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AU OPTRONICS CORPORATION AMERICA

By Fax

UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

AU OPTRONICS CORPORATION, a Taiwanese corporation, and AU OPTRONICS CORPORATION AMERICA, a California corporation Plaintiffs, v. SHARP CORPORATION a.k.a. SHARP KABUSHIKI KAISHA, a Japanese corporation, and SHARP ELECTRONICS CORPORATION, a New York corporation, Defendants.	CASE NO. **SACV11-00338 CJC (RNBx)** **COMPLAINT FOR PATENT INFRINGEMENT** **DEMAND FOR JURY TRIAL**

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Plaintiffs AU OPTRONICS CORPORATION and AU OPTRONICS CORPORATION AMERICA (collectively, "AUO") for its complaint against defendants SHARP CORPORATION a.k.a. SHARP KABUSHIKI KAISHA ("Sharp Japan") and SHARP ELECTRONICS CORPORATION ("Sharp America") (collectively, "Sharp" or the "Defendants") state and allege as follows:

JUISDICTION AND VENUE

1. This action is based upon and arises under the Patent Laws of the United States, 35 U.S.C. § 100 et seq., and in particular §§ 271, 281, 283, 284 and 285, and is intended to redress infringement of the Patents-in-Suit owned by AU Optronics Corporation and AU Optronics Corporation America. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

2. Defendants have transacted and continue to transact business in the United States and in the Southern Division of this judicial district by: using or causing to be used; making; importing or causing to be imported; offering to sell or causing to be offered for sale; and/or selling or causing to be sold directly, through intermediaries and/or as an intermediary, a variety of products that infringe the Patents-in-Suit.

3. This Court has personal jurisdiction over Sharp Japan, and venue is proper in this judicial district pursuant to 28 U.S.C. §§ 1391 (b), (c) and (d), and 28 U.S.C. § 1400(b), in that the Defendants are committing and are causing acts of patent infringement within the United States and within this judicial district, including the infringing acts alleged herein, both directly, through one or more intermediaries, and as an intermediary, and in that Sharp Japan has caused and causes injury and damages in this judicial district by acts or omissions outside of this judicial district, including but not limited to utilization of its own distribution channels established in the United States, to import a variety of products that infringe the Patent-in-Suit into the United States and into this judicial district while

deriving substantial revenue from services or things used or consumed within this judicial district, and will continue to do so unless enjoined by this Court.

4. This Court has personal jurisdiction over Sharp America and venue is proper in this judicial district pursuant to 28 U.S.C. §§ 1391 (b) and (c), and 28 U.S.C. § 1400(b), in that the Defendants are committing acts of patent infringement within the United States and within this judicial district, including the infringing acts alleged herein, both directly, through one or more intermediaries, and as an intermediary.

5. On information and belief, Sharp America regularly imports large quantities of Sharp Japan products into the United States for distribution throughout the United States, including in the Southern Division of this judicial district. On information and belief, Sharp America is involved in the distribution of LCD products that infringe that Patents-in-Suit and is aware that its products are sold throughout the United States, including in the Southern Division of the Central District of California. On information and belief, the established distribution networks of the Defendants consist of national distributors and resellers, and the Defendants distribute to national retailers that have stores located in the Southern Division of the Central District of California. By shipping into, offering to sell in, using, or selling products that infringe the Patents-in-Suit in this judicial district, or by inducing or causing those acts to occur, Sharp America has transacted business and performed works and services in this judicial district, has contracted to supply services and things in this judicial district, and has caused injury and damages in this judicial district while deriving substantial revenue from services or things used or consumed within this judicial district.

NATURE OF THE ACTION

6. AU Optronics Corporation and AU Optronics Corporation America are the owners of United States Patent No. 7,723,728 ("the '728 patent"), United

States Patent No. 7,771,098 ("the '098 patent"), and United States Patent No. 7,101,073 ("the '073 patent) (collectively, the "Patents-in-Suit").

7. This is a civil action for the infringement of the Patents-in-Suit, including the willful infringement of the Patents-in-Suit by Defendants.

8. The technology at issue involves the design and manufacture of Liquid Crystal Display ("LCD") modules, and thin film transistors on LCD glass panels, which are both types of flat panel displays that are incorporated into a variety of devices, including at least LCD portable computers and handheld devices, LCD computer monitors, and LCD televisions.

THE PARTIES

9. AU Optronics Corporation is a corporation existing under the laws of Taiwan, R.O.C., having a principal place of business located at No. 1 Li-Hsin Road 2, Science-Based Industrial Park, Hsinchu 300, Taiwan, R.O.C.

10. AU Optronics Corporation America is a California corporation, having a principal place of business at 1525 McCarthy Blvd., Milpitas, CA 95035.

11. On information and belief, Sharp Japan is a corporation existing under the laws of Japan, with a principal place of business located at 22-22 Nagaike-cho, Abeno-ku, Osaka, Japan 545-8522.

12. On information and belief, Sharp America is a corporation existing under the laws of New York, with a principal place of business located at Mahwah, New Jersey. On information and belief, Sharp America is a wholly owned subsidiary of Sharp Japan that either directly or indirectly imports into, sells, and/or offers for sale Sharp Japan products in the Central District of California and elsewhere in the United States. On information and belief, Sharp America has its principal place of business at Sharp Plaza, Mahwah, New Jersey 07495-1163.

13. On information and belief, Sharp America's Western Regional Office, a 539,000-square-foot facility, which serves as the hub for sales, marketing, service and warehousing operations in the Western United States, is located in the

Southern Division of the Central District of California at 5901 Bolsa Avenue, Huntington Beach, California 92647.

14. On information and belief, Sharp America is registered to do business in California.

THE PATENTS-IN-SUIT

15. On May 25, 2010, the '728 patent, entitled "Fan-out wire structure for a display panel" was duly and legally issued. AU Optronics Corporation and AU Optronics Corporation America are the owners by assignment of all rights, title, and interest in and to the '728 patent. A copy of the '728 patent is attached as Exhibit A.

16. On August 10, 2010, the '098 patent, entitled "Multi-primary color display" was duly and legally issued. AU Optronics Corporation and AU Optronics Corporation America are the owners by assignment of all rights, title, and interest in and to the '098 patent. A copy of the '098 patent is attached as Exhibit B.

17. On September 5, 2006, the '073 patent, entitled "Light Positioning Device" was duly and legally issued. AU Optronics Corporation and AU Optronics Corporation America are the owners by assignment of all rights, title, and interest in and to the '073 patent. A copy of the '073 patent is attached as Exhibit C.

18. AU Optronics Corporation and AU Optronics Corporation America own the Patents-in-Suit and possesses the right to sue and to recover for infringement of the Patents-in-Suit.

COUNT I

INFRINGEMENT OF THE '728 PATENT

19. The allegations in the foregoing paragraphs of this Complaint are incorporated by reference herein as if restated and set forth in full.

20. In violation of 35 U.S.C. § 271, Defendants are now, and have been, directly infringing, contributorily infringing and/or inducing infringement of the '728 patent by, among other things, making, using, causing to be used, offering to sell, causing to be offered for sale, selling, causing to be sold, importing and/or causing to be imported without authority or license LCD devices (including but not limited to LCD panels and LCD modules) manufactured by Sharp, its subsidiaries, and its agents or third-party contract manufacturers and LCD products containing such Sharp LCD devices.

21. On information and belief, Defendants have had knowledge of the '728 patent through direct or indirect communications with AUO and/or as a result of their participation in the LCD industry. Thus Defendants' infringement of the '728 patent is and has been deliberate and willful.

22. Unless enjoined, Defendants will continue to infringe the '728 patent, and AUO will suffer irreparable injury as a direct and proximate result of Defendants' conduct.

23. AUO has been damaged by Defendants' conduct, and until an injunction issues will continue to be damaged in an amount yet to be determined.

COUNT II

INFRINGEMENT OF THE '098 PATENT

24. The allegations in the foregoing paragraphs of this Complaint are incorporated by reference herein as if restated and set forth in full.

25. In violation of 35 U.S.C. § 271, Defendants are now, and have been, directly infringing, contributorily infringing and/or inducing infringement of the '098 patent by, among other things, making, using, causing to be used, offering to sell, causing to be offered for sale, selling, causing to be sold, importing and/or causing to be imported without authority or license LCD devices (including but not limited to LCD panels and LCD modules) manufactured by Sharp, its subsidiaries,

and its agents or third-party contract manufacturers and LCD products containing such Sharp LCD devices.

26. On information and belief, Defendants have had knowledge of the '098 patent through direct or indirect communications with AUO and/or as a result of their participation in the LCD industry. Thus Defendants' infringement of the '098 patent is and has been deliberate and willful.

27. Unless enjoined, Defendants will continue to infringe the '098 patent, and AUO will suffer irreparable injury as a direct and proximate result of Defendants' conduct.

28. AUO has been damaged by Defendants' conduct, and until an injunction issues will continue to be damaged in an amount yet to be determined.

COUNT III

INFRINGEMENT OF THE '073 PATENT

29. The allegations in the foregoing paragraphs of this Complaint are incorporated by reference herein as if restated and set forth in full.

30. In violation of 35 U.S.C. § 271, Defendants are now, and have been, directly infringing, contributorily infringing and/or inducing infringement of the '073 patent by, among other things, making, using, causing to be used, offering to sell, causing to be offered for sale, selling, causing to be sold, importing and/or causing to be imported without authority or license LCD devices (including but not limited to LCD panels and LCD modules) manufactured by Sharp, its subsidiaries, and its agents or third-party contract manufacturers and LCD products containing such Sharp LCD devices.

31. On information and belief, Defendants have had knowledge of the '073 patent through direct or indirect communications with AUO and/or as a result of their participation in the LCD industry. Thus Defendants' infringement of the '073 patent is and has been deliberate and willful.

32. Unless enjoined, Defendants will continue to infringe the '073 patent, and AUO will suffer irreparable injury as a direct and proximate result of Defendants' conduct.

33. AUO has been damaged by Defendants' conduct, and until an injunction issues will continue to be damaged in an amount yet to be determined.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs AUO prays for judgment as follows:

A. That the Defendants have directly and/or indirectly infringed the Patents-in-Suit;

B. That the Defendants' infringement of the Patents-in-Suit has been willful;

C. That the Defendants and their parents, subsidiaries, affiliates, successors, predecessors, assigns, and the officers, directors, agents, servants and employees of each of the foregoing, and those persons acting in concert or participation with any of them, are preliminarily and permanently enjoined and restrained from continued infringement, including but not limited to using, making, importing, offering for sale and/or selling products that infringe, and from contributorily and/or inducing the infringement of the Patents-in-Suit prior to their expiration, including any extensions;

D. That AUO be awarded monetary relief adequate to compensate AUO for the Defendants' acts of infringement of the Patents-in-Suit within the United States prior to the expiration of the Patents-in-Suit, including any extensions;

E. That any monetary relief awarded to AUO regarding the infringement of the Patents-in-Suit by Defendants be trebled due to the willful nature of the Defendants' infringement of the Patents-in-Suit;

F. That any monetary relief awarded to AUO be awarded with prejudgment interest;

G. That this is an exceptional case and that AUO be awarded the attorneys' fees, costs and expenses that it incurs prosecuting this action; and

H. That AUO be awarded such other and further relief as this Court deems just and proper.

DATED: March 2, 2011

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DEMAND FOR JURY TRIAL

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, Plaintiffs AU Optronics Corporation and AU Optronics Corporation America respectfully demands a trial by jury on all issues so triable in this action.

DATED: March 2, 2011

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TABLE OF EXHIBITS

EXHIBIT A

US007723728B2

(12) **United States Patent**
Chen et al.

(10) **Patent No.: US 7,723,728 B2**
(45) **Date of Patent: May 25, 2010**

(54) **FAN-OUT WIRE STRUCTURE FOR A DISPLAY PANEL**

(75) Inventors: **Kun-Hong Chen**, Danshuei Township, Taipei County (TW); **Wen-Rei Guo**, Jhunan Township, Miaoli County (TW)

(73) Assignee: **Au Optronics Corporation**, Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 911 days.

(21) Appl. No.: **11/438,382**

(22) Filed: **May 22, 2006**

(65) **Prior Publication Data**

US 2007/0039706 A1 Feb. 22, 2007

(30) **Foreign Application Priority Data**

Aug. 19, 2005 (TW) ..... 94128484 A

(51) **Int. Cl.**
H01L 27/12 (2006.01)

(52) **U.S. Cl.** **257/72**; 257/E23.062; 257/29; 257/751; 349/151; 349/152; 345/98

(58) **Field of Classification Search** 257/E23.062, 257/E23.07, E23.178, 72, 207, 751, E21.413, 257/29, 258; 162/301; 29/603.18, 603.25, 29/831, 847; 349/152, 151, 147–149; 345/90, 345/98–100; 174/254, 260; 438/30, 149
See application file for complete search history.

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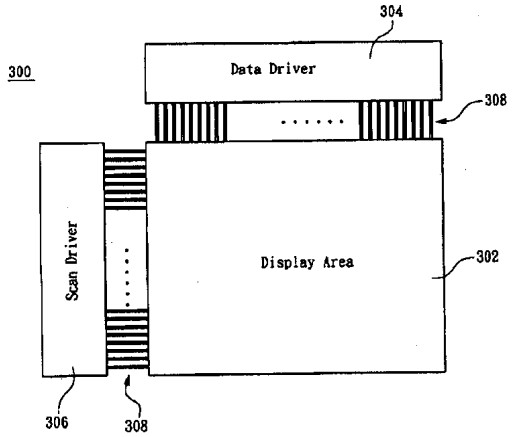
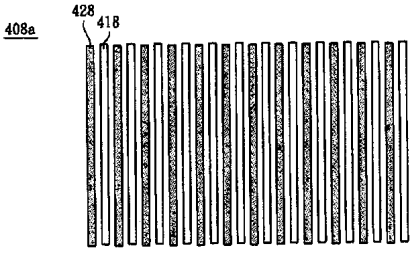
Primary Examiner—Chris C Chu
(74) *Attorney, Agent, or Firm*—Thomas, Kayden, Horstemeyer & Risley

(57) **ABSTRACT**

A fan-out wire structure is used to connect a driver and a display region of a display panel and has a plurality of first single-layer wires and at least one second single-layer wire. The first ends of the first single-layer wires are connected to the driver, and the second ends of the first single-layer wires are connected to the display area. The first end of the second single-layer wire is connected to the driver, and the second end of the second single-layer wire is connected to the display area. A metal layer of the first single-layer wires is different from a metal layer of the second single-layer wire.

7 Claims, 4 Drawing Sheets





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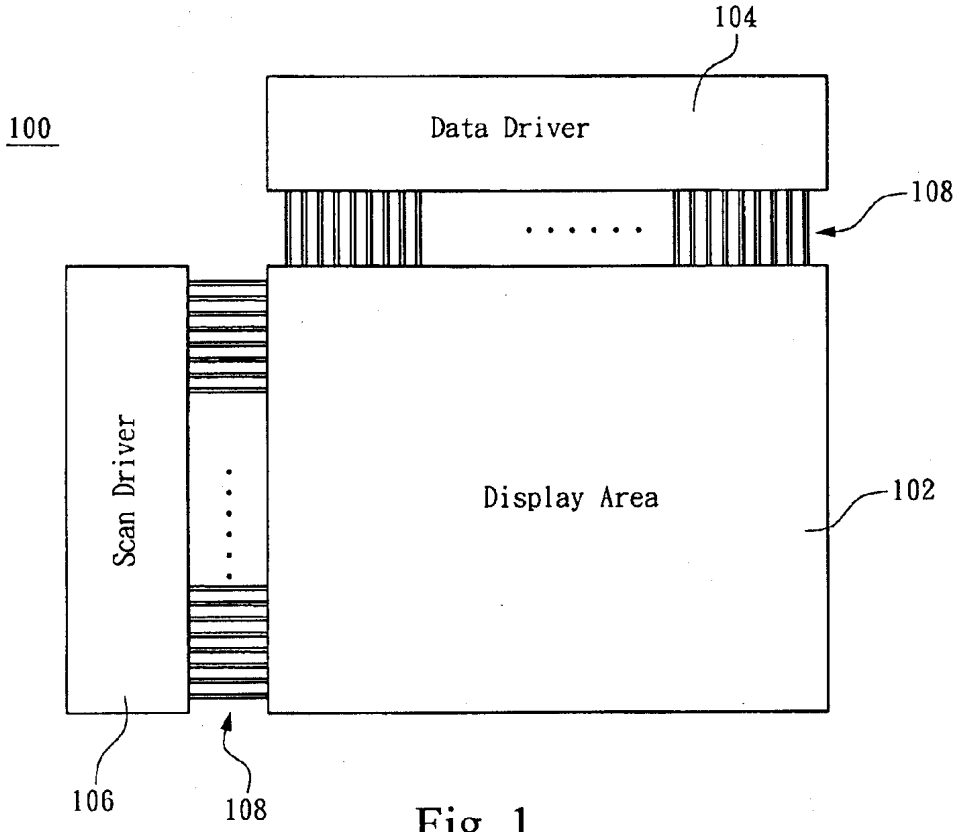

Fig. 1
(Prior Art)

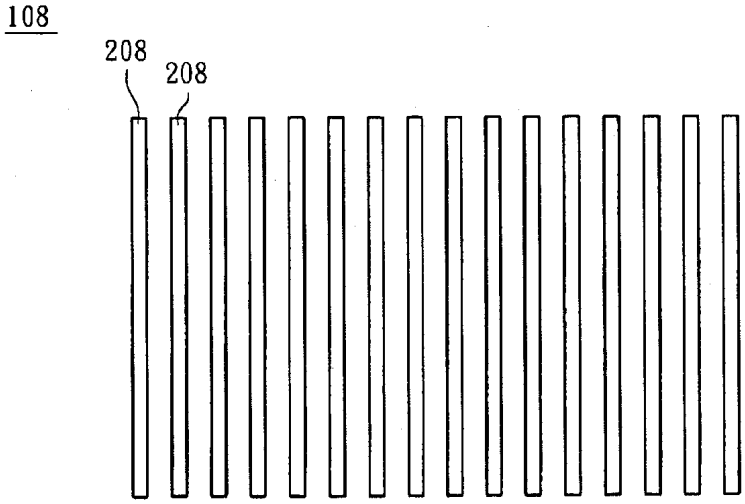

Fig. 2
(Prior Art)

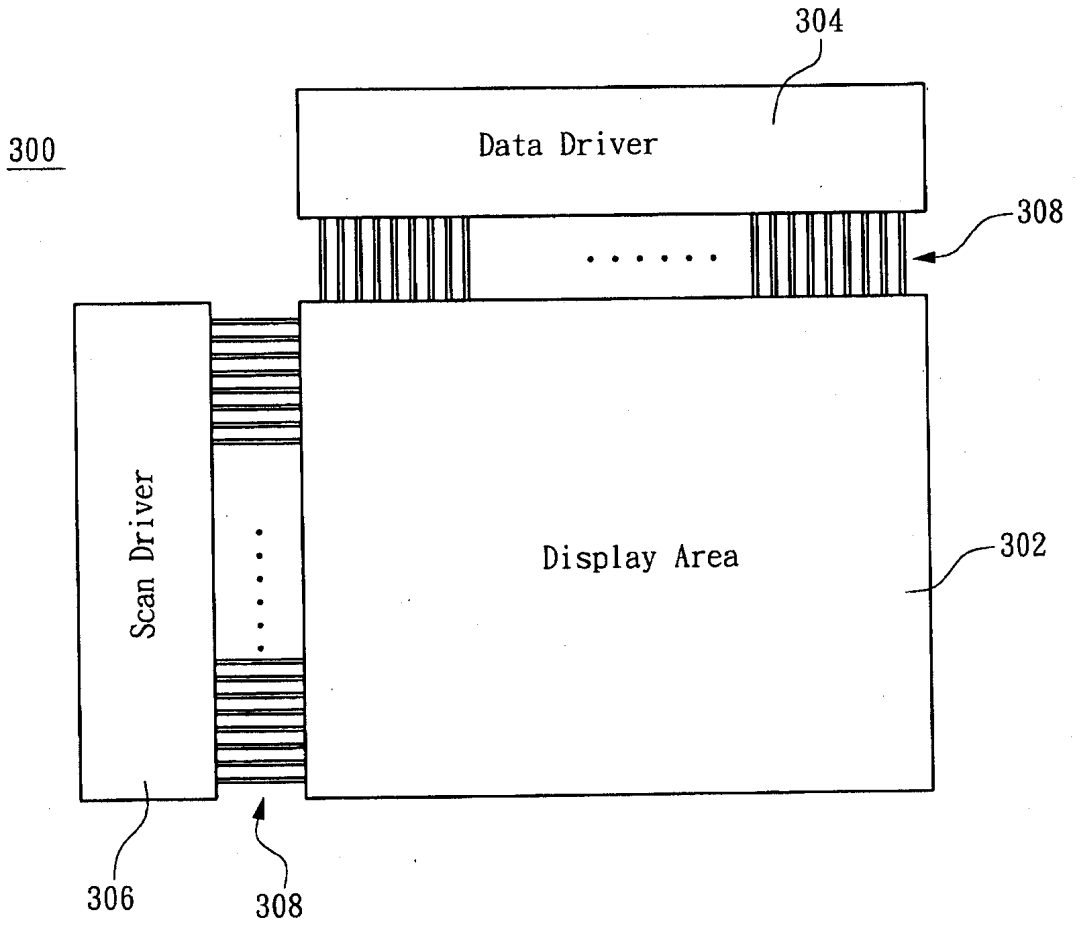

Fig. 3

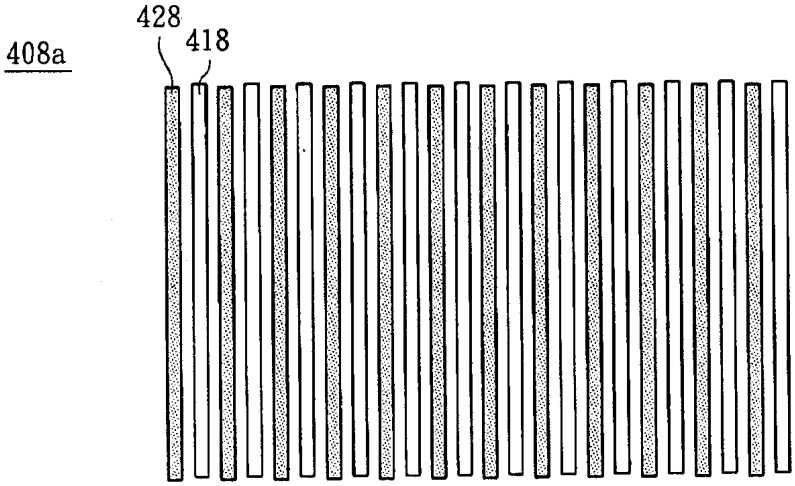

Fig. 4A

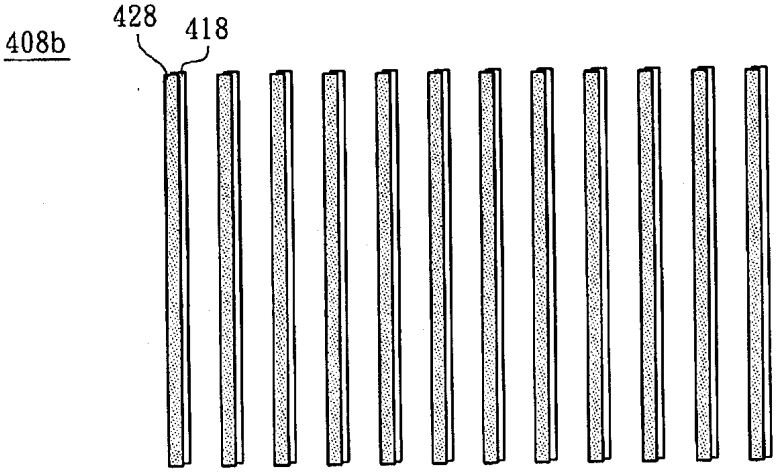

Fig. 4B

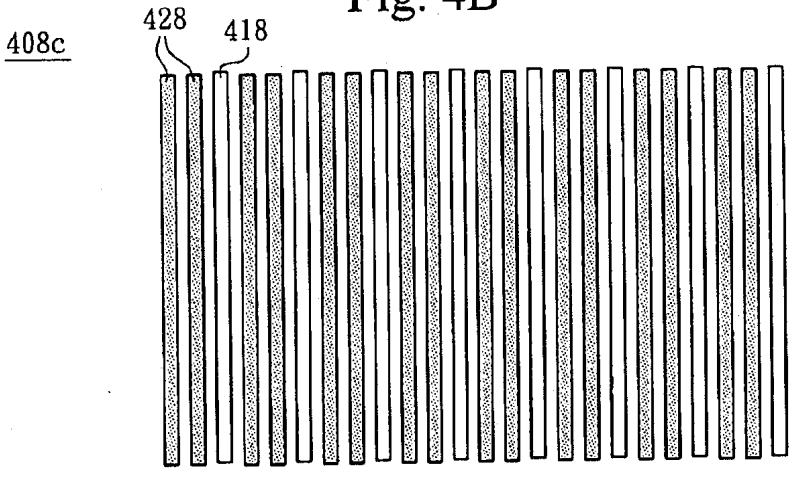

Fig. 4C

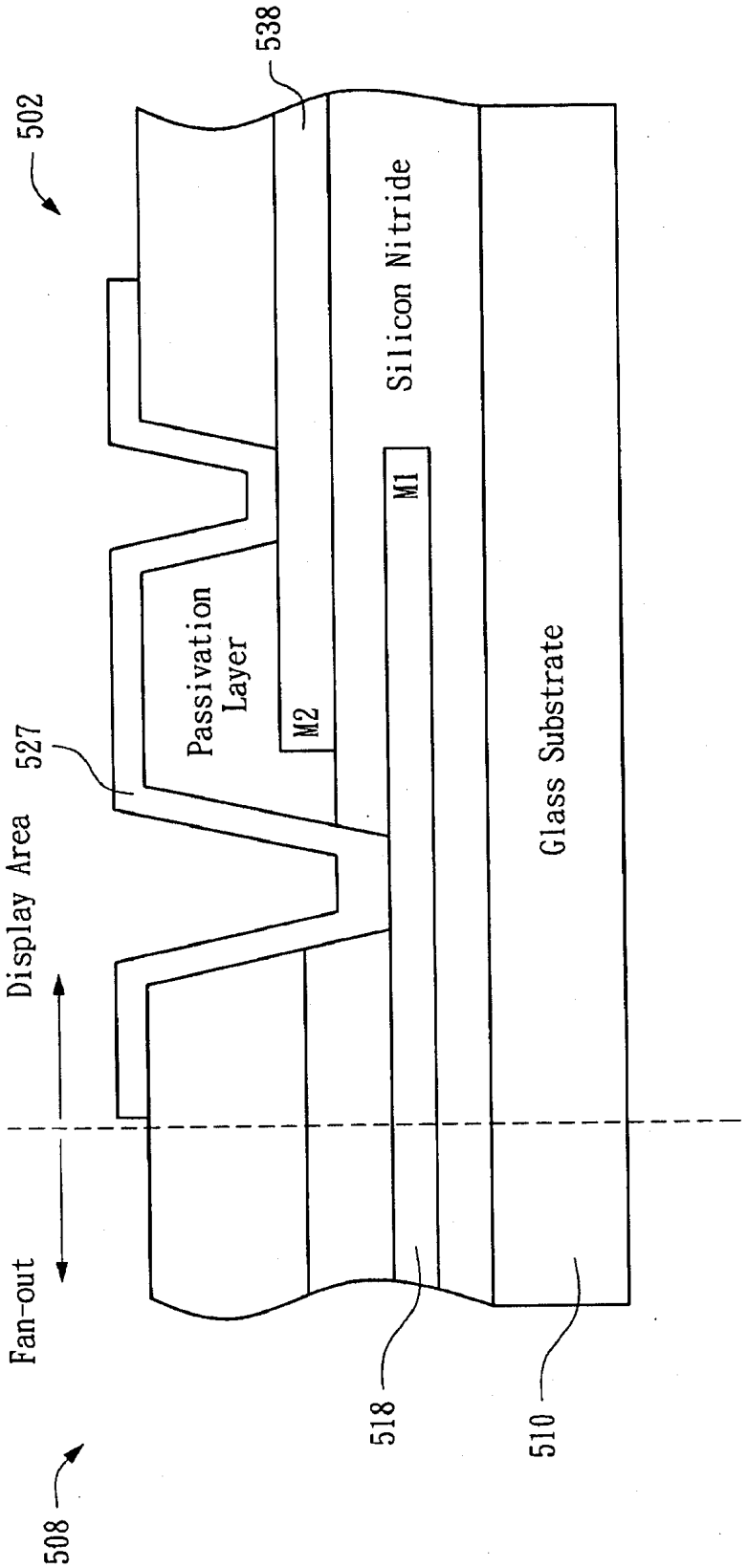
538
502
Silicon Nitride
M1
Passivation Layer
M2
Glass Substrate
527
Display Area
Fan-out
518
510
508

Fig. 5

FAN-OUT WIRE STRUCTURE FOR A DISPLAY PANEL

RELATED APPLICATIONS

The present application is based on, and claims priority from, Taiwan Application Serial Number 94128484, filed Aug. 19, 2005, the disclosure of which is hereby incorporated by reference herein in its entirety.

BACKGROUND

1. Field of Invention

The present invention relates to a display panel. More particularly, the present invention relates to a fan-out wire structure for the display panel.

2. Description of Related Art

Flat panel displays such as a liquid crystal display (LCD) and a plasma display have the advantages of high image quality, small size, light weight and a broad application range, and thus are widely applied on consumer electronic products such as a mobile phone, a notebook computer, a desktop display and a television, and have gradually replaced the conventional CRT displays as the main trend in the display industry. The requirements of the so-called big area and high resolution also become the key factors claimed by the flat panel displays.

FIG. **1** is a schematic diagram showing a conventional display panel. In a display panel **100**, driver chips located on a data driver **104** and a scan driver **106** provide signals respectively to data lines and scan lines in a display area **102** via their own fan-out wire structures **108**. Since the pin gaps of the driver chips are small and the gaps among the data lines or scan lines are large, the ends of the fan-out wire structures **108** close to the data driver **104** and the scan driver **106** has a smaller area and other ends of the fan-out wire structures **108** close to the display area **102** has a larger area, thus showing a fan-shaped area.

FIG. **2** is a schematic diagram showing the conventional fan-out wire structure. Generally speaking, different single-layer metal layers are used to form the wires **208** in accordance with different drivers **104** and **106** connected to the fan-out wire structures **108**. For example, in the fan-out wire structure **108** connected to the data driver **104**, the wires **208** thereof are formed from a second metal layer (M2) on the display panel; and in the fan-out wire structure **108** connected to the scan driver **106**, the wires **208** thereof are formed from a first metal layer (M1) on the display panel.

However, with the increasing resolution of the flat panel display and the decreasing size of the display frame, the gaps among the wires **208** are also reduced and have approached to the limits allowed by the design rule. Moreover, for preventing signal quality from being affected by different lengths of transmission paths, the wires **208** in the fan-out wire structure **108** sometimes may need extra curves to provide the transmission paths of equal impedance, and yet, this method takes more space. Hence, the aforementioned conventional skill using one single-layer metal layer to construct all of the wires in the same fan-out wire structure **108** cannot satisfy the current requirements, and cannot be used for fabricating flat panel displays having higher resolution, lighter weight and thinner size, and better display quality.

SUMMARY

Hence, one aspect of the present invention is to provide a fan-out wire structure for a display panel, thereby fabricating a flat panel display with higher resolution, lighter weight and thinner size, and better display quality.

In accordance with a preferred embodiment, the fan-out wire structure comprises a plurality of wires. Each of the wires is formed from a single-layer metal layer, wherein the single-layer metal layer of at least one wire is different from the single-layer metal layer of the other wires.

In accordance with another preferred embodiment, the fan-out wire structure is located on a glass substrate of a display panel, and the fan-out wire structure comprises a plurality of wires. The wires are formed respectively from a first metal layer and a second metal layer formed on a glass substrate, wherein at least one of the wires is of the first metal layer, and at least one of the other wires is of the second metal layer, and each of the wires is not across both of the first metal layer and the second metal layer.

In accordance with still another preferred embodiment, the fan-out wire structure is used for connecting a driver to a display area in a display panel, and the fan-out wire structure comprises a plurality of first single-layer wires and at least one second single-layer wire. One end of each of the first single-layer wires is connected to the driver, and the other end of each of the first single-layer wires is connected to the display area. One end of the second single-layer wire is connected to the driver, and the other end of the second single-layer wire is connected to the display area, wherein the metal layer of the first single-layer wires is different from the metal layer of the second single-layer wire.

It is to be understood that both the foregoing general description and the following detailed description are examples, and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and accompanying drawings where:

FIG. **1** is a schematic diagram showing a conventional display panel;

FIG. **2** is a schematic diagram showing the conventional fan-out wire structure;

FIG. **3** is a schematic diagram showing a display panel according to a preferred embodiment of the present invention;

FIG. **4**A is a schematic diagram showing a fan-out wire structure according to a preferred embodiment of the present invention;

FIG. **4**B is a schematic diagram showing a still another fan-out wire structure according to a preferred embodiment of the present invention;

FIG. **4**C is a schematic diagram showing a further another fan-out wire structure according to a preferred embodiment of the present invention; and

FIG. **5** illustrates a cross-sectional view showing a preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

The present invention is featured in forming individual wires by using different single-layer metal layers, thereby

promoting the wire distribution density in the fan-out wire structure via a plurality of metal layers and the wires each of which are not across different metal layers, thus fabricating a flat panel display with higher resolution, lighter weight and smaller size and better display quality.

FIG. **3** is a schematic diagram showing a display panel according to a preferred embodiment of the present invention, wherein a display panel **300** comprises a display area **302**, a data driver **304** and a scan driver **306**. The display panel **300** can be used in such as a liquid crystal display, a plasma display, an organic electroluminescent display, an optical interference display or other suitable flat panel displays.

The driver chips disposed in the data driver **304** and the scan driver **306** provide signals respectively to data lines and scan lines in the display area **302** via their own fan-out wire structures **308**. Since the pin gaps of the driver chips are small and the gaps among the data lines or scan lines are large, the ends of the fan-out wire structures **308** close to the data driver **304** and the scan driver **306** has a smaller area and other ends of the fan-out wire structures **308** close to the display area **302** has a larger area, thus showing a fan-shaped area.

FIG. **4**A is a schematic diagram showing a fan-out wire structure according to a preferred embodiment of the present invention, wherein a fan-out wire structure **408***a* comprises a plurality of wires **418** and a plurality of wires **428**. Each of the wires **418** is formed form a first metal layer M1 alone, and each of the wires **428** is formed form a second metal layer M2 alone, i.e. each of the wires **418** or **428** is formed from a single-layer metal layer M1 or M2, and the metal layer of at least one wire is different from the metal layer of the other wires.

In one aspect, the fan-out wire structure **408***a* is located on a glass substrate of a display panel, and comprises a plurality of wires **418** and **428**. The wires **418** and **428** are formed respectively from a first metal layer M1 and a second metal layer M2, wherein at least one wire (**418**) is of the first metal layer M1, and at least another wire (**428**) is of the second metal layer M2. Each of the wires **418** or **428** is not across the metal layers, i.e. each individual wire has to be formed from one single-layer metal layer M1 or Me alone.

In the other aspect, referring to FIG. **3** and FIG. **4**A, the fan-out wire structure **408***a* is used for connecting the display area **302** to the driver **304** or **306**, and comprises a plurality of single-layer wires **418** and at least one single-layer wire **428**. One end of each first single-layer wire **418** is connected to the driver **304** or **306**, and the other end of each first single-layer wire **418** is connected to the display area **302**. One end of the second single-layer wire **428** is connected to the driver **304** or **306**, and the other end of the second single-layer wire **428** is connected to the display area **302**.

The first metal layer M1 of the first single-layer wires **428** is different from the second metal layer M2 of the second single-layer wire **418**. Moreover, the single-layer wires **418** and **428** are connected to a plurality of pins of the driver **304** or **306** in a one-to-one relationship, i.e. to the pins of a driver chip.

FIG. **4**B is a schematic diagram showing a still another fan-out wire structure according to a preferred embodiment of the present invention; and FIG. **4**C is a schematic diagram showing a further another fan-out wire structure according to a preferred embodiment of the present invention. FIG. **4**A to FIG. **4**C are referenced for explaining the relationships between different single-layer wires and different single-layer metal layers thereof.

In accordance with the preferred embodiments of the present invention, the wires **418** and **428** are arranged in a predetermined sequence in the fan-out wire structure **408***a* according to the respective single-layer metal layers of the wires **418** and **428**. Further, two adjacent ones of the wires **418** and **428** are located on different metal layers, i.e. in case one of the two adjacent wires is located on the first metal layer M1, and the other one thereof is located on the second metal layer M2.

Such as shown in FIG. **4**A, the wires **418** and **428** of different single-layer metal layers are alternately arranged, i.e. those next to both sides of the wires **418** located on the first metal layer M1 are the wires **428** located on the second metal layer M2. Or, such as shown in FIG. **4**B, the wires **428** of the second metal layer M2 also can be formed directly above the wires **418** of the first metal layer M1.

Accordingly, the minimum gap between two wires **418** located on the first metal layer M1 can be as small as the limit allowed by the design rule, and the minimum gap between two wires **428** located on the second metal layer M2 also can be as small as the limit allowed by the design rule. By means of the arrangement in which two adjacent wires **418** and **428** are of different single-layer metal layers M1 and M2 respectively, the gap between two adjacent wires **418** and **428** can be as small as the limit allowed by the design rule, thereby increasing the number of wires accommodated in the fan-out wire structure and promoting the signal transmission quality.

A proper arrangement method between the wires **418** and the wires **428** may be selected by those who are skilled in the art in accordance with the requirement of design and specification, and is not limited to the one-to-one arrangement method shown in FIG. **4**A or FIG. **4**B. Such as shown in FIG. **4**C, one wire **428** located on the second metal layer M2 also can be arranged between two wires **418** and another two wires **418** of the first metal layer M1, so as to appropriately increasing the wire density in the fan-out wire structure.

FIG. **5** illustrates a cross-sectional view showing a preferred embodiment of the present invention for explaining how to connect a wire **518** located on a first metal layer M1 in a fan-out wire structure **508** to a display element (not shown) located on a second metal layer M2 in a display area **502**. Specifically speaking, while a connecting wire **538** of the display element in the display area **502** is located on the second metal layer M2 formed above a glass substrate **510**, two through holes (not labeled) are first formed on the first metal layer M1 and the second metal M2, and then a wire **518** located on the first metal layer M1 in the fan-out wire structure **508** can be connected to the connecting wire **530** via a conductive layer **527** formed on the two through holes.

In other words, the single-layer wires described in the aforementioned preferred embodiments can be connected to circuit lines (such as data lines or scan lines) located on the meal layers different from where the single layer wires is, merely by using the through holes and conductive layer in the display area. Hence, in comparison to the conventional skill of using the wires all of which are formed from the second metal layer M2 to connect the data driver; and using the wires all of which are formed from the first metal layer M1 to connect the scan driver, the aforementioned preferred embodiment of the present invention can simultaneously use the fan-out wire structure containing wires of different single layers to connect the data driver or the scan driver.

It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A fan-out wire structure disposed on a glass substrate of a display panel for connecting a driver to a display area in the display panel, comprising:

a plurality of wires respectively formed from a first metal layer and a second metal layer, wherein at least one of the wires is of the first metal layer, and at least one of the other wires is of the second metal layer, and each of the wires is not across both of the first metal layer and the second metal layer, wherein one end of each of the wires is connected to the driver, and the other end of each of the wires is connected to the display area, wherein two adjacent ones of the wires are separately formed from different metal layers.

2. The fan-out wire structure as claimed in claim 1, wherein the plurality of wires is repetitively arranged in the fan-out wire structure with a predetermined sequence according to the metal layer of each of the wires.

3. A fan-out wire structure used for connecting a driver to a display area in a display panel, comprising:

a plurality of first single-layer wires, wherein one end of each of the first single-layer wires is connected to the driver, and the other end of each of the first single-layer wires is connected to the display area; and

at least one second single-layer wire, wherein one end of the second single-layer wire is connected to the driver, and the other end of the second single-layer wire is connected to the display area, and a metal layer of the first single-layer wires is different from a metal layer of the second single-layer wire.

4. The fan-out wire structure as claimed in claim 3, wherein the single-layer wires are connected to a plurality of pins of the driver in a one-to-one relationship.

5. The fan-out wire structure as claimed in claim 3, wherein the single-layer wires are repetitively arranged in the fan-out wire structure with a predetermined sequence according to the metal layer of each of the single-layer wires.

6. The fan-out wire structure as claimed in claim 3, wherein two adjacent ones of the single-layer wires are separately formed from different metal layers.

7. The fan-out wire structure as claimed in claim 3, wherein the single-layer wires are disposed on a glass substrate of the display panel.

* * * * *

EXHIBIT B

US007771098B2

(12) **United States Patent**
Chu Ke et al.

(10) **Patent No.: US 7,771,098 B2**
(45) **Date of Patent: Aug. 10, 2010**

(54) **MULTI-PRIMARY COLOR DISPLAY**

(75) Inventors: **Hui Chu Ke**, Hsin-Chu (TW); **Chih-Cheng Chan**, Hsin-Chu (TW); **Guo-Feng Uei**, Hsin-Chu (TW)

(73) Assignee: **Au Optronics Corporation**, Hsin-Chu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 194 days.

(21) Appl. No.: **11/963,917**

(22) Filed: **Dec. 24, 2007**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Sep. 28, 2007 (TW) ..... 96136407 A

(51) **Int. Cl.**
G02F 1/00 (2006.01)

(52) **U.S. Cl.** **362/561**; 362/583

(58) **Field of Classification Search** 362/583, 362/561; 345/694; 349/106, 409
See application file for complete search history.

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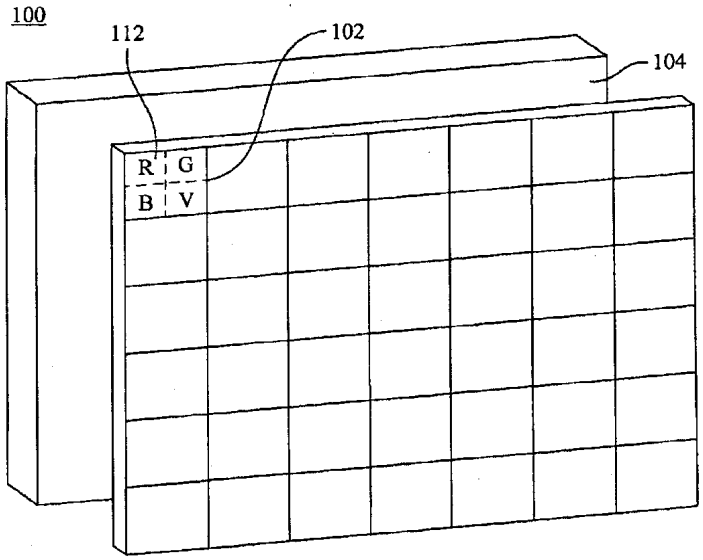
Primary Examiner—Stephen F Husar
Assistant Examiner—Peggy A. Neils
(74) *Attorney, Agent, or Firm*—Thomas, Kayden, Horstemeyer & Risley

(57) **ABSTRACT**

A multi-primary color display has a backlight source and pixels. Each pixel has at least four sub pixels, which display red primary color, green primary color, blue primary color and a fourth primary color, respectively. At the peak position of the fourth primary color located in the wavelength range between 550 nm~600 nm, the relative luminance ratio of the fourth primary color to the green primary color is greater than or equal to 0.5. When the ratio of the relative luminance meets the requirement and the relative luminance of a newly added primary color is greater than a certain value, the colors beyond the three-primary color gamut, which includes natural colors and other colors outside the natural color gamut, can be reproduced.

16 Claims, 16 Drawing Sheets



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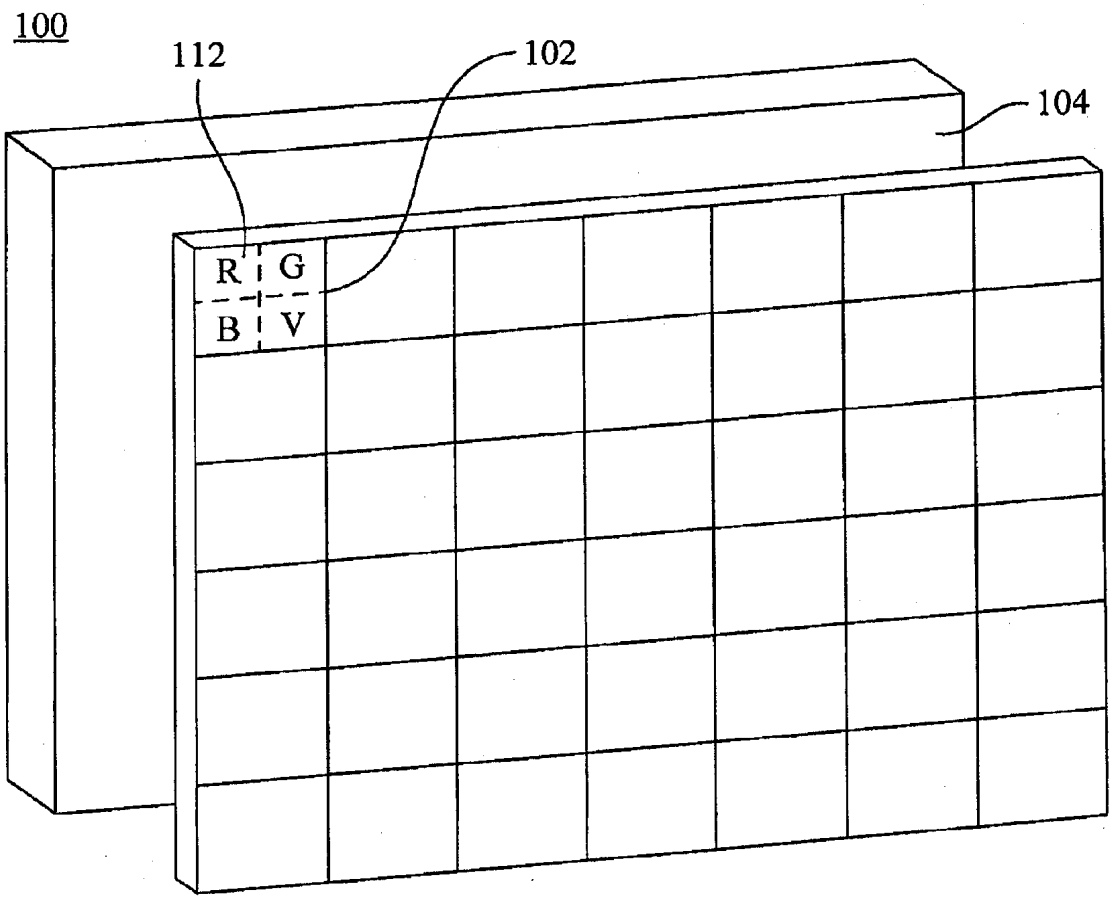

Fig. 1

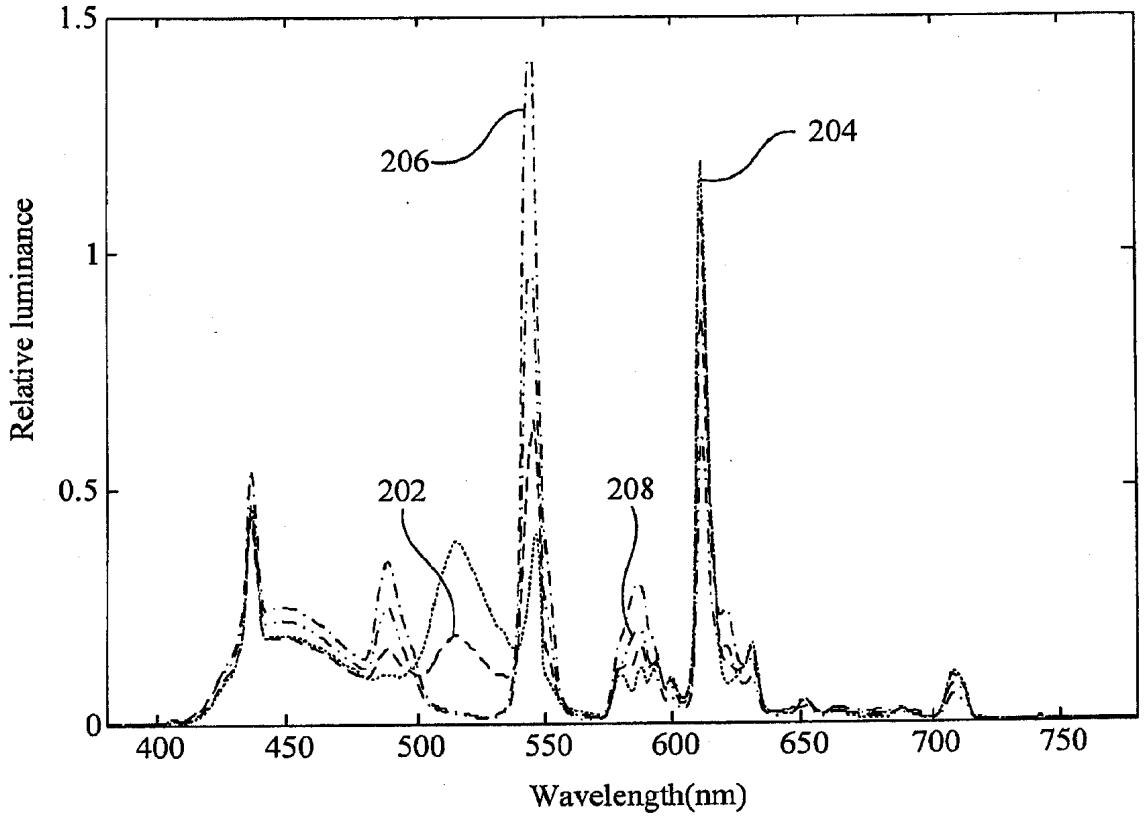
1.5
1
0.5
0
Relative luminance
206
204
202
208
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 2

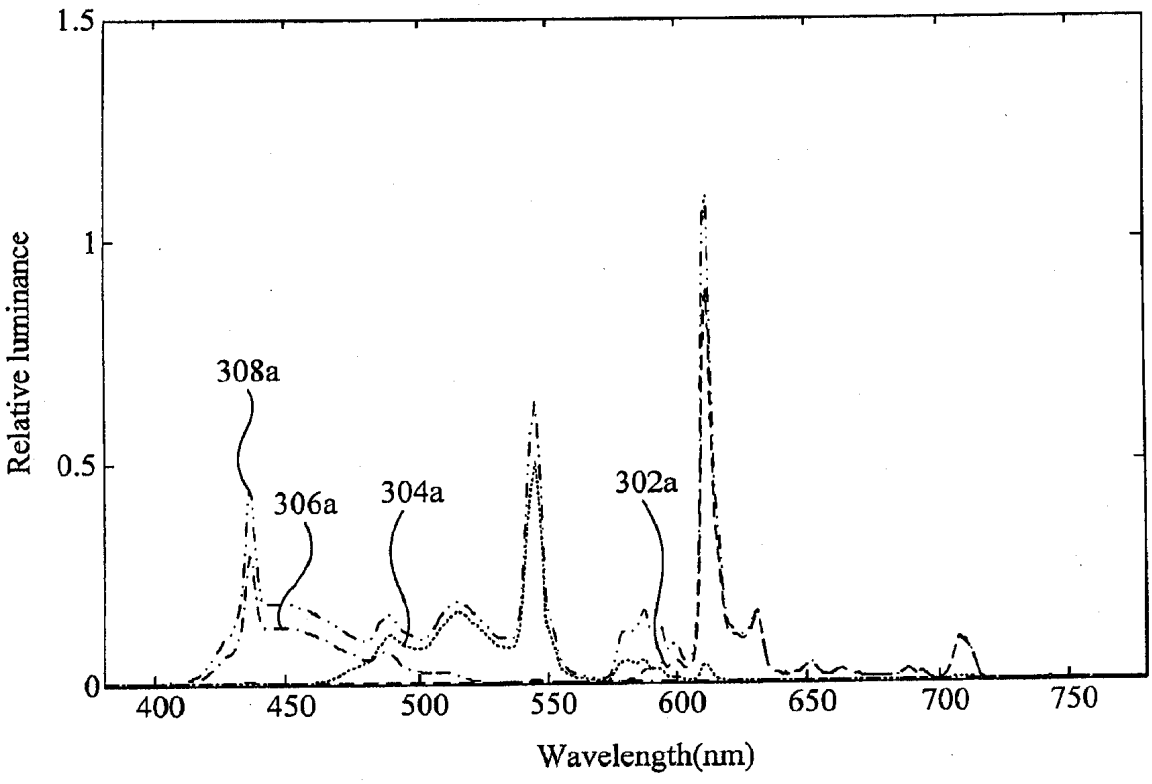
1.5
1
0.5
0
Relative luminance
308a
306a
304a
302a
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 3A

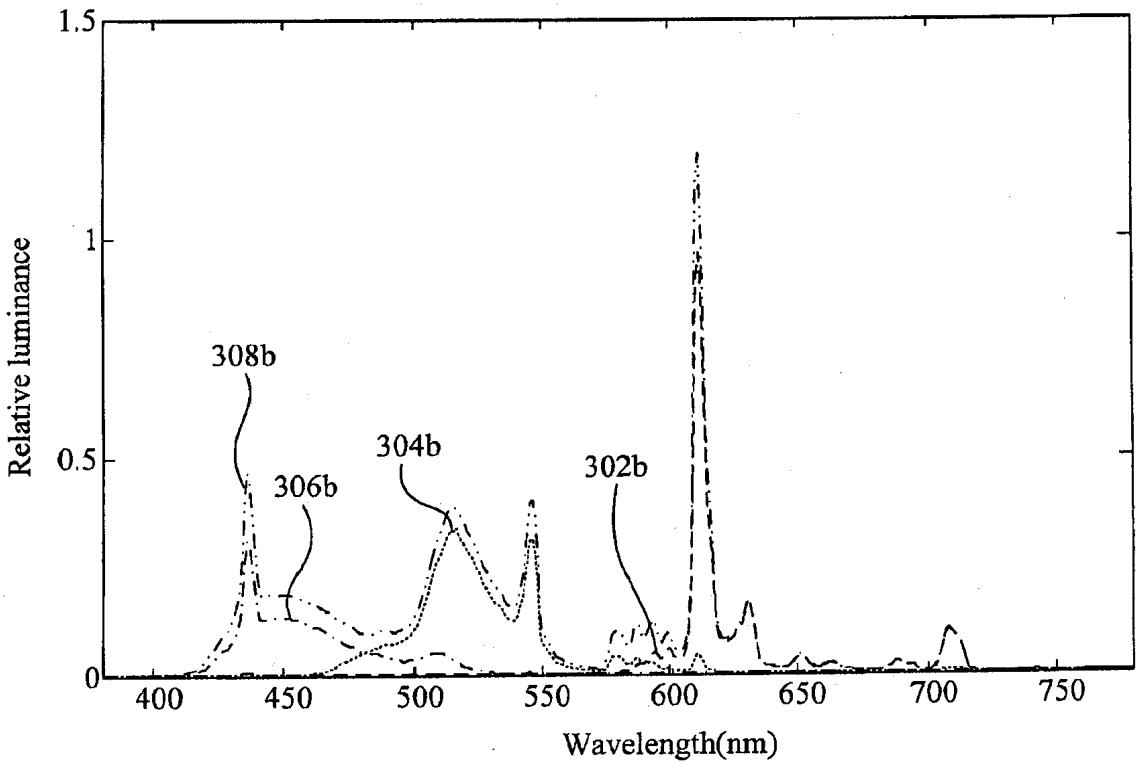
1.5
1
0.5
0
Relative luminance
308b
306b
304b
302b
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 3B

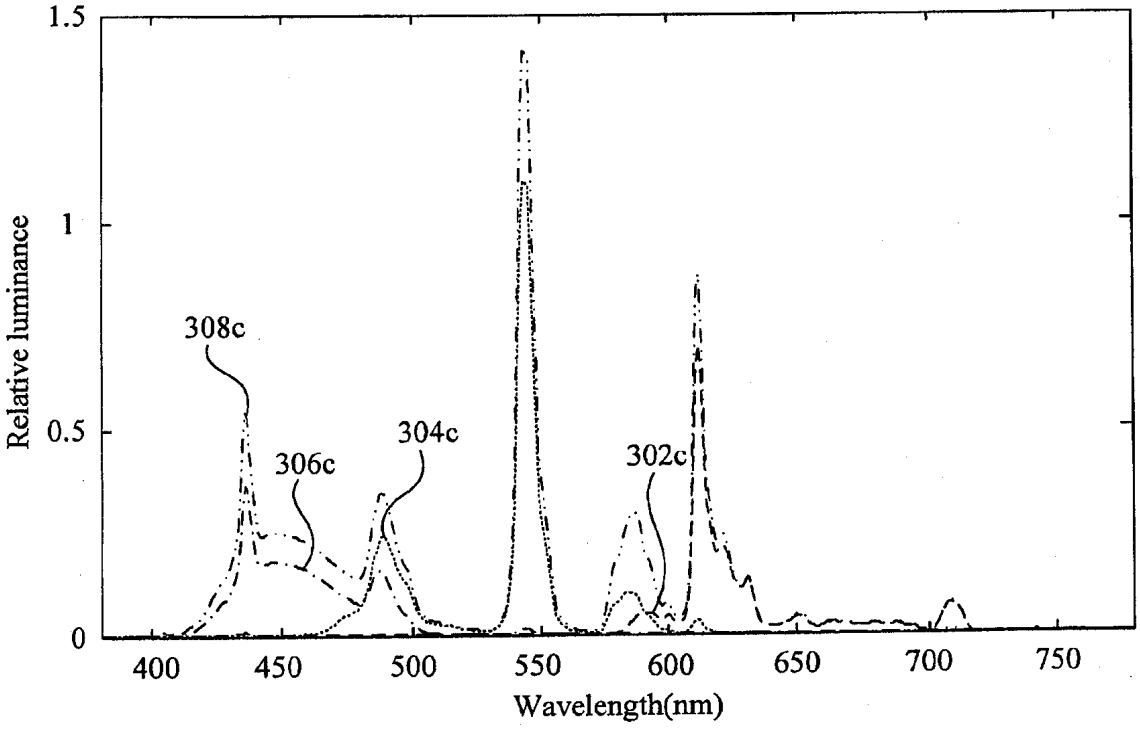
1.5
1
0.5
0
Relative luminance
308c
306c
304c
302c
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 3C

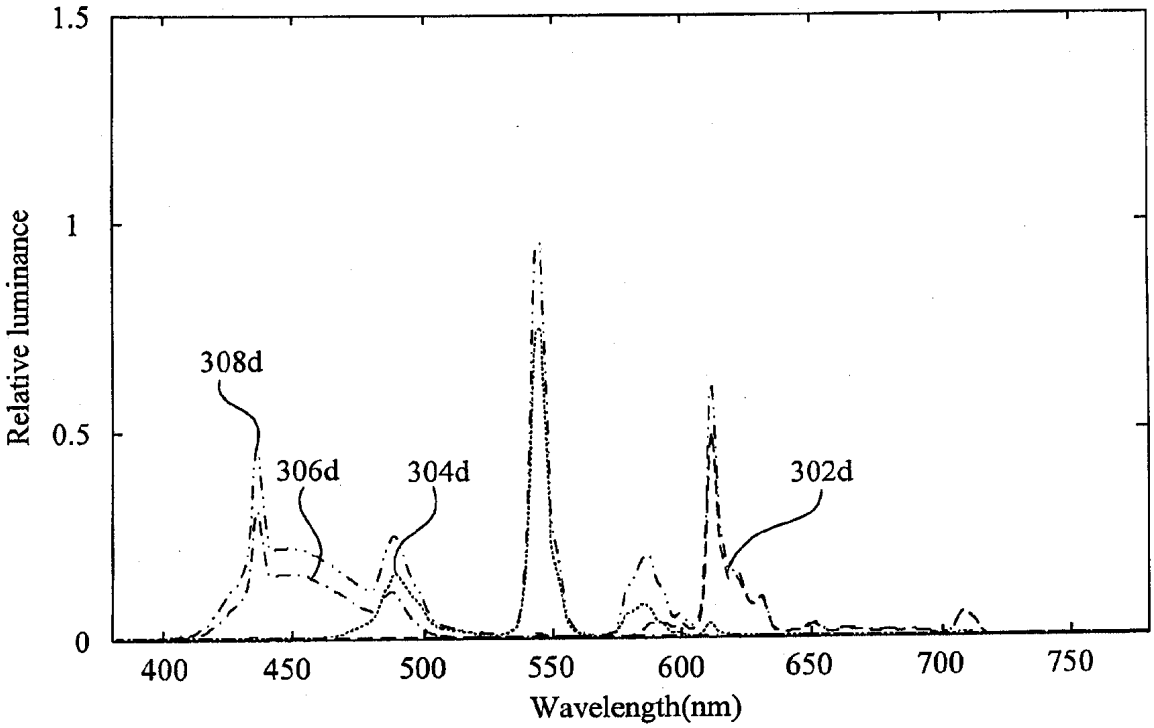
1.5
1
0.5
0
Relative luminance
308d
306d
304d
302d
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 3D

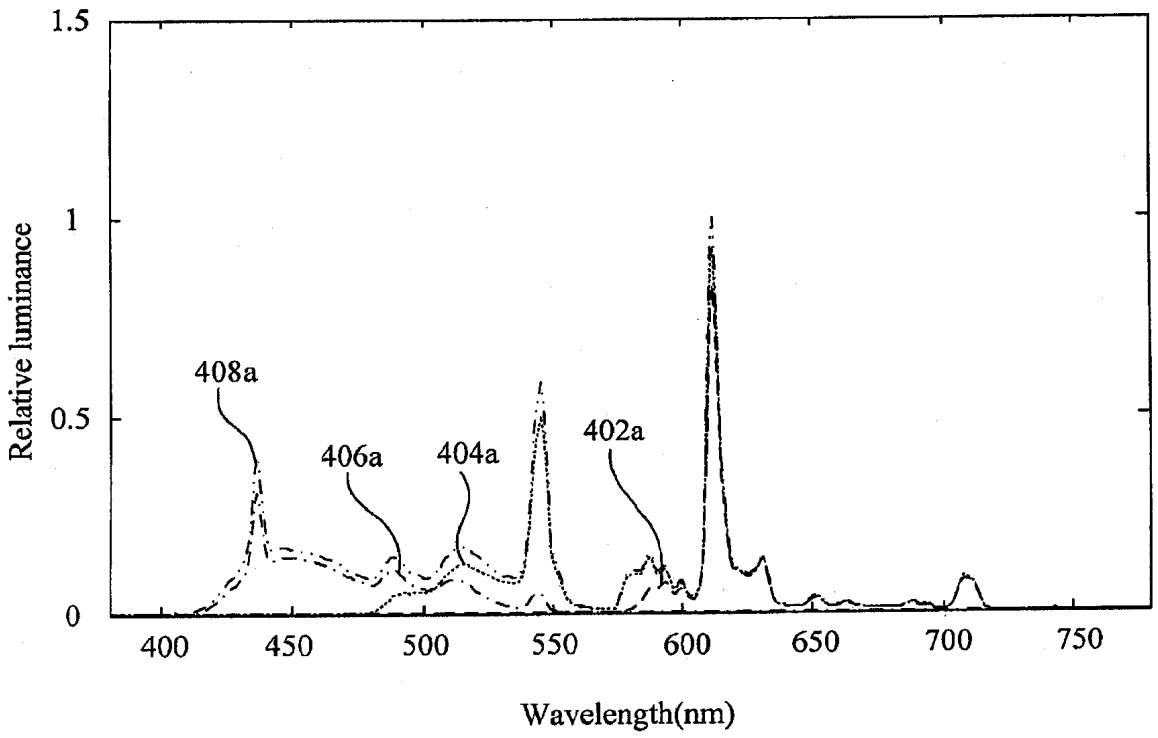
1.5
1
0.5
0
Relative luminance
408a
406a
404a
402a
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 4A

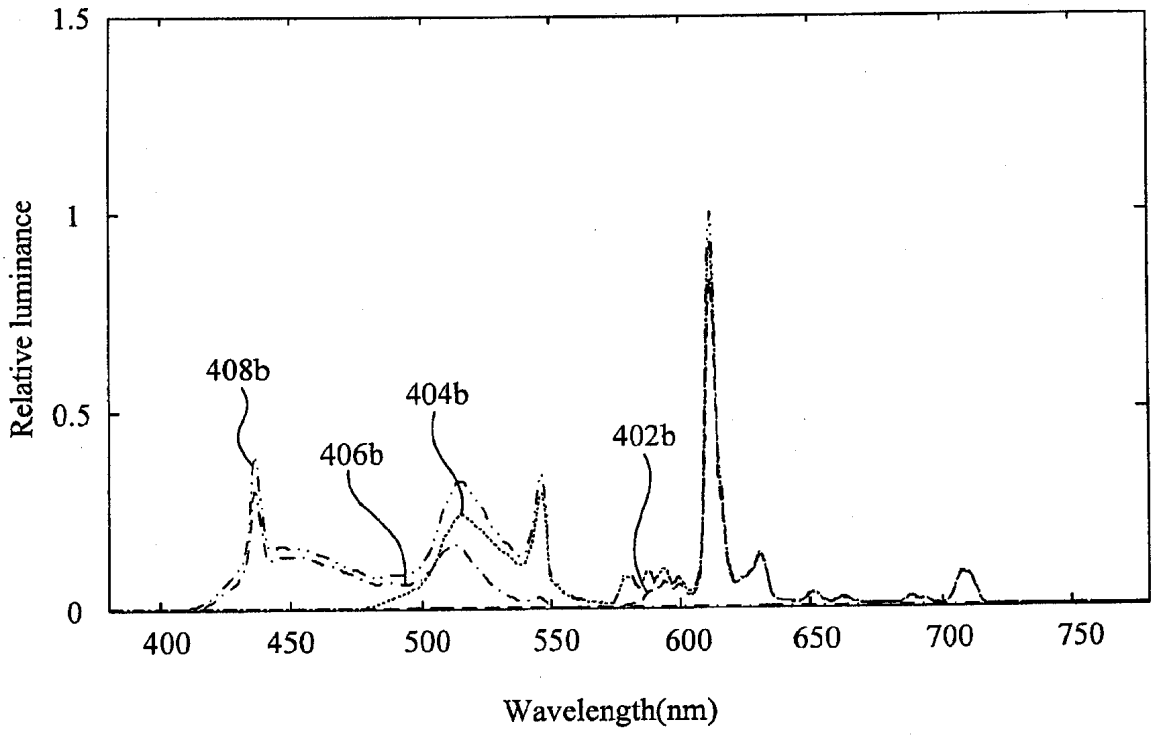
1.5
1
0.5
0
Relative luminance
408b
406b
404b
402b
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 4B

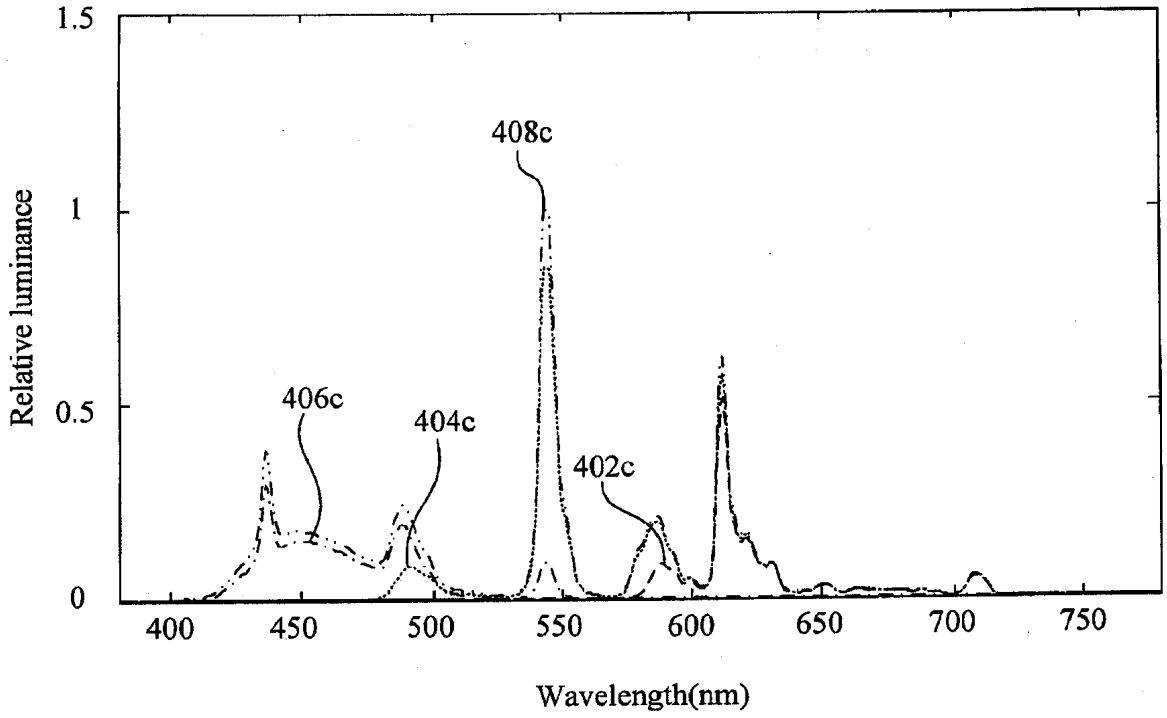
1.5
1
0.5
0
Relative luminance
408c
406c
404c
402c
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 4C

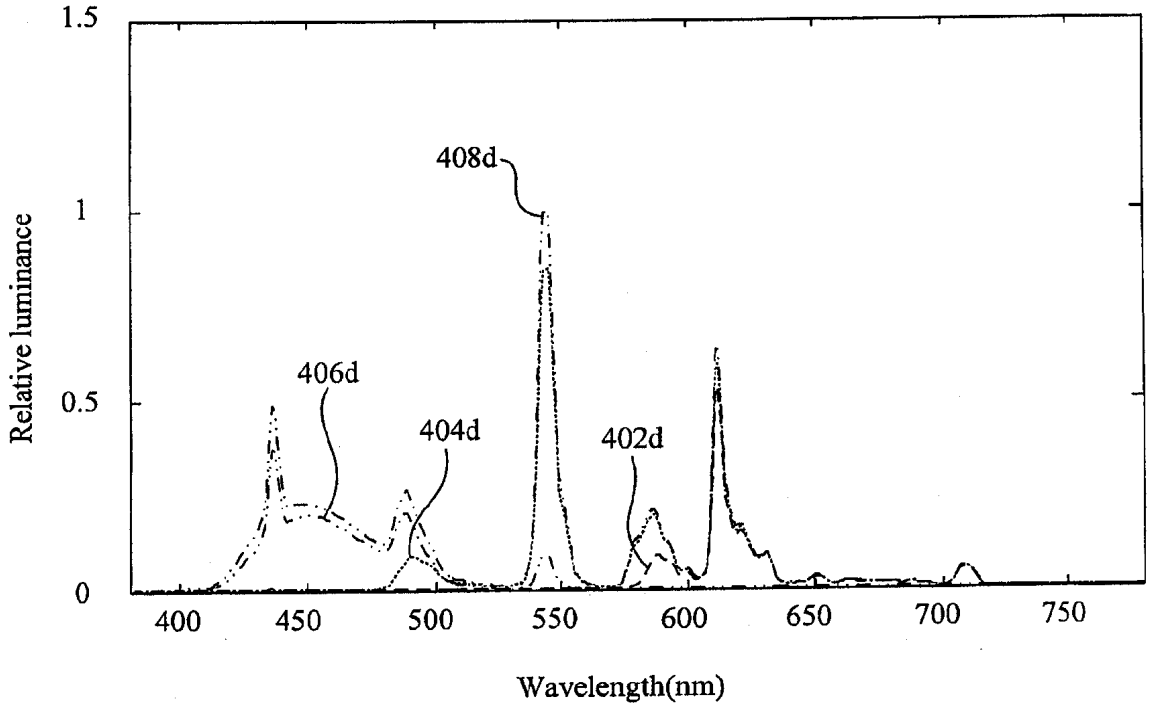
1.5
1
0.5
0
Relative luminance
408d
406d
404d
402d
400
450
500
550
600
650
700
750
Wavelength(nm)

Fig. 4D

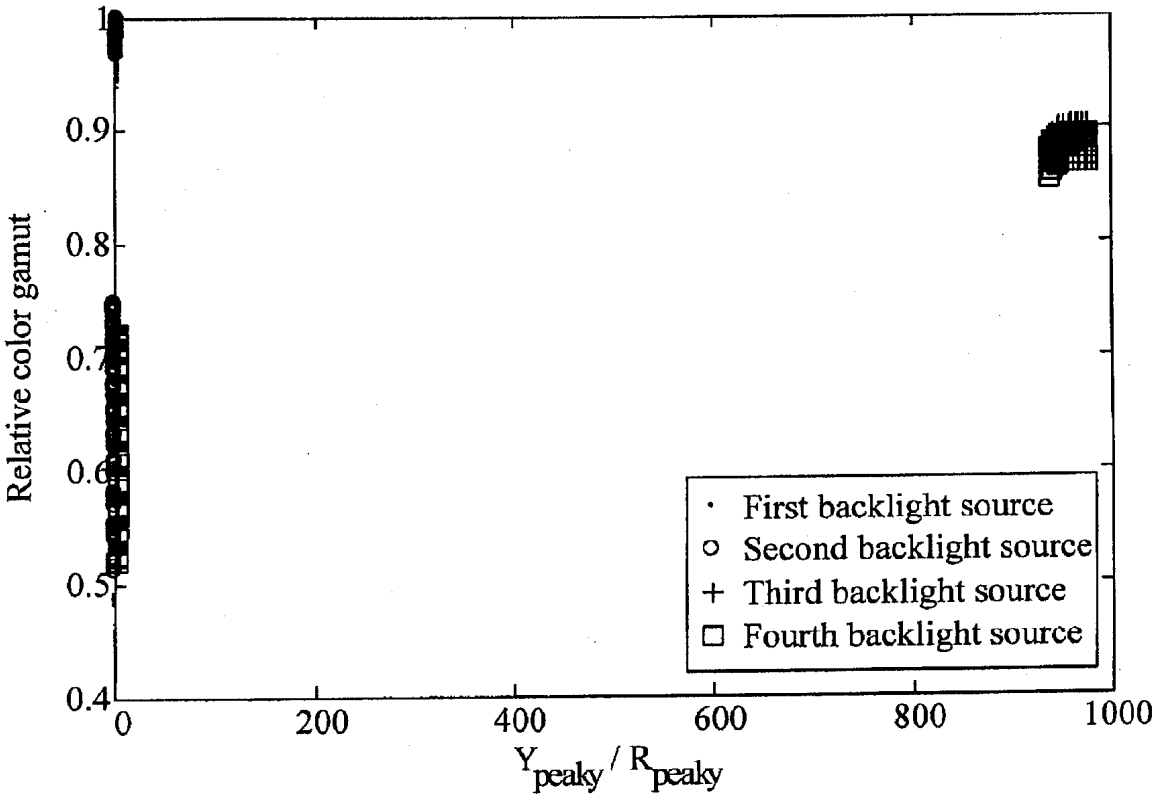
Relative color gamut
1
0.9
0.8
0.7
0.6
0.5
0.4
0
200
400
600
800
1000
Y_{peaky} / R_{peaky}
First backlight source
Second backlight source
Third backlight source
Fourth backlight source

Fig. 5A

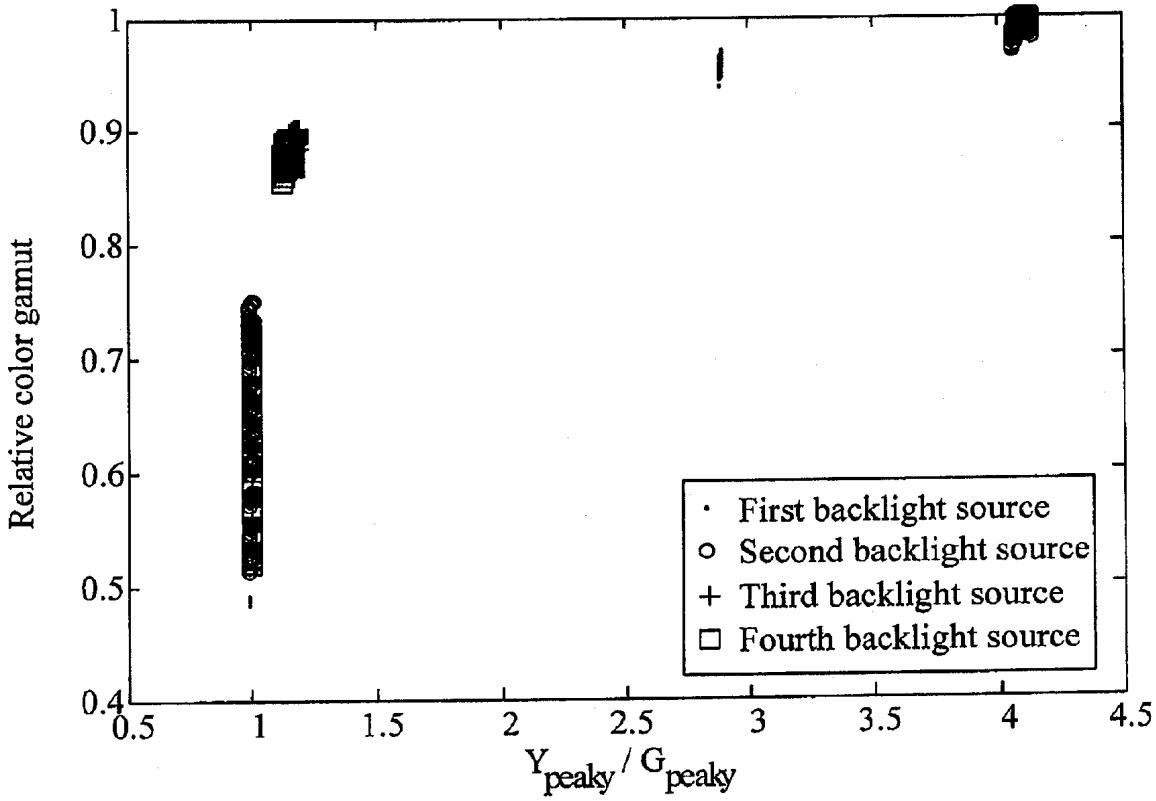
Relative color gamut
1
0.9
0.8
0.7
0.6
0.5
0.4
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Y_{peaky} / G_{peaky}
First backlight source
Second backlight source
Third backlight source
Fourth backlight source

Fig. 5B

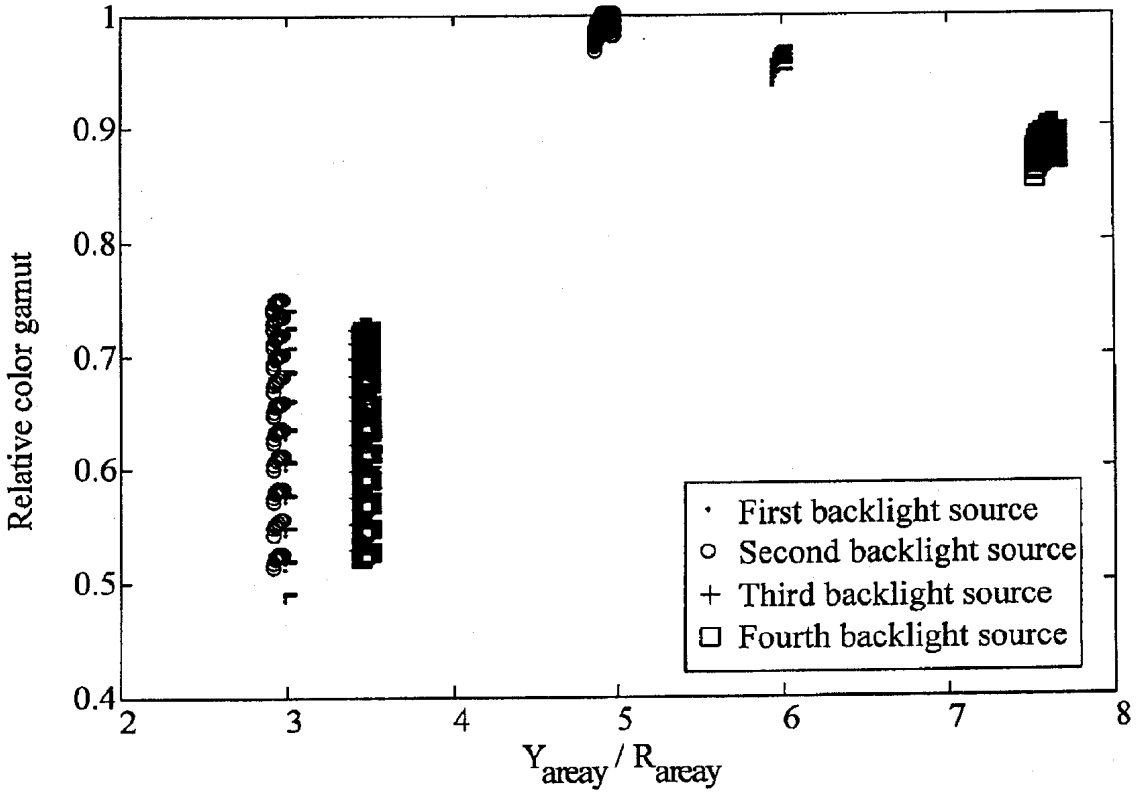
Relative color gamut
1
0.9
0.8
0.7
0.6
0.5
0.4
2
3
4
5
6
7
8
Y_{areay} / R_{areay}
First backlight source
Second backlight source
Third backlight source
Fourth backlight source

Fig. 5C

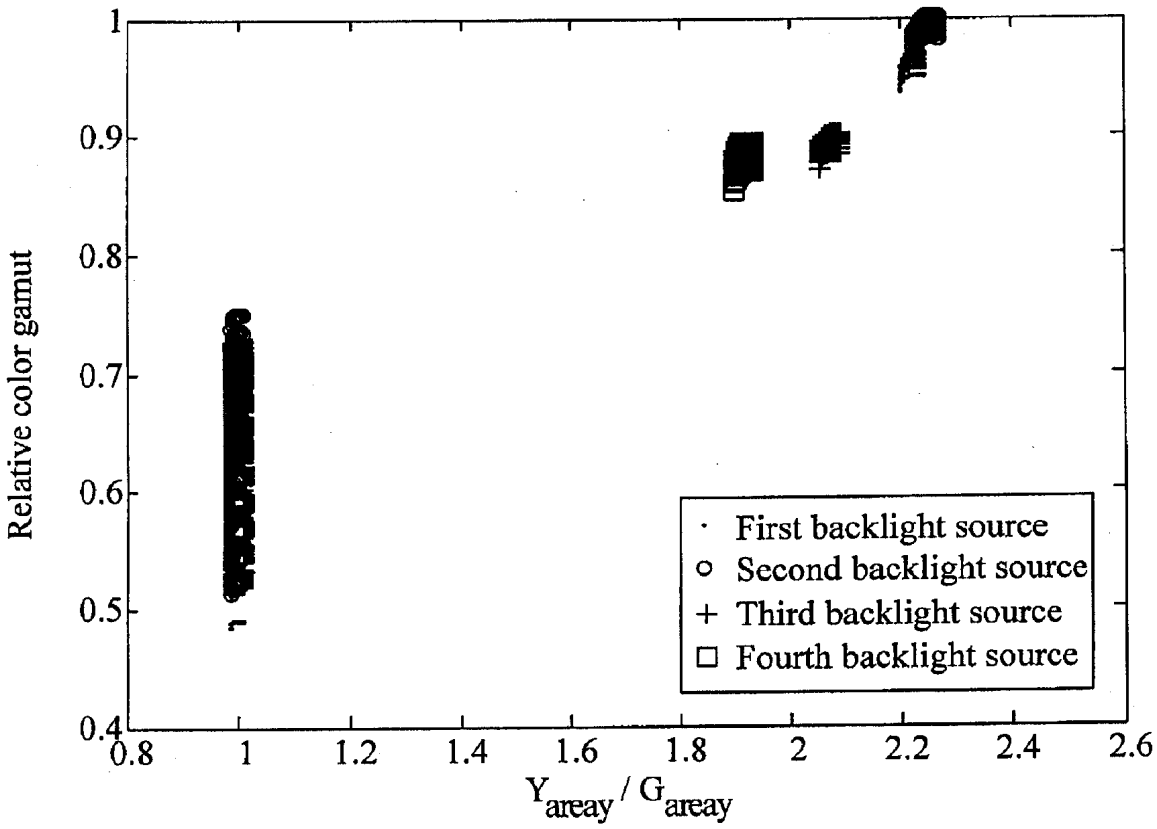
Relative color gamut
1
0.9
0.8
0.7
0.6
0.5
0.4
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
Y_{areay} / G_{areay}
First backlight source
Second backlight source
Third backlight source
Fourth backlight source

Fig. 5D

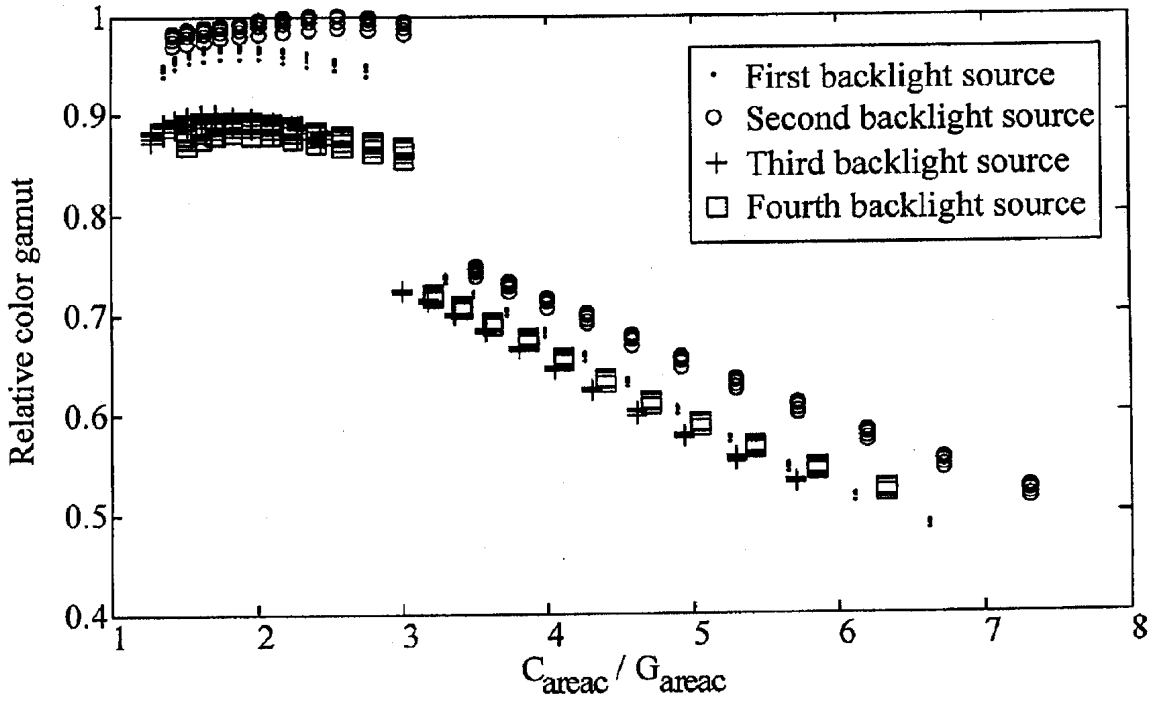
Relative color gamut
1
0.9
0.8
0.7
0.6
0.5
0.4
1
2
3
4
5
6
7
8
C_{areac} / G_{areac}
First backlight source
Second backlight source
Third backlight source
Fourth backlight source

Fig. 6A

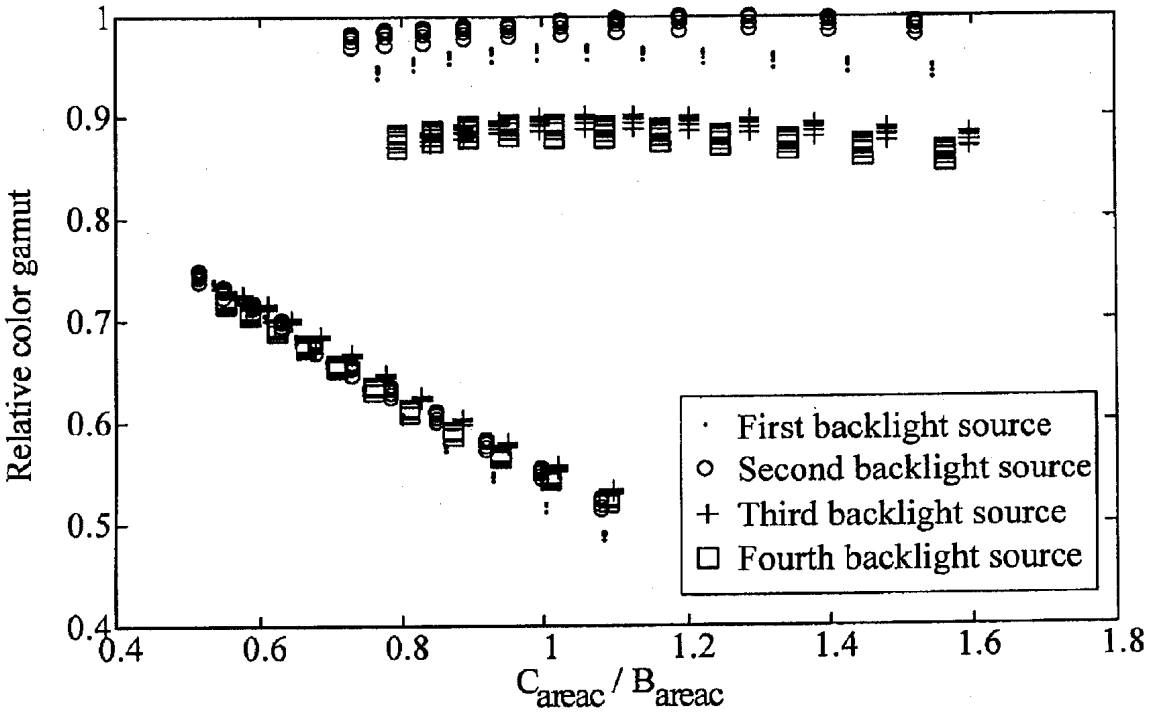
Relative color gamut
1
0.9
0.8
0.7
0.6
0.5
0.4
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
C_{areac} / B_{areac}
First backlight source
Second backlight source
Third backlight source
Fourth backlight source

Fig. 6B

MULTI-PRIMARY COLOR DISPLAY

RELATED APPLICATIONS

This application claims priority to Taiwan Application Serial Number 96136407, filed Sep. 28, 2007, which is herein incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of Invention

The invention relates to a display device and, in particular, to a multi-primary color display.

2. Related Art

With advances in modern technologies, people have higher demands for the colors of display devices, hoping that they can provide more ample and saturated colors. Usual displays only use three primary colors (e.g., red, green, and blue primary colors). However, such three-primary color displays cannot thoroughly present all colors existing in nature, particularly sky blue and gold colors. In the prior art, a solution is to increase the saturation of the above-mentioned three primary colors, thereby enlarging the color gamut. However, this method has its limitations. Moreover, it has the disadvantage of a lower brightness due to the properties of the display. Another solution is to include a new primary color different from the red, green, and blue primary colors in the conventional three-primary color displays. This newly added primary color falls outside the triangular color gamut enclosed by the red, green, and blue primary colors on the CIE1931 chromatic diagram. Therefore, it can effectively increase the color gamut of the display, as well as keep or even enhance the brightness thereof.

SUMMARY OF THE INVENTION

An objective of the invention is to provide a display device with a wider color gamut and more possible colors in nature.

In an embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels displayed, respectively, red primary color, green primary color, blue primary color, and a fourth primary color. At the peak position of the fourth primary color located in the wavelength range between 550 nm~600 nm, the relative luminance ratio of the fourth primary color to the red primary color is greater than or equal to 1.

In another embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color. The peak position of the fourth primary color is located in the wavelength range between 550 nm~600 nm and the relative luminance ratio of the fourth primary color to the green primary color is greater than or equal to 0.5.

In a further embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color. In the wavelength range between 550 nm~600 nm the ratio of the total relative luminances of the fourth primary color and the red primary color is greater than or equal to 2.

In yet another embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color. In the wavelength range of 550~600 nm, the ratio of the total relative luminances of the fourth primary color and the green primary color is greater than or equal to 0.5.

In yet another embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color. Suppose the backlight maximum of the backlight source is normalized to one, and the filter spectrum of the sub pixels of the fourth primary color is also normalized to one. The average relative luminance of the fourth primary color located in the wavelength range of 550 nm~600 nm is greater than or equal to 0.03.

In yet another embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color. In the wavelength range of 450 nm~500 nm, the ratio of the total relative luminances of the fourth primary color and the green primary color is smaller than or equal to 10.

In yet another embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color. In the wavelength range between 450 nm~500 nm, the ratio of the total relative luminances of the fourth primary color and the blue primary color is smaller than or equal to 10.

In yet another embodiment of the invention, the display device includes a backlight source and pixels. Each pixel has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color. Suppose the backlight maximum of the backlight source is normalized to one, and the filter spectrum of the sub pixels of the fourth primary color is also normalized to one. The average relative luminance of the fourth primary color located in the wavelength range of 450 nm-500 nm is smaller than or equal to 10.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects and advantages of the invention will become apparent by reference to the following description and accompanying drawings which are given by way of illustration only, and thus are not limitative of the invention, and wherein:

FIG. **1** is a schematic view of a display device according to an embodiment of the invention;

FIG. **2** shows the spectra of the four backlight sources used for simulations in the disclosed embodiments;

FIGS. **3**A-**3**D show the relative luminance spectra of the first, second, third, and fourth backlight sources in combination with the red, green, and blue primary color filters according to the invention for obtaining larger color gamut;

FIGS. **4**A-**4**D show the relative luminance spectra of the first, second, third, and fourth backlight sources in combination with the red, green, and blue primary color filters according to the invention for obtaining smaller color gamut;

FIG. **5**A shows the relative color gamut and the relative luminance ratio of the yellow primary color to the red primary color obtained from several experiments in the first embodiment;

FIG. **5**B shows the relative color gamut and the relative luminance ratio of the yellow primary color to the green primary color obtained from several experiments in the first embodiment;

FIG. **5**C shows the relative color gamut and the ratio of the total relative luminances of the yellow primary color and the red primary color obtained from several experiments in the first embodiment;

FIG. **5**D shows the relative color gamut and the ratio of the total relative luminances of the yellow primary color and the green primary color obtained from several experiments in the first embodiment;

FIG. **6**A shows the relative color gamut and the ratio of the total relative luminances of the cyan primary color and the green primary color obtained from several experiments in the first embodiment; and

FIG. **6**B shows the relative color gamut and the ratio of the total relative luminances of the cyan primary color and the blue primary color obtained from several experiments in the first embodiment.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be apparent from the following detailed description, which proceeds with reference to the accompanying drawings, wherein the same references relate to the same elements.

The invention discloses the relation among the relative luminance (i.e., backlight intensity×transmittance) of the primary colors in a multi-primary color display. At an appropriate proportion of relative luminance or when the relative luminance of the newly added primary color is greater than a specific value, colors beyond the color gamut of the original three primary colors (including natural colors and those beyond the natural color gamut) can be produced.

An embodiment of the invention uses a simulation method to simulate and observe spectral variations in the relative luminance produced by the four different backlight sources and several sets of color filters, as the color gamut thus formed increases its range.

FIG. **1** is a schematic view of the display device in an embodiment of the invention. The display device **100** has a backlight source **104** and pixels **102**. Each pixel **102** has at least four sub pixels **112** that displays red primary color (R), green primary color (G), blue primary color (B), and a fourth primary color (V), respectively. For example, the display device **100** can be a flat panel display, such as a liquid crystal display (LCD). Each sub pixel **112** has a distinct color filter for displaying a specific color from the light emitted by the backlight source **104**.

FIG. **2** shows four backlight spectra used in the simulation of the disclosed embodiment. The vertical axis labels the relative luminance, and the horizontal axis labels the wavelength in units of rm. As shown in the drawing, the spectra

202, **204**, **206**, and **208** of the first, second, third, and fourth backlight sources, respectively, have their specific relative luminance distributions in different wavelength ranges. Therefore, they can combine with different sets of color filters to produce more colors in the simulations. FIGS. **3**A-**3**D show the relative luminance spectra when the first, second, third, and fourth backlight sources, are combined respectively with the red, green, and blue primary color filters to render larger color gamut. The vertical axis labels the relative luminance, and the horizontal axis labels the wavelength in units of nm. In FIGS. **3**A-**3**D, the spectra **302***a*-**302***d* represent respectively the relative luminances in different wavelengths after each backlight source is combined with the red color filter. The spectra **304***a*-**304***d* represent respectively the relative luminances in different wavelengths after each backlight source is combined with the green color filter. The spectra **306***a*-**306***d* represent respectively the relative luminances in different wavelengths after each backlight source is combined with the blue color filter. The spectra **308***a*-**308***d* represent respectively the relative luminances of the light emitted by the backlight source in different wavelengths.

FIGS. **4**A-**4**D show the relative luminance spectra when the first, second, third, and fourth backlight sources, are combined respectively with the red, green, and blue primary color filters to render smaller color gamut. The vertical axis labels the relative luminance, and the horizontal axis labels the wavelength in units of nm. In FIGS. **4**A-**4**D, the spectra **402***a*-**402***d* represent respectively the relative luminances in different wavelengths after each backlight source is combined with the red color filter. The spectra **404***a*-**404***d* represent respectively the relative luminances in different wavelengths after each backlight source is combined with the green color filter. The spectra **406***a*-**406***d* represent respectively the relative luminances in different wavelengths after each backlight source is combined with the blue color filter. The spectra **408***a*-**408***d* represent respectively the relative luminances of the light emitted by the backlight source in different wavelengths.

Afterwards, in the two sets of three-primary color filters for the above-mentioned larger color gamut and smaller color gamut, a different yellow or cyan primary color filter is added to obtain multiple sets of four primary color filters for simulations with four different backlight sources. Table 1 and Table 2 show the chromatic coordinates (x,y) of the yellow primary color or cyan primary color in the CIE1931 chromatic diagram when the four backlight sources are combined with the yellow primary color filter or the cyan primary color filter.

TABLE 1

Chromatic coordinates of the yellow primary color for different backlight sources.

First backlight source		Second backlight source		Third backlight source		Fourth backlight source	
x	y	x	y	x	y	x	y
0.4731	0.4949	0.4454	0.5128	0.4517	0.5196	0.4517	0.5174
0.4833	0.4925	0.4598	0.5071	0.4584	0.5215	0.4590	0.5194
0.4910	0.4902	0.4715	0.5017	0.4627	0.5226	0.4637	0.5205

TABLE 1-continued

Chromatic coordinates of the yellow primary color for different backlight sources.

First backlight source		Second backlight source		Third backlight source		Fourth backlight source	
x	y	x	y	x	y	x	y
0.4970	0.4879	0.4810	0.4968	0.4656	0.5231	0.4668	0.5210
0.5016	0.4858	0.4888	0.4923	0.4675	0.5233	0.4689	0.5213
0.5053	0.4838	0.4955	0.4883	0.4688	0.5233	0.4704	0.5213
0.5084	0.4821	0.5011	0.4846	0.4697	0.5233	0.4714	0.5212
0.5110	0.4805	0.5059	0.4813	0.4704	0.5232	0.4722	0.5211
0.5132	0.4790	0.5102	0.4783	0.4710	0.5230	0.4728	0.5209
0.5151	0.4777	0.5139	0.4756	0.4714	0.5228	0.4732	0.5208

TABLE 2

Chromatic coordinates of the cyan primary color for different backlight sources.

First backlight source		Second backlight source		Third backlight source		Fourth backlight source	
x	y	x	y	x	y	x	y
0.1557	0.2376	0.1429	0.2809	0.1697	0.2186	0.1658	0.1880
0.1572	0.2646	0.1427	0.3092	0.1732	0.2453	0.1687	0.2124
0.1592	0.2927	0.1429	0.3382	0.1774	0.2734	0.1722	0.2384
0.1618	0.3215	0.1437	0.3673	0.1822	0.3024	0.1763	0.2659
0.1650	0.3506	0.1449	0.3962	0.1876	0.3319	0.1812	0.2944
0.1690	0.3795	0.1468	0.4243	0.1937	0.3613	0.1868	0.3235
0.1736	0.4077	0.1493	0.4514	0.2005	0.3901	0.1932	0.3527
0.1791	0.4348	0.1526	0.4771	0.2079	0.4179	0.2002	0.3814
0.1853	0.4604	0.1565	0.5011	0.2158	0.4442	0.2079	0.4091
0.1923	0.4841	0.1613	0.5231	0.2243	0.4685	0.2163	0.4355

The following two embodiments explain how to define the relative luminance of the newly added primary color (e.g., yellow or cyan primary color) by observing several experimental examples using the above-mentioned simulation process. The relative luminance relation between red, green primary colors and the yellow primary color in the wavelength range between 550 nm~600 nm and the relative luminance relation between green, blue primary colors and the cyan primary color in the wavelength range between 450 nm~500 nm can effectively produce colors outside the gamut of the three primary colors.

First Embodiment

FIG. **5**A shows the relative color gamut and the ratio of the relative luminance of the yellow primary color to the red primary color according to several experimental results in the first embodiment. The little circle, hollow circle, cross, and hollow square represent the results of using the first backlight source, the second backlight source, the third backlight source, and the fourth backlight source in combination with different sets of four-primary color filters, respectively. The relative luminance ratio of the yellow primary color to the red primary color is taken at the peak position of the yellow primary color in the wavelength between 550 nm~600 nm. As shown in FIG. **5**A, a wider color gamut is obtained when the ratio is greater than or equal to 1.

FIG. **5**B shows the relative color gamut and the ratio of the relative luminance of the yellow primary color to the green primary color according to several experimental results in the first embodiment. The little circle, hollow circle, cross, and hollow square represent the results of using the first backlight source, the second backlight source, the third backlight source, and the fourth backlight source in combination with different sets of four-primary color filters, respectively. The relative luminance ratio of the yellow primary color to the green primary color is taken at the peak position of the yellow primary color in the wavelength between 550 nm~600 nm. As shown in FIG. **5**B, a wider color gamut is obtained when the ratio is greater than or equal to 0.5.

FIG. **5**C shows the relative color gamut and the ratio of the ratio of the total relative luminances of the yellow primary color and the red primary color according to several experimental results in the first embodiment. The little circle, hollow circle, cross, and hollow square represent the results of using the first backlight source, the second backlight source, the third backlight source, and the fourth backlight source in combination with different sets of four-primary color filters, respectively. The ratio of the total relative luminances of the yellow primary color and the red primary color is taken in the wavelength between 550 nm~600 nm. As shown in FIG. **5**C, a wider color gamut is obtained when the ratio of the total relative luminances is greater than or equal to 2.

FIG. **5**D shows the relative color gamut and the ratio of the ratio of the total relative luminances of the yellow primary color and the green primary color according to several experimental results in the first embodiment. The little circle, hollow circle, cross, and hollow square represent the results of using the first backlight source, the second backlight source, the third backlight source, and the fourth backlight source in combination with different sets of four-primary color filters, respectively. The ratio of the total relative luminances of the yellow primary color and the green primary color is taken in the wavelength between 550 nm~600 nm. As shown in FIG. **5**D, a wider color gamut is obtained when the ratio of the total relative luminances is greater than or equal to 0.5.

TABLE 3

Relations of the relative luminance ratios and color gamut for FIGS. 5A-5D.

$\frac{Y_{peakY}}{R_{peakY}}$	Tendency	$\frac{Y_{peakY}}{G_{peakY}}$	Tendency	$\frac{Y_{area550\sim600}}{R_{area550\sim600}}$	Tendency	$\frac{Y_{area550\sim600}}{G_{area550\sim600}}$	Tendency
1.4859		0.99722		2.9895		1.0114	
938.4043	↑	4.0694	↑	7.5361	↑	2.2268	↑

$\frac{Y_{peakY}}{R_{peakY}}$: Ratio of the relative luminance of the yellow primary color to the red primary color (peak position in the wavelength of 550~600 nm);

$\frac{Y_{peakY}}{G_{peakY}}$: Ratio of the relative luminance of the yellow primary color to the green primary color (peak position in the wavelength of 550~600 nm);

$\frac{Y_{area550\sim600}}{R_{area550\sim600}}$: Ratio of the total relative luminances of the yellow primary color and the red primary color (in the wavelength of 550~600 nm);

$\frac{Y_{area550\sim600}}{G_{area550\sim600}}$: Ratio of the total relative luminances of the yellow primary color and the green primary color (in the wavelength of 550~600 nm).

Table 3 shows the relationships of the ratios and the color gamut in FIGS. **5A-5D**. The upper row gives the ratio in a smaller color gamut, and the lower row gives that in a larger color gamut. This clearly shows the change tendency in the ratio and the corresponding color gamut. In the wavelength range between 550 nm~600 nm, when the relative luminance of the red and green primary colors gets closer to the relative luminance of the yellow primary color, the color gamut thus formed is smaller. The ratios (area enclosed by the yellow primary color in the wavelength range of 550~600 nm)/(area enclosed by the red primary color in the wavelength range of 550~600 nm) and (area enclosed by the yellow primary color in the wavelength range of 550~600 nm)/(area enclosed by the green primary color in the wavelength range of 550~600 nm) are also smaller. That is, when the enclosed color gamut becomes larger, the spectrum of the yellow primary color remains almost the same while those of the red and green primary colors get lower.

To avoid the situation that colors beyond the color gamut of the three primary colors cannot be displayed even when the ratios are reached because the relative luminance of the primary colors is too small, the first embodiment also finds the required average relative luminance for the yellow primary color in the wavelength range between 550 nm~600 nm. When the maximum of the backlight emitted by the backlight source and the spectrum of the yellow primary color filter are both normalized to unity, the average relative luminance of the yellow primary color in the wavelength range between 550 nm~600 nm should be greater than or equal to 0.03 to avoid the above-mentioned situation.

Second Embodiment

FIG. **6A** shows the relative color gamut and the ratio of the total relative luminances of the cyan primary color and the green primary color obtained from several experiments according to the second embodiment of the invention. The little circle, hollow circle, cross, and hollow square represent the results of using the first backlight source, the second backlight source, the third backlight source, and the fourth backlight source in combination with different sets of four-primary color filters, respectively. The total relative luminance here takes the total relative luminance of the cyan primary color and the green primary color in the wavelength range between 450 nm~500 nm. FIG. **6A** shows that a larger color gamut is obtained when the ratio of their total relative luminances is smaller than or equal to 1.

FIG. **6B** shows the relative color gamut and the ratio of the total relative luminances of the cyan primary color and the blue primary color obtained from several experiments according to the second embodiment of the invention. The little circle, hollow circle, cross, and hollow square represent the results of using the first backlight source, the second backlight source, the third backlight source, and the fourth backlight source in combination with different sets of four-primary color filters, respectively. The total relative luminance here takes the total relative luminance of the cyan primary color and the blue primary color in the wavelength range between 450 nm~500 nm. FIG. **6B** shows that a larger color gamut is obtained when the ratio of their total relative luminances is smaller than or equal to 1.

TABLE 4

Relations of the relative luminance ratios and the color gamut in FIGS. 6A-6B.

$\frac{C_{area450\sim500}}{G_{area450\sim500}}$	Tendency	$\frac{C_{area450\sim500}}{B_{area450\sim500}}$	Tendency
7.3217		1.0956	
1.5293	↑	0.83304	↑

$\frac{C_{area450\sim500}}{G_{area450\sim500}}$: Ratio of the total relative luminances of the cyan primary color and the green primary color (in the wavelength range of (450~500 nm);

$\frac{C_{area450\sim500}}{B_{area450\sim500}}$: Ratio of the total relative luminances of the cyan primary color and the blue primary color (in the wavelength range of (450~500 nm).

Table 4 lists the relationships of the relative luminance ratios and the color gamut in FIGS. **6A-6B**. The upper row gives the ratio in a smaller color gamut, and the lower row gives that in a larger color gamut. This clearly shows the change tendency in the ratio and the corresponding color gamut. In the wavelength range between 450 nm~500 nm, when the relative luminance of the cyan gets closer to the relative luminance of the blue primary color, the color gamut thus formed is smaller. In this case, the ratios (area enclosed by the cyan primary color in the wavelength range of 450~500

nm)/(area enclosed by the blue primary color in the wavelength range of 450~500 nm) and (area enclosed by the cyan primary color in the wavelength range of 450~500 nm)/(area enclosed by the green primary color in the wavelength range of 450~500 nm) are greater. That is, when the enclosed color gamut becomes larger, the spectra of the blue and green primary colors remain almost the same while that of the cyan primary color get lower.

To avoid the situation that colors beyond the color gamut of the three primary colors cannot be displayed even when the ratios are reached because the relative luminance of the primary colors is too small, the second embodiment also finds the required average relative luminance for the cyan primary color in the wavelength range between 450 nm~500 nm. When the maximum of the backlight emitted by the backlight source and the spectrum of the cyan primary color filter are both normalized to unity, the average relative luminance of the cyan primary color in the wavelength range between 450 nm~500 nm should be smaller than or equal to 10 to avoid the above-mentioned situation.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

What is claimed is:

1. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the relative luminance ratio of the fourth primary color to the red primary color is greater than or equal to 1 at the peak position of the fourth primary color located in the wavelength range between 550 nm~600 nm.

2. The display device of claim **1**, wherein the fourth primary color is yellow primary color.

3. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the relative luminance ratio of the fourth primary color to the green primary color is greater than or equal to 0.5 at the peak position of the fourth primary color located in the wavelength range between 550 nm~600 nm.

4. The display device of claim **3**, wherein the fourth primary color is yellow primary color.

5. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the ratio of the total relative luminances of the fourth primary color and the red primary color is greater than or equal to 2 in the wavelength range between 550 nm~600 nm.

6. The display device of claim **5**, wherein the fourth primary color is yellow primary color.

7. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the ratio of the total relative luminances of the fourth primary color and the green primary color is greater than or equal to 0.5 in the wavelength range between 550 nm~600 nm.

8. The display device of claim **7**, wherein the fourth primary color is yellow primary color.

9. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the average relative luminance of the fourth primary color is greater than or equal to 0.03 in the wavelength range between 550 nm~600 nm when the maximum of the backlight emitted by the backlight source and filters of the sub pixels of the fourth primary color are both normalized to unity.

10. The display device of claim **9**, wherein the fourth primary color is yellow primary color.

11. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the ratio of the total relative luminances of the fourth primary color and the green primary color is smaller than or equal to 10 in the wavelength range between 450 nm~500 nm.

12. The display device of claim **11**, wherein the fourth primary color is cyan primary color.

13. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the ratio of the total relative luminances of the fourth primary color and the blue primary color is smaller than or equal to 10 in the wavelength range between 450 nm~500 nm.

14. The display device of claim **13**, wherein the fourth primary color is cyan primary color.

15. A display device, comprising:
a backlight source; and
a plurality of pixels, each of which has at least four sub pixels including red primary color, green primary color, blue primary color, and a fourth primary color;
wherein the average relative luminance of the fourth primary color is smaller than or equal to 10 in the wavelength range between 450 nm~500 nm when the maximum of the backlight emitted by the backlight source and filters of the sub pixels of the fourth primary color are both normalized to unity.

16. The display device of claim **15**, wherein the fourth primary color is cyan primary color.

* * * * *

EXHIBIT C

US007101073B2

(12) **United States Patent**
Li

(10) **Patent No.: US 7,101,073 B2**
(45) **Date of Patent: Sep. 5, 2006**

(54) **LIGHT POSITIONING DEVICE**

(75) Inventor: **Cheng-Wei Li**, Kaohsiung (TW)

(73) Assignee: **AU Optronics Corp.**, Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 161 days.

(21) Appl. No.: **10/880,203**

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(51) **Int. Cl.**
F21V 7/04 (2006.01)

(52) **U.S. Cl.** **362/621**; 362/628; 362/631

(58) **Field of Classification Search** 362/607, 362/612, 613, 555, 561, 511, 330, 581, 628, 362/630, 633, 634, 608, 610; 349/58, 65
See application file for complete search history.

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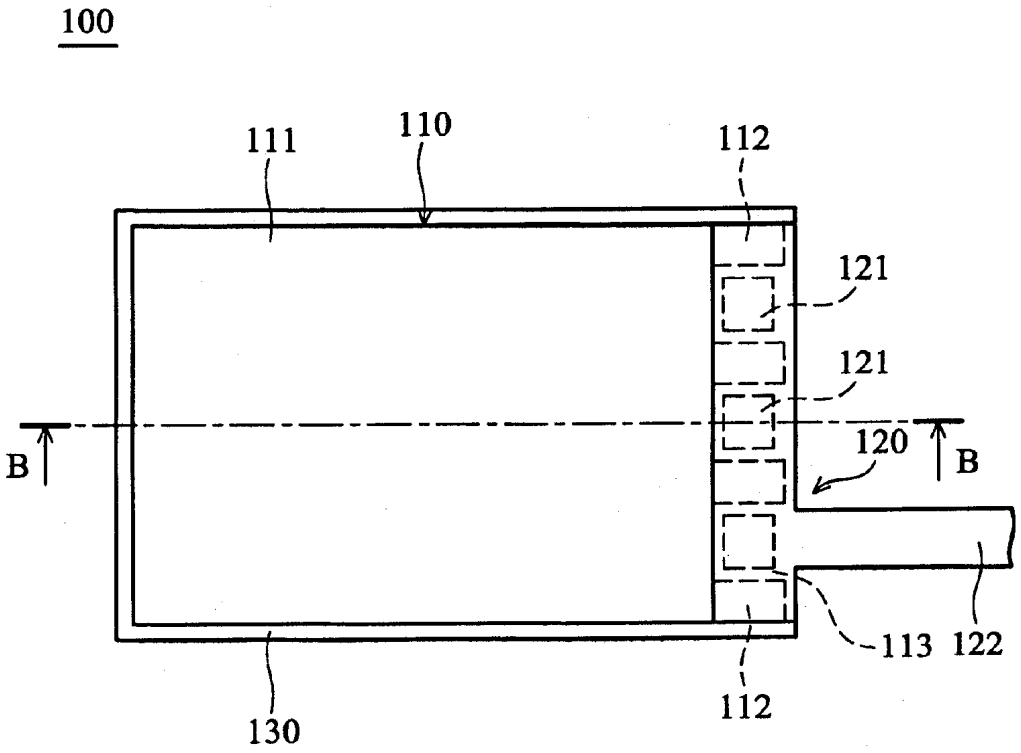
(74) *Attorney, Agent, or Firm*—Thomas, Kayden, Horstemeyer & Risley

(57) **ABSTRACT**

A light positioning device. The light positioning device comprises a light guide plate, a light source assembly and a frame. The light guide plate comprises a protrusion and a recess. The light source assembly is disposed on the protrusion of the light guide plate and abuts the light guide plate. The light source assembly comprises a light source module received in the recess of the light guide plate. The frame is disposed under the light guide plate and light source assembly.

8 Claims, 5 Drawing Sheets



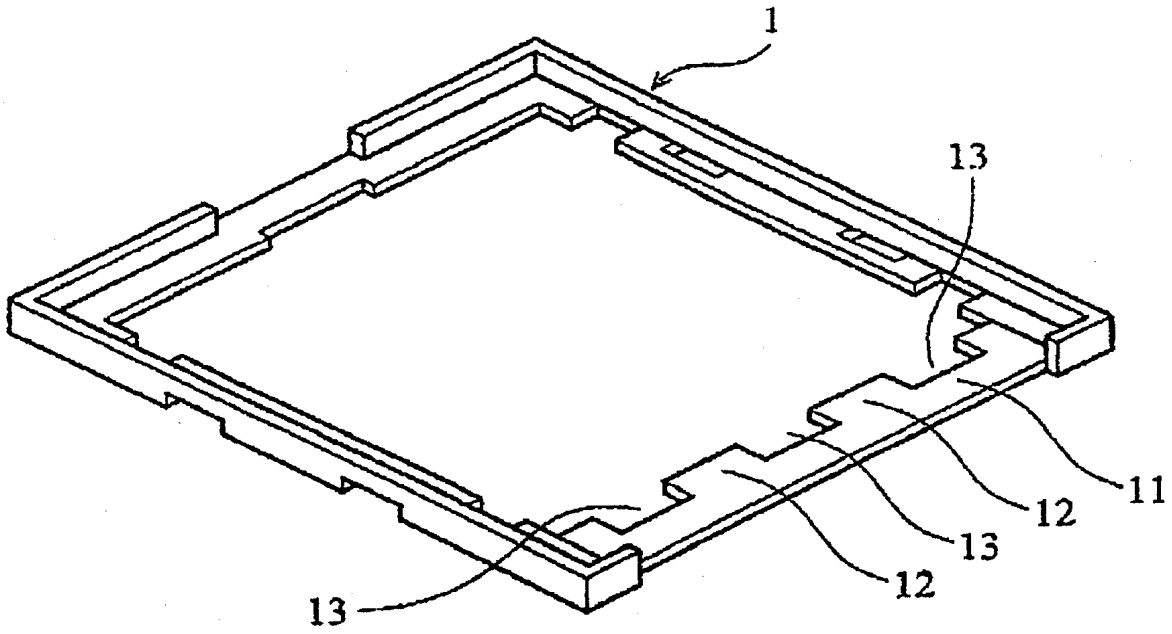


FIG. 1 (Prior Art)

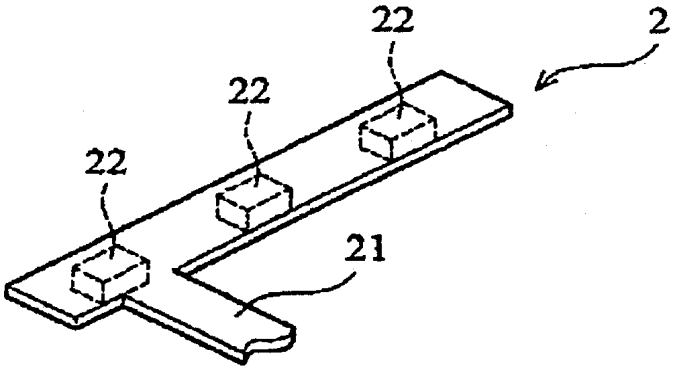


FIG. 2 (Prior Art)

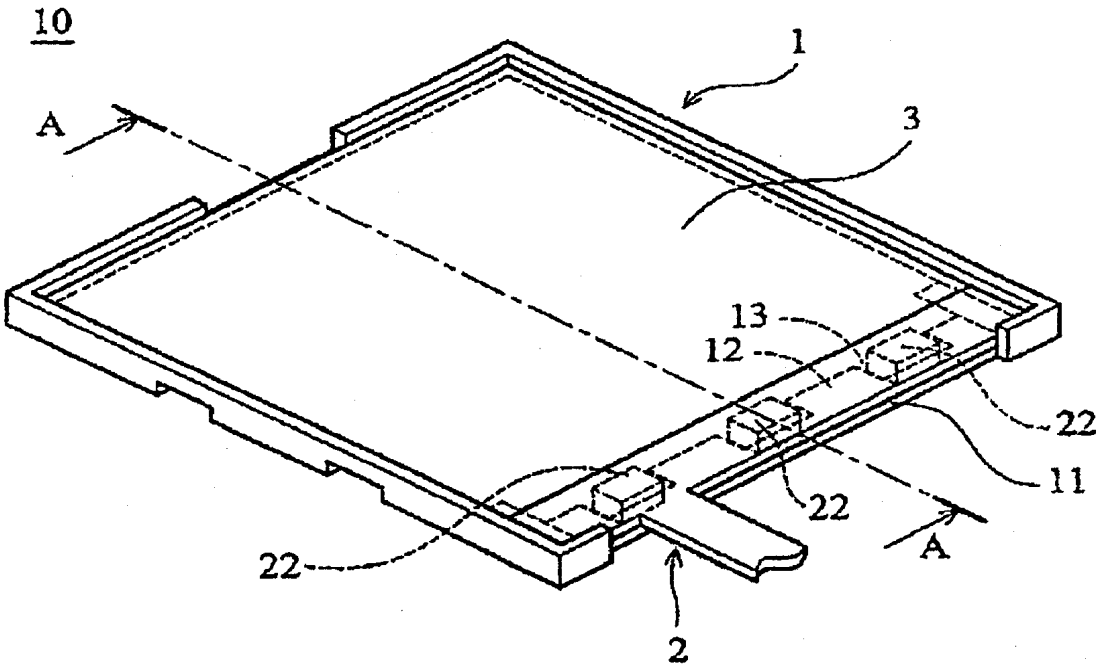


FIG. 3A (Prior Art)

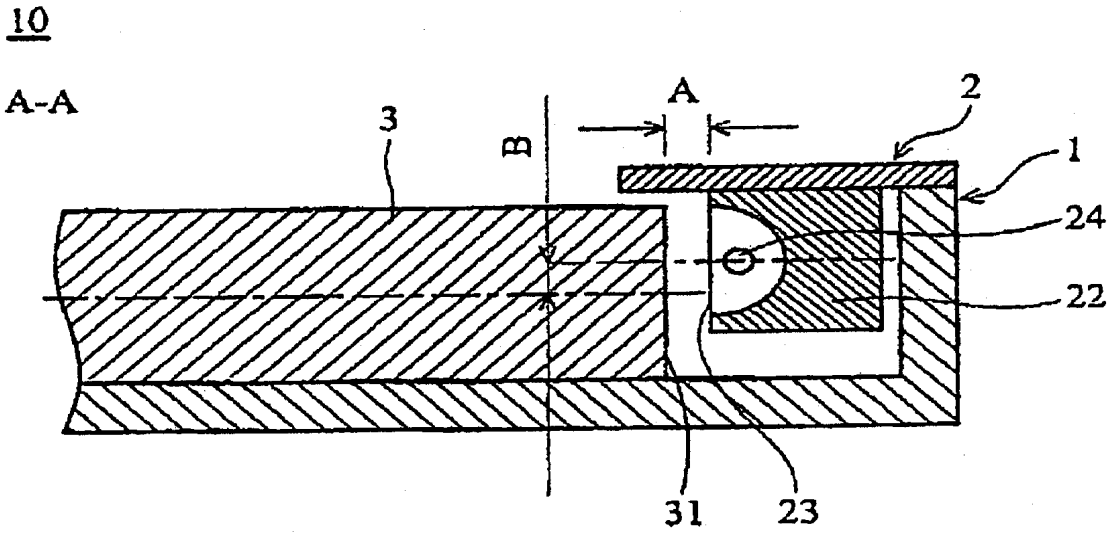


FIG. 3B (Prior Art)

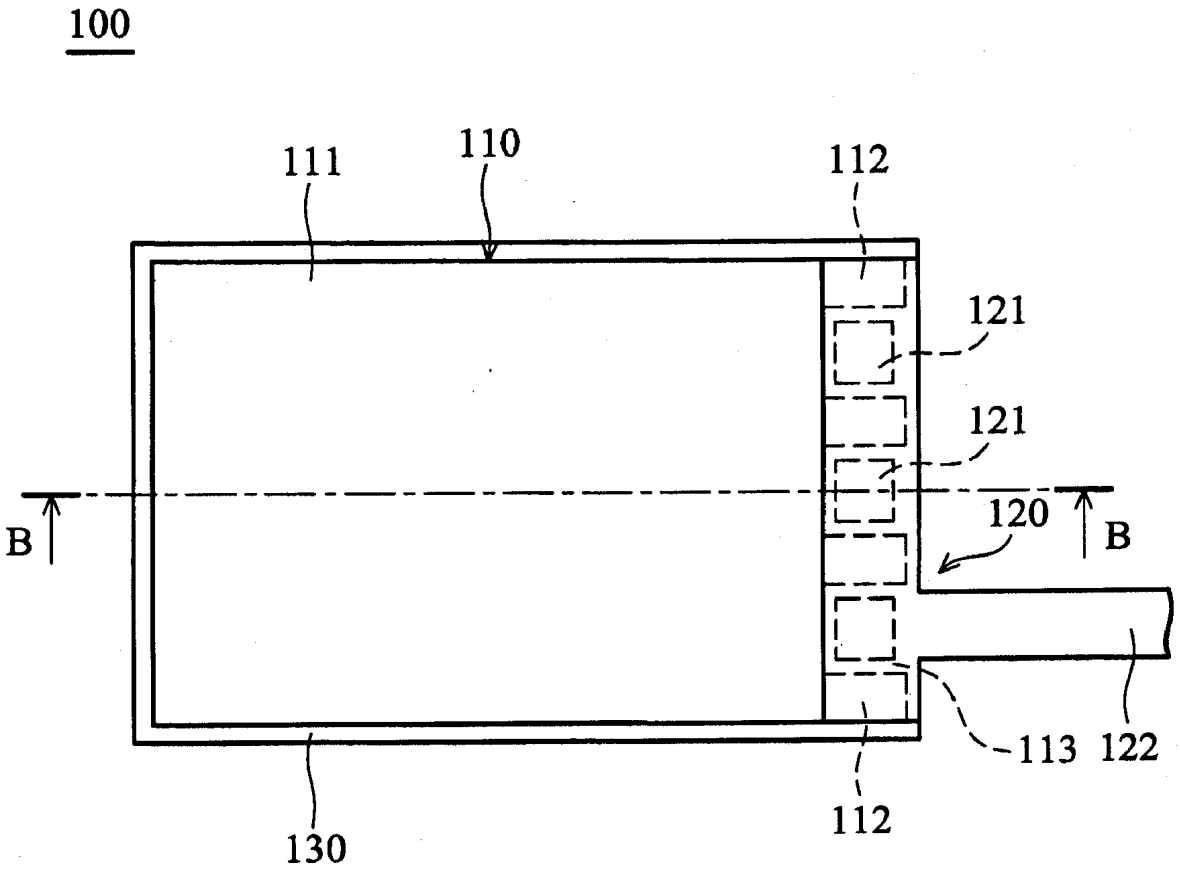


FIG. 4

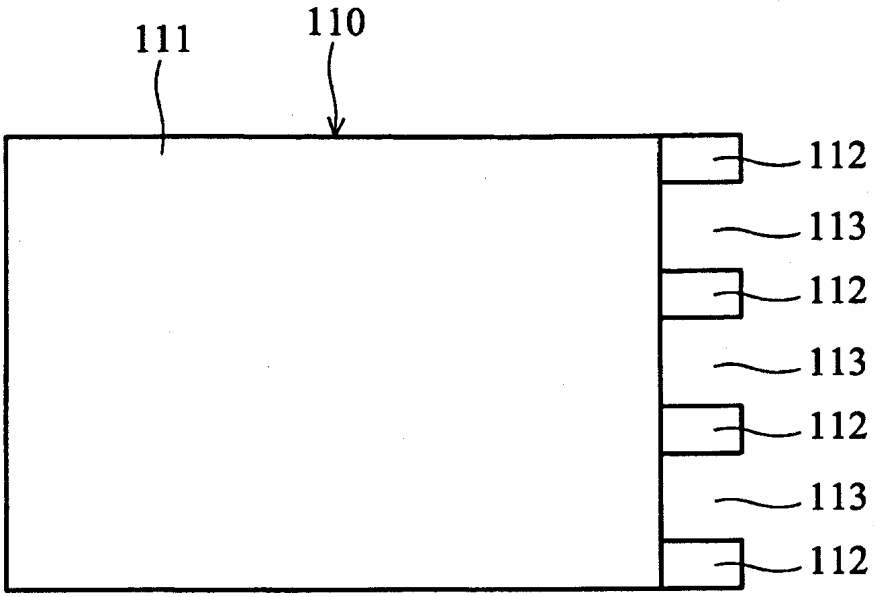


FIG. 5A

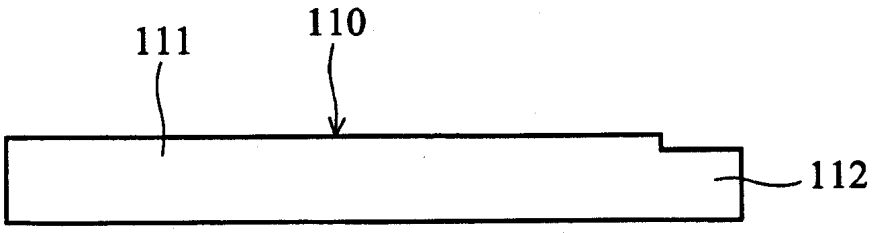


FIG. 5B

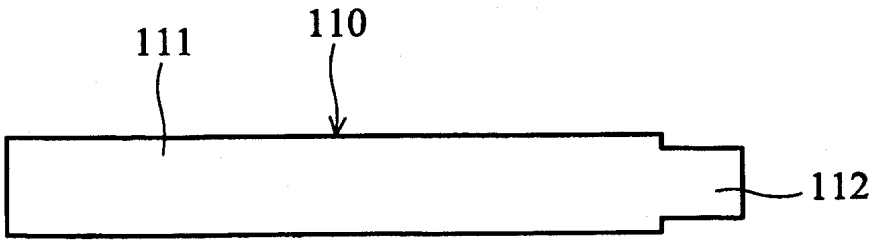


FIG. 5C

100

B-B

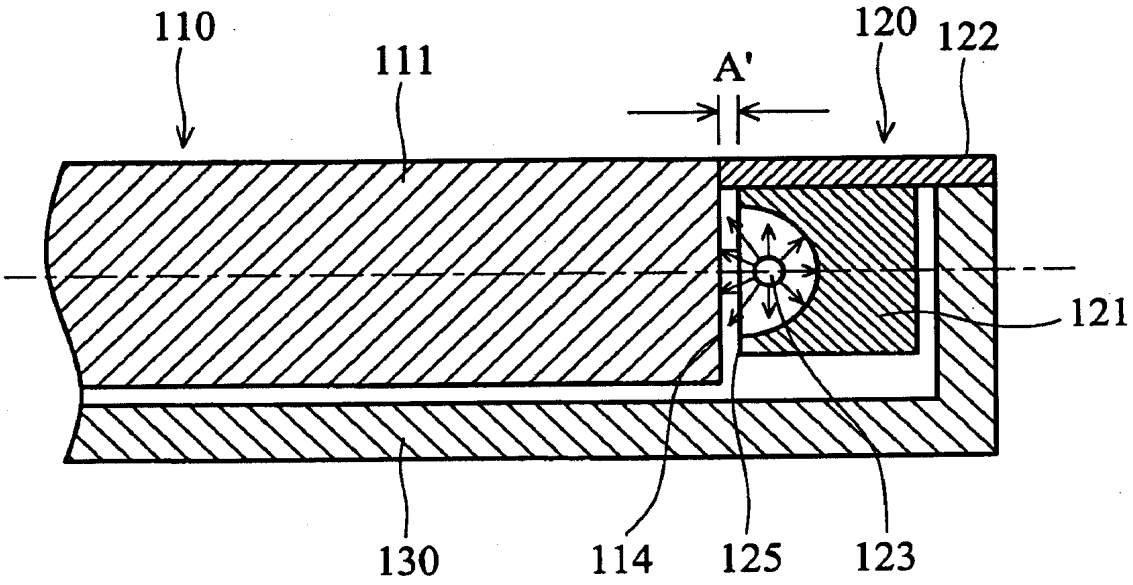


FIG. 6

LIGHT POSITIONING DEVICE

BACKGROUND

The present invention relates to a light positioning device, and in particular to a light positioning device capable of reducing errors in assembly of a light guide plate, a light source assembly and a frame thereof.

LCD devices are generally multiple-layer structures comprising a light guide plate, a light source assembly, an LCD panel, a reflective plate, a diffusing plate and a frame. Conventionally, the light source assembly is first fixed on the frame and the light guide plate is then fitted into the frame.

Referring to FIG. **1**, one side **11** of a conventional frame **1** is formed with a plurality of protrusions **12** and a plurality of recesses **13**. The protrusions **12** and recesses **13** are alternately formed on the side **11**.

Referring to FIG. **2**, a conventional light source assembly **2** comprises a flexible circuit board **21** and a plurality of light source modules **22**. Each light source module **22** comprises at least one light-emitting diode (LED).

Referring to FIG. **3**A, the light source assembly **2** is first disposed on the side **11** of the frame **1**. At this point, the light source modules **22** of the light source assembly **2** are respectively received in the recesses **13** of the side **11**. A light guide plate **3** is then fitted into the frame **1** and abuts the light source assembly **2** to form a light positioning device **10**.

Specifically, a tolerance or error may occur during manufacture of the frame **1**. Further, assembly errors may occur between the light guide plate **3** and the frame **1** and between the light source assembly **2** and the frame **1**. The cross section of the assembled light positioning device **10** is shown in FIG. **3**B. Accordingly, a gap A exists between a light-input surface **31** of the light guide plate **3** and a light-output surface **23** of the light source modules and a displacement B exists between the central line of a LED **24** (or the light source module **22**) of the light source assembly **2** and the central line of the light guide plate **3**. The gap A and displacement B are often large, such that light from the LED **24** (or the light source module **22**) cannot be effectively utilized by the light guide plate **3**. Thus, the performance of the light positioning device **10** is adversely affected.

Additionally, assembly of the light positioning device **10** is complicated, resulting in increased manufacturing time, manpower and cost.

SUMMARY

Accordingly, the invention provides an improved light positioning device to overcome the aforementioned problems. The light positioning device comprises a light guide plate, a light source assembly and a frame. The light guide plate comprises a protrusion and a recess. The light source assembly is disposed on the protrusion of the light guide plate and abuts the light guide plate. The light source assembly comprises a light source module received in the recess of the light guide plate. The frame is disposed under the light guide plate and light source assembly.

The light guide plate further comprises a main body. The protrusion and recess are formed on one side of the main body and the light source assembly abuts the main body.

The light source assembly further comprises a power transmission member electrically connected to the light source module.

The power transmission member comprises a flexible printed circuit board (FPCB) or a printed circuit board (PCB).

The light source module further comprises a light-emitting element.

The light-emitting element comprises a light-emitting diode (LED) or a cold cathode fluorescent lamp (CCFL).

The recess is rectangular, curved, or polygonal.

A detailed description is given in the following embodiments with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the present invention can be more fully understood by reading the subsequent detailed description and examples with references made to the accompanying drawings, wherein:

FIG. **1** is a schematic perspective view of a conventional frame;

FIG. **2** is a schematic perspective view of a light source assembly;

FIG. **3**A is a schematic perspective view of a conventional light positioning device;

FIG. **3**B is a partial cross section according to FIG. **3**A;

FIG. **4** is a schematic top view of the light positioning device of an embodiment of the invention;

FIG. **5**A is a schematic top view of the light guide plate of the light positioning device of an embodiment of the invention;

FIG. **5**B is a schematic side view of the light guide plate of the light positioning device of an embodiment of the invention;

FIG. **5**C is another schematic side view of the light guide plate of the light positioning device of an embodiment of the invention; and

FIG. **6** is a partial cross section according to FIG. **4**.

DETAILED DESCRIPTION

Referring to FIG. **4**, the light positioning device **100** comprises a light guide plate **110**, a light source assembly **120** and a frame **130**.

Referring to FIG. **4** and FIG. **5**A, the light guide plate **110** comprises a main body **111**, a plurality of protrusions **112** and a plurality of recesses **113**. The protrusions **112** and recesses **113** are alternately formed on one side of the main body **111**. The light guide plate **110** can alternatively comprise lateral shapes as shown in FIG. **5**B and FIG. **5**C.

As shown in FIGS. **4**, **5**A and **6**, the light source assembly **120** is disposed on the protrusions **112** of the light guide plate **110** and abuts the main body **111** thereof. The light source assembly **120** comprises a plurality of light source modules **121** received in the recesses **113** of the light guide plate **110**. Moreover, the light source assembly **120** comprises a power transmission member **122**. The light source modules **121** are disposed on the power transmission member **122** and electrically connected thereto. The light source modules **121** can thus acquire power via the power transmission member **122**. Additionally, the power transmission member **122** can be a flexible printed circuit board (FPCB) or a printed circuit board (PCB).

As shown in FIG. **6**, each light source module **121** further comprises a light-emitting element **123** disposed therein. The light-emitting element **123** can be a light-emitting diode (LED) or a cold cathode fluorescent lamp (CCFL).

Specifically, although the recesses **113** of the light guide plate **110** of this embodiment are rectangular, the recesses **113** can selectively be curved or polygonal in accordance with the shape of the light source modules **121**.

The following description is directed to assembly of the light positioning device **100**.

The light source assembly **120** is directly fixed on the protrusions **112** of the light guide plate **110**. At this point, a gap A' between a light-input surface **114** of the main body **111** of the light guide plate **110** and a light-output surface **125** of each light source module **121** can be adjusted to be a minimal or optimal distance. The central lines of the light-emitting element **123** of each light source module **121** and main body **111** of the light guide plate **110** can also be adjusted to coincide with each other. As shown in FIG. **4**, the assembled light source assembly **120** and light guide plate **110** are then fitted into the frame **130**. At this point, the assembly of the light positioning device **100** is complete.

In conclusion, the light positioning device **100** has many advantages including the following. Since the light source assembly **120** is fixed directly on the light guide plate **110**, the assembly errors therebetween are reduced. Each light-emitting element **123** directly outputs light toward the center of the main body **111** of the light guide plate **110**. Thus, light from each light-emitting element **123** is effectively utilized by the light guide plate **110**, enhancing brightness of the light positioning device **100** (or an LCD device). Moreover, the assembly of the light positioning device **100** is simplified, thereby reducing manufacturing time, manpower and cost. Additionally, the frame **130** is simplified. Namely, the frame **130** is formed without any protrusions and recesses as are required by the conventional frame **1**, thus reducing manufacturing time and cost. Further, since the frame **130** is simplified, the frame **130** provides more space for additional deployment than the conventional frame **1**.

While the invention has been described by way of example and in terms of the preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. To the contrary, it is intended to cover various modifications and similar arrangements (as would be apparent to those skilled in the art). Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.

What is claimed is:

1. A light positioning device, comprising:

a light guide plate, comprising a main body, a protrusion and a recess, wherein the protrusion and recess are formed on one side of the main body, and a thickness of the protrusion is less than that of the main body;

a light source assembly disposed on the protrusion of the light guide plate and abutting the main body of the light guide plate, wherein the light source assembly comprise a light source module and a power transmission member, wherein the power transmission member comprises a printed circuit board (PCB), the light source module is received in the recess of the light guide plate, and the power transmission member is electrically connected to the light source and disposed on the protrusion; and

a frame disposed under the light guide plate and light source assembly.

2. A light positioning device, comprising:

a light guide plate comprising a main body, a protrusion and a recess, wherein the protusion and recess are formed on one side of the main body, and a thickness of the protrusion is less than that of the main body;

a light source assembly disposed on the protrusion of the light guide plate and abutting the main body of the light guide plate, wherein the light source assembly comprises a light source module and a power transmission member wherein the power transmission member comprises a flexible printed circuit board (PCB), the light source module is received in the recess of the light guide plate, and the power transmission member is electrically connected to the light source module and disposed on the protrusion; and

a frame disposed under the light guide plate and light source assembly.

3. The light positioning device as claimed in claim **2**, wherein the light source module further comprises a light-emitting element.

4. The light positioning device as claimed in claim **3**, wherein the light-emitting element comprises a light-emitting diode (LED).

5. The light positioning device as claimed in claim **3**, wherein light-emitting element comprises a cold cathode flourescent lamp (CCFL).

6. The light positioning device as claimed in claim **2**, wherein the recess is rectangular.

7. The light positioning device as claimed in claim **2**, wherein the recess is curved.

8. The light positioning device as claimed in claim **2**, wherein the recess is polygonal.

* * * * *

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Phone | 858-350-2300

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

AU OPTRONICS CORPORATION, a Taiwanese corporation, and AU OPTRONICS CORPORATION AMERICA, a California corporation PLAINTIFF(S) v. SHARP CORPORATION a.k.a. SHARP KABUSHIKI KAISHA a Japanese corporation, and SHARP ELECTRONICS CORPORATION, a. New York CORPORATION DEFENDANT(S).	CASE NUMBER **SACV11-00338 CJC (RNBx)** **SUMMONS**

TO: DEFENDANT(S): _____

A lawsuit has been filed against you.

Within _21_ days after service of this summons on you (not counting the day you received it), you must serve on the plaintiff an answer to the attached ☑ complaint ☐ _____ amended complaint ☐ counterclaim ☐ cross-claim or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff's attorney, Natalie J. Morgan, whose address is WSGR, 12235 El Camino Real, Suite 200 San Diego, California 92130-3002. If you fail to do so, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

Clerk, U.S. District Court

Dated: MAR - 2 2011

By: J. Barrera
Deputy Clerk

(Seal of the Court) 1144

[Use 60 days if the defendant is the United States or a United States agency, or is an officer or employee of the United States. Allowed 60 days by Rule 12(a)(3)].

BY Fax

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

I (a) PLAINTIFFS (Check box if you are representing yourself ☐)

AU OPTRONICS CORPORATION, a Taiwanese corporation, and AU OPTRONICS CORPORATION AMERICA, a California corporation

DEFENDANTS

SHARP CORPORATION a k a SHARP KABUSHIKI KAISHA, a Japanese corporation, and SHARP ELECTRONICS CORPORATION, a New York corporation

(b) Attorneys (Firm Name, Address and Telephone Number. If you are representing yourself, provide same.)

Natalie J. Morgan, Esq , Wilson, Sonsini, Goodrich & Rosati
12235 El Camino Real, Suite 200, San Diego, California 92130-3002
Phone | 858-350-2300

Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an X in one box only.)

☐ 1 U.S. Government Plaintiff ☑ 3 Federal Question (U.S. Government Not a Party)

☐ 2 U.S. Government Defendant ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES - For Diversity Cases Only (Place an X in one box for plaintiff and one for defendant.)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated or Principal Place of Business in this State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated and Principal Place of Business in Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. ORIGIN (Place an X in one box only.)

☑ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify): ☐ 6 Multi-District Litigation ☐ 7 Appeal to District Judge from Magistrate Judge

V. REQUESTED IN COMPLAINT: JURY DEMAND: ☑ Yes ☐ No (Check 'Yes' only if demanded in complaint.)

CLASS ACTION under F.R.C.P. 23: ☐ Yes ☑ No ☑ MONEY DEMANDED IN COMPLAINT: $ TO BE DETERMINED

VI. CAUSE OF ACTION (Cite the U.S. Civil Statute under which you are filing and write a brief statement of cause. Do not cite jurisdictional statutes unless diversity.)

35 U.S.C. § 100 et seq., particularly §§ 271, 281, 283, 284 and 285

VII. NATURE OF SUIT (Place an X in one box only.)

OTHER STATUTES
- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce/ICC Rates/etc.
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 480 Consumer Credit
- ☐ 490 Cable/Sat TV
- ☐ 810 Selective Service
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 875 Customer Challenge 12 USC 3410
- ☐ 890 Other Statutory Actions
- ☐ 891 Agricultural Act
- ☐ 892 Economic Stabilization Act
- ☐ 893 Environmental Matters
- ☐ 894 Energy Allocation Act
- ☐ 895 Freedom of Info. Act
- ☐ 900 Appeal of Fee Determination Under Equal Access to Justice
- ☐ 950 Constitutionality of State Statutes

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loan (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability
- ☐ 196 Franchise

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Fed. Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury
- ☐ 362 Personal Injury-Med Malpractice
- ☐ 365 Personal Injury-Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

IMMIGRATION
- ☐ 462 Naturalization Application
- ☐ 463 Habeas Corpus-Alien Detainee
- ☐ 465 Other Immigration Actions

TORTS PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

CIVIL RIGHTS
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/Accommodations
- ☐ 444 Welfare
- ☐ 445 American with Disabilities - Employment
- ☐ 446 American with Disabilities - Other
- ☐ 440 Other Civil Rights

PRISONER PETITIONS
- ☐ 510 Motions to Vacate Sentence Habeas Corpus
- ☐ 530 General
- ☐ 535 Death Penalty
- ☐ 540 Mandamus/ Other
- ☐ 550 Civil Rights
- ☐ 555 Prison Condition

FORFEITURE/ PENALTY
- ☐ 610 Agriculture
- ☐ 620 Other Food & Drug
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 630 Liquor Laws
- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs
- ☐ 660 Occupational Safety /Health
- ☐ 690 Other

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt. Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ret. Inc. Security Act

PROPERTY RIGHTS
- ☐ 820 Copyrights
- ☑ 830 Patent
- ☐ 840 Trademark

SOCIAL SECURITY
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 IRS-Third Party 26 USC 7609

FOR OFFICE USE ONLY: Case Number: SACV11-00338 CJC (RNBx)

AFTER COMPLETING THE FRONT SIDE OF FORM CV-71, COMPLETE THE INFORMATION REQUESTED BELOW.

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

VIII(a). IDENTICAL CASES: Has this action been previously filed in this court and dismissed, remanded or closed? ☑ No ☐ Yes
If yes, list case number(s): _____

VIII(b). RELATED CASES: Have any cases been previously filed in this court that are related to the present case? ☑ No ☐ Yes
If yes, list case number(s): _____

Civil cases are deemed related if a previously filed case and the present case:
(Check all boxes that apply) ☐ A. Arise from the same or closely related transactions, happenings, or events; or
☐ B. Call for determination of the same or substantially related or similar questions of law and fact; or
☐ C. For other reasons would entail substantial duplication of labor if heard by different judges; or
☐ D. Involve the same patent, trademark or copyright, and one of the factors identified above in a, b or c also is present.

IX. VENUE: (When completing the following information, use an additional sheet if necessary.)

(a) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which EACH named plaintiff resides.
☐ Check here if the government, its agencies or employees is a named plaintiff. If this box is checked, go to item (b).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
	AU Optronics Corporation America: Santa Clara County, California AU Optronics Corporation: Taiwan

(b) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which EACH named defendant resides.
☐ Check here if the government, its agencies or employees is a named defendant. If this box is checked, go to item (c).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Sharp Electronics Corporation: Orange County, California	Sharp Corporation: Japan

(c) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which EACH claim arose.
Note: In land condemnation cases, use the location of the tract of land involved.

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Claim I, Claim II, and Claim III arose in Orange County, California.	

* Los Angeles, Orange, San Bernardino, Riverside, Ventura, Santa Barbara, or San Luis Obispo Counties
Note: In land condemnation cases, use the location of the tract of land involved

X. SIGNATURE OF ATTORNEY (OR PRO PER): _____ Date 3/2/11

Notice to Counsel/Parties: The CV-71 (JS-44) Civil Cover Sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law. This form, approved by the Judicial Conference of the United States in September 1974, is required pursuant to Local Rule 3-1 is not filed but is used by the Clerk of the Court for the purpose of statistics, venue and initiating the civil docket sheet. (For more detailed instructions, see separate instructions sheet.)

Key to Statistical codes relating to Social Security Cases:

Nature of Suit Code	Abbreviation	Substantive Statement of Cause of Action
861	HIA	All claims for health insurance benefits (Medicare) under Title 18, Part A, of the Social Security Act, as amended. Also, include claims by hospitals, skilled nursing facilities, etc., for certification as providers of services under the program. (42 U.S.C. 1935FF(b))
862	BL	All claims for "Black Lung" benefits under Title 4, Part B, of the Federal Coal Mine Health and Safety Act of 1969. (30 U.S.C. 923)
863	DIWC	All claims filed by insured workers for disability insurance benefits under Title 2 of the Social Security Act, as amended; plus all claims filed for child's insurance benefits based on disability. (42 U.S.C. 405(g))
863	DIWW	All claims filed for widows or widowers insurance benefits based on disability under Title 2 of the Social Security Act, as amended. (42 U.S.C. 405(g))
864	SSID	All claims for supplemental security income payments based upon disability filed under Title 16 of the Social Security Act, as amended.
865	RSI	All claims for retirement (old age) and survivors benefits under Title 2 of the Social Security Act, as amended. (42 U.S.C. (g))

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

NOTICE OF ASSIGNMENT TO UNITED STATES MAGISTRATE JUDGE FOR DISCOVERY

This case has been assigned to District Judge Cormac J. Carney and the assigned discovery Magistrate Judge is Robert N. Block.

The case number on all documents filed with the Court should read as follows:

SACV11- 338 CJC (RNBx)

Pursuant to General Order 05-07 of the United States District Court for the Central District of California, the Magistrate Judge has been designated to hear discovery related motions.

All discovery related motions should be noticed on the calendar of the Magistrate Judge

==========

NOTICE TO COUNSEL

A copy of this notice must be served with the summons and complaint on all defendants (if a removal action is filed, a copy of this notice must be served on all plaintiffs).

Subsequent documents must be filed at the following location:

[ ] **Western Division**
312 N. Spring St., Rm. G-8
Los Angeles, CA 90012

[X] **Southern Division**
411 West Fourth St., Rm. 1-053
Santa Ana, CA 92701-4516

[ ] **Eastern Division**
3470 Twelfth St., Rm. 134
Riverside, CA 92501

Failure to file at the proper location will result in your documents being returned to you.