Onishi’s extruded prismatic structures to Schiavoni’s optical element 100. Schiavoni describes that its diffusing areas “are ... preferentially associated with elongated patterns of the prism, lenticule, or Fresnel lens type.” Schiavoni, 9. Onishi describes additional extruded prismatic structures in connection with a diffuser plate. *See* Onishi, [0057]. A person of ordinary skill in the art would have been motivated to modify Schiavoni to include these prismatic structures to improve the total light transmittance of the light diffusion plane.

134. Further, this combination is nothing more than combining a known improvement in display backlighting as disclosed by Onishi and applying that improvement to the backlight disclosed by Schiavoni. A person of ordinary skill in the art would have been motivated to make this combination, and this combination would be within the skillset of a person of ordinary skill in the art at the time.

135. The references describe known options for generating optical features in a diffusion optical element. As with any optical diffusing element there is a trade-off between optical transmission and diffusivity – as diffusivity is increase there are more opportunities for various loss mechanisms in the material. The specifics of the diffusion geometry as defined by the selection and concentration and arrangement of diffusion features will be a consideration for person of ordinary skill in the art since they relate to the ultimate uniformity of the light from the backlight, as well as to the overall geometry (thickness), selection and arrangement of LEDs, and efficiency of the display. Again, these were known options for a person of ordinary skill in the art to consider when designing a backlight system for an LCD.

136. The claim chart below further demonstrates that the combination of Schiavoni, Lim, Tabito, and Onishi renders obvious to a person of ordinary skill in the art each element of claim 18 and 20 of the '382 Patent.

Claims of the '382 Patent	Schiavoni, Lim, and Tabito in view of Onishi and the Knowledge of a Person of Skill in the Art
['382 Claim 18] The device of claim 1, wherein the diffuser plate comprises a structured refractive diffuser that includes a plurality of extrusion peaks that are divided by a plurality of extrusion grooves.	“If two elements are used, the second element may preferentially be a refractive index material[.]” Schiavoni, 7 The “repeated pattern can be over the entire associated main face or only in areas preferably offset with respect to the sources. In the area or areas, the elongated elements can be essentially contiguous.” Schiavoni, 9. Schiavoni, Fig. 6 “Firstly, in order to mold a prism plane composed of a prism portion having an apex angle 40 degrees and flat portions disposed equally between each prism portion by a ratio of 30% to the whole plane and a convexoconcave portion formed of prism having an apex angle 140 degrees, respectively, a die having a plurality of grooves corresponding to each prism shape is manufactured by cutting work. Where, the plurality of grooves provided at intervals of 50 μm. The surface shape of the die manufactured by cutting work is formed of symmetry corresponding to the prism shape. The depth of the symmetric grooves is fixed in the plane” Onishi, [0221] Onishi, [0057]; Fig. 7

Claims of the '382 Patent	Schiavoni, Lim, and Tabito in view of Onishi and the Knowledge of a Person of Skill in the Art
	
[’382 Claim 20] The device of claim 18, wherein ones of the plurality of extrusion peaks include a peak angle in a range of about 120 degrees to 170 degrees.	See claim 18 “Firstly, in order to mold a prism plane composed of a prism portion having an apex angle 40 degrees and flat portions disposed equally between each prism portion by a ratio of 30% to the whole plane and a convexoconcave portion formed of prism having an apex angle 140 degrees, respectively, a die having a plurality of grooves corresponding to each prism shape is manufactured by cutting work. Where, the plurality of grooves provided at intervals of 50 μm. The surface shape of the die manufactured by cutting work is formed of symmetry corresponding to the prism shape. The depth of the symmetric grooves is fixed in the plane” Onishi, [0221]

XVIII. The Combination of Schiavoni, Lim, Tabito, and Onishi in View of Epstein Renders Obvious to a Person of Ordinary Skill in the Art Claim 19 of the '382 Patent

137. As described above, each element of claim 19 was known in the art.

Further, in my opinion, a person of ordinary skill in the art would have been

motivated to modify the Schiavoni-Lim-Tabito-Onishi to further include the plurality of crossed linear prismatic lenselets described in Epstein.

138. A person of ordinary skill in the art would have been motivated to combine Epstein to the Schiavoni-Lim-Tabito-Onishi combination. As discussed above, Schiavoni discloses a display for backlight assemblies. Schiavoni does not expressly disclose that the structured refractive diffuser comprises a plurality of crossed linear prismatic lenselets. However, Epstein is similarly in the field of LCD displays. *See* Epstein, Abstract. Epstein discloses “symmetrical, four sided prisms having curved or arced faces in both the XZ and YZ planes” for use in LCD displays. *See* Epstein, [0214].

139. A person of ordinary skill in the art would have been motivated to apply these structures to Schiavoni’s optical system 100. This combination is nothing more than combining a known improvement in the same field (display technology) to Schiavoni’s device in the same technical area. Further, a person of ordinary skill in the art would have been motivated to make this combination to provide improved lighting characteristics and viewing angles. As Epstein describes its “disclosed structures also have the advantage of reducing the effects of glare, Since they enable the image to be viewed from positions outside of the areas receiving unwanted specularly reflected light from the various surfaces and interfaces of the display.” Epstein, [0005]. A person of ordinary skill in the art

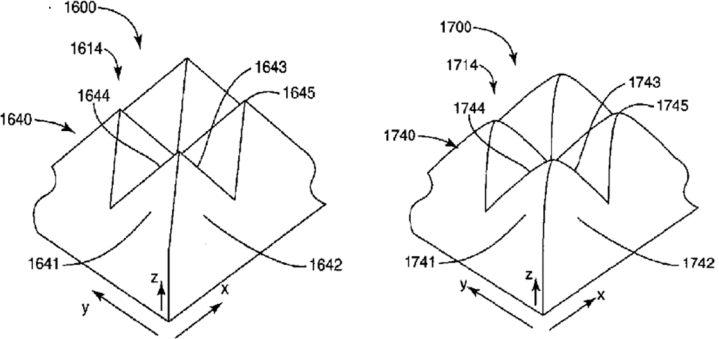
would have been motivated to apply Epstein’s structures to Schiavoni’s diffusing plate 4 to take advantage of these improvements.

140. The references describe known options for generating optical features in a diffusion optical element. As with any optical diffusing element there is a trade-off between optical transmission and diffusivity – as diffusivity is increase there are more opportunities for various loss mechanisms in the material. The specifics of the diffusion geometry as defined by the selection and concentration and arrangement of diffusion features will be a consideration for a person of ordinary skill in the art since they relate to the ultimate uniformity of the light from the backlight, as well as to the overall geometry (thickness), selection and arrangement of LEDs, and efficiency of the display. Again, these were known options for a person of ordinary skill in the art to consider when designing a backlight system for an LCD.

141. The claim chart below further demonstrates that the combination of Schiavoni, Lim, Tabito, Onishi, and Epstein renders obvious to a person of ordinary skill in the art each element of claim 19 of the ’382 Patent.

Claims of the ’382 Patent	Schiavoni, Lim, Tabito, and Onishi in view of Epstein and the Knowledge of a Person of Skill in the Art
[’382 Claim 19] The device of claim 18, wherein the structured refractive diffuser comprises a plurality of	“The system 100 consists of a plastic or preferably a glass substrate, 3 mm thick. Its upper face 120 is texturized, for example by printing a laminated glass, to obtain the grooves 121 of the prism type with a triangular section, with an apex angle of

Claims of the '382 Patent	Schiavoni, Lim, Tabito, and Onishi in view of Epstein and the Knowledge of a Person of Skill in the Art
crossed linear prismatic lenselets.	preferably 90°, of height h1 equal to 1 mm for example.” Schiavoni, 16. Examples 24 through 29 are examples of films having a plurality of pyramidal prisms.” Epstein, [0213] “For Example 25 in FIG. 30A, prisms 1740 are symmetrical, four sided prisms having curved or arced faces in both the XZ and YZ planes. Prisms 1740 have four faces, 1741, 1742, 1743, 1744, which meet at apex 1745. Apex 1745 is not a sharp peak as is apex 1645 from film 1600 of Example 24; rather, apex 1745 has a fairly rounded surface, formed by the intersection of arc curves extending in both the x-direction and the y-direction. When collimated normally incident light is provided on film 1700, the light is split into four directions, and four discrete regions of reflectances, each shaped approximately as a square, are formed; see FIG. 30B. The square or rectangular regions of reflected light are caused by the four distinct, curved prism faces 1741, 1742, 1743, 1744 which form the repeat cell..” Epstein, [0215] “For Example 24, prisms 1640 are symmetric, isosceles prisms having straight faces in both the XZ and YZ planes. Each prism 1640 has a first face 1641, a second face 1642, a third face 1643 and a fourth face 1644. The four faces meet at apex 1645.” Epstein, [0214] Epstein, Figs. 29A & 30A

Claims of the '382 Patent	Schiavoni, Lim, Tabito, and Onishi in view of Epstein and the Knowledge of a Person of Skill in the Art
	 Fig. 29A Fig. 30A

XIX. The Combination of Kobayashi and Lim Renders Obvious to a Person of Ordinary Skill in the Art Claim 8 of the '382 Patent

142. As described above, each element of claim 8 was known in the art.

Further, in my opinion, a person of ordinary skill in the art would have been motivated to modify Kobayashi to include the specific distance ratios disclosed in Lim.

143. A person of ordinary skill in the art would have been motivated to modify Kobayashi's diffuser plates 4 and 5 and spacing of light sources to include the spacing disclosed by Lim. Kobayashi discloses a backlighting system including a multi-plane light diffuser and describes specific distances between the light sources and the lighting elements and diffuser plates and relationships between those distances. Lim similarly discloses a diffusion plate and a lighting source, and expressly discloses a relationship "between a diffusion plate and a lamp in accordance with the distance between lamps having the same visible angle." Lim,

[0057]. Lim acknowledges that “the farther the interval between the lamps realizing the same color is, the longer the interval between the lamp and the diffusion plate is. Lim, [0058]. Additionally, “as shown in [Lim’s] FIG. 4B, the closer the interval between the lamps is, the narrower the interval between the lamp and diffusion plate.” Lim, [0059]. Lim further discloses that the first distance of 5mm is one half the third distance of 10mm. Lim, [0047] (“a distance between the respective lamps or chips is designed to be within 10 mm, inclusive, and another distance between an LED lamp (or chip) and a diffusion plate is designed to be within 5 mm, inclusive.”).

144. A person of ordinary skill in the art would have been motivated to modify the backlighting system of Kobayashi to include the spacing relationship described by Lim because this enables the overall backlight structure to be designed with fewer diffuser plates and have a thinner structure. This combination is nothing more than the application of a known distance relationship in a backlighting structure as taught by Lim to another known backlighting structure as taught by Kobayashi. This combination would have been within the skillset of a person of ordinary skill in the art and is nothing more than modifying the positioning of elements already described in Kobayashi to account for spacing considerations expressly disclosed in Lim.

145. The specific diffusing capabilities of the diffuser elements and the specific optical distribution of the LED light sources would require adjustments to the spacing of the various elements to achieve optimal optical uniformity, cost, and thickness of the backlighting module. As Lim shows, and as was well known in the practice of optical engineering, the distance of an optical element from a light source or group of light sources affects the interaction of the optical element with the light source, as shown by Lim figures 4A and 4B. The optical spread of the light sources, the influence of back reflected light, the level of diffusion provided by the diffuser element would all be additional elements for consideration that bely the use of a simplistic spatial relationship for actual engineering purposes. A person of ordinary skill in the art would be motivated to explore the engineering options described by references in the current art and would expect to find optimal configurations for the desired characteristics based on the specific features of the various components. In other words, the use of the distance relationships expressly disclosed by Lim in the Kobayashi system is nothing more than a design choice.

146. The claim chart below further demonstrates that the combination of Kobayashi and Lim renders obvious to a person of ordinary skill in the art each element of claim 8 of the '382 Patent.

Claims of the '382 Patent	Kobayashi and Lim in view of Epstein and the Knowledge of a Person of Skill in the Art
['382 Claim 8] The device of claim 2,	“Usually, a plurality of LEDs are arranged two-dimensionally on the main surface of the substrate 2 at

wherein the plurality of solid state emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, and wherein the first distance comprises approximately one half the third distance.	regular intervals. In the present invention, b is the distance between the center of two adjacent LEDs 1, a is the distance from the surface of the LED 1 to the light emitting surface of the diffusing plate at the most exiting side, and c is the distance from the surface of the LED 1 to the lensed diffusing plate 4” Kobayashi, [0019] “c is 0.1 mm or more, and if it is less than 0.1 mm, the Diffusing plate 4 with lenses may come into contact with the LEDs 1 when the Diffusing plate 4 with lenses is bent, which is not preferable. The ratio of c/b is preferably in the range of 2×10^{-3} to 0.4. Less than 2×10^{-3} is undesirable because the eye-catching lamp image is unlikely to disappear, causing uneven brightness, which is not preferable.” Kobayashi, [0020] Fig. 1
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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.

August 7, 2023

Date



Dr. F. Morgan Pattison