



US007507993B2

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

(10) **Patent No.:** **US 7,507,993 B2**
(45) **Date of Patent:** **Mar. 24, 2009**

(54) **DOUBLE-SIDED DISPLAY**

(75) Inventors: **Chung-Chun Lee**, Yunlin County (TW);
Chun-Yi Chiu, Taoyuan County (TW)

(73) Assignee: **Au Optonics 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 325 days.

(21) Appl. No.: **11/424,974**

(22) Filed: **Jun. 19, 2006**

(65) **Prior Publication Data**

US 2007/0164659 A1 Jul. 19, 2007

(30) **Foreign Application Priority Data**

Jan. 18, 2006 (TW) 95101846 A

(51) **Int. Cl.**
H01L 51/10 (2006.01)

(52) **U.S. Cl.** **257/59; 257/40; 257/72;**
257/E51.018

(58) **Field of Classification Search** 257/40,
257/59, 72, E51.018
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,677,610 B2 * 1/2004 Choi et al. 257/59
7,350,326 B2 * 4/2008 Hu 40/544

2004/0263759 A1 12/2004 Matsuhira et al.
2007/0120478 A1 * 5/2007 Lee et al. 313/512
2007/0164659 A1 * 7/2007 Lee et al. 313/500
2007/0220792 A1 * 9/2007 Capurso et al. 40/463

FOREIGN PATENT DOCUMENTS

CN 1571606 1/2005
CN 1576980 2/2005
CN 1617192 5/2005

OTHER PUBLICATIONS

CN Office Action mailed Oct. 12, 2007.

* cited by examiner

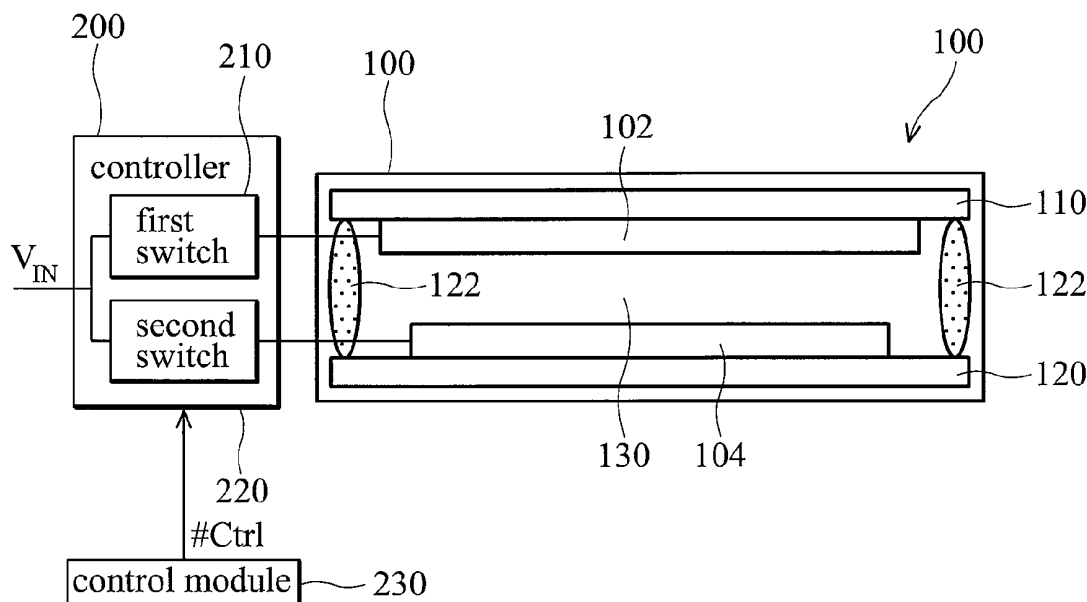
Primary Examiner—Victor A Mandala

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

(57) **ABSTRACT**

A double-sided display comprises a first organic light emitting device with a first transparent substrate, and the first organic light emitting device illuminates toward the first substrate. A second organic light emitting device with a second transparent substrate opposite to the first substrate, and the second organic light emitting device illuminates toward the second substrate. The first organic light emitting device is separated from the second organic light emitting device by a gap. A controller, coupled to the first and second organic light emitting devices, receives a control signal to individually switch the power of the first and second organic light emitting devices.

6 Claims, 3 Drawing Sheets



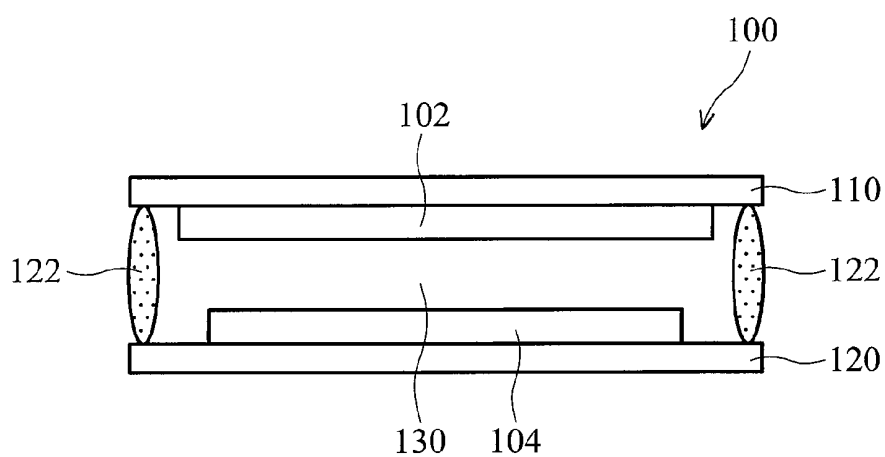


FIG. 1 (RELATED ART)

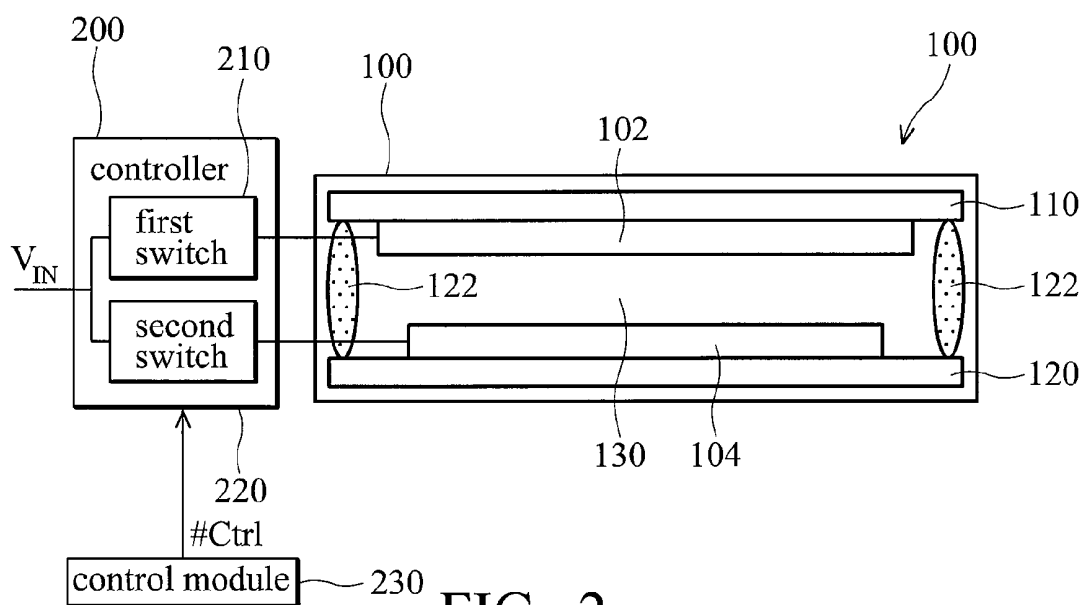


FIG. 2

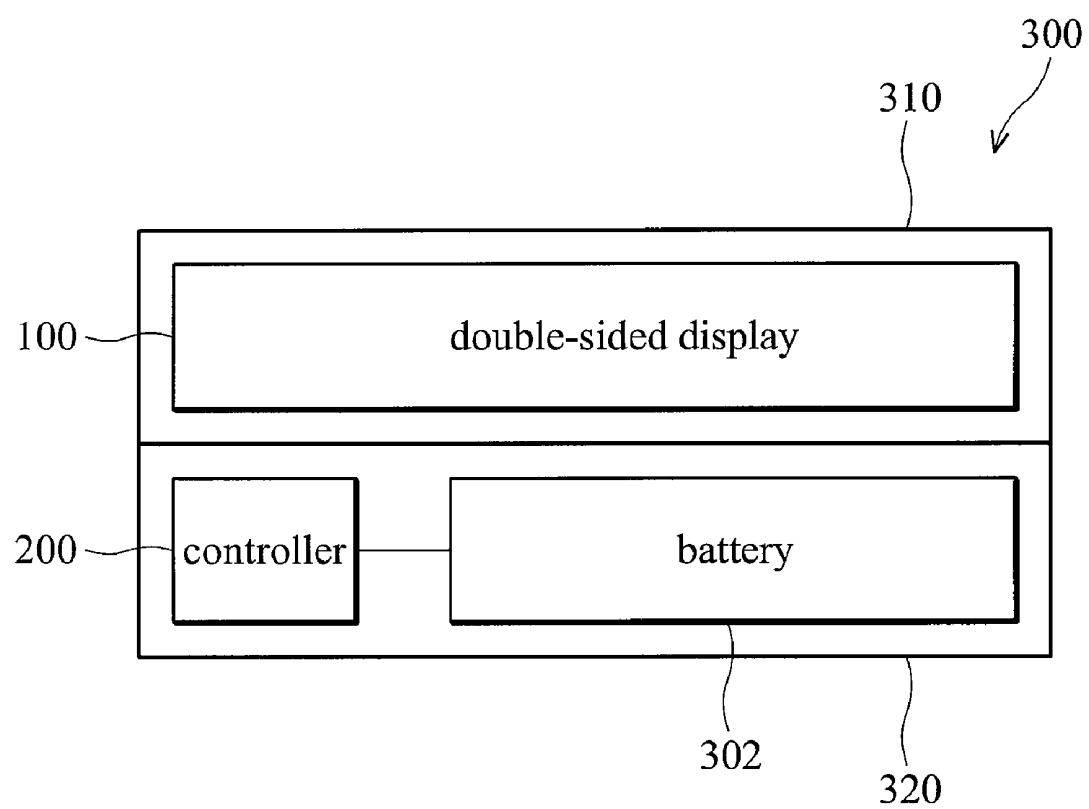


FIG. 3a

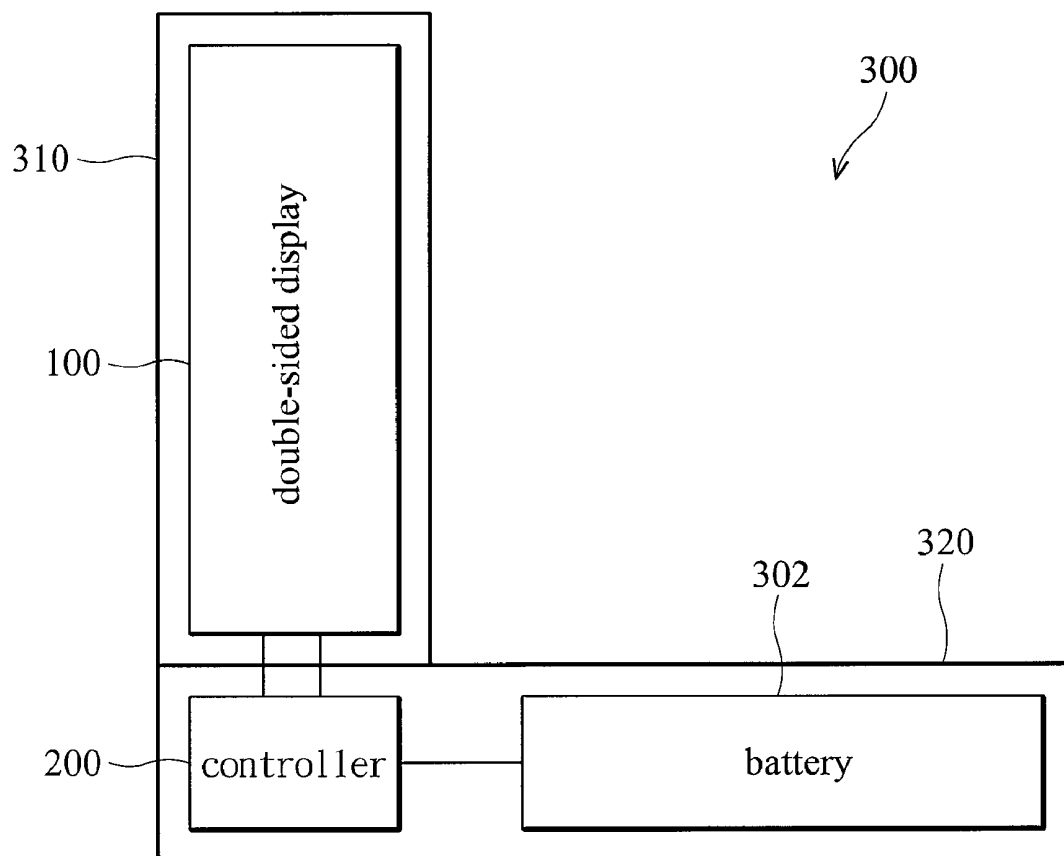


FIG. 3b

DOUBLE-SIDED DISPLAY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to double-sided display, and in particular, to a control device managing illumination of a double-sided display.

2. Description of the Related Art

FIG. 1 is a cross section of a conventional double-sided organic light emitting display. A first organic light emitting device **102** and a second organic light emitting device **104** are deposited in parallel, partitioned with a space **130** therebetween. A first transparent substrate **110** and the first organic light emitting device **102** form an upper panel, and the first organic light emitting device **102** illuminates upward through the transparent substrate **110**. The second transparent substrate **120** and the second organic light emitting device **104** form a lower panel, and the second organic light emitting device **104** illuminates in the opposite direction through the transparent substrate **120**. An encapsulant **122** is deposited as a sidewall between the first organic light emitting device **102** and second organic light emitting device **104**, forming a sealed space to avoid moisture penetration. A dryer material may also be placed in the sealed space to protect the electronic components from moisture corrosion. In some case, the sealed space is filled with special materials. Typically, the areas of the first organic light emitting device **102** and second organic light emitting device **104** are not necessarily identical, and the relative position thereof can vary. The first organic light emitting device **102** and second organic light emitting device **104** may be organic light emitting diode (OLED) or polymer light emitting diode (PLED), and the driving mode may be passive matrix or active matrix. The double-sided display **100** is widely adapted, such as collapsible mobile phones. The architecture of double-sided display **100** effectively reduces thickness and cost. A double sided LCD requires only one backlight source to illuminate both sides. On the contrary, the OLEDs in the double-sided display **100** are not based on a backlight source, thus an improved driving mechanism is desirable.

BRIEF SUMMARY OF INVENTION

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

An exemplary embodiment of a double-sided display comprises a first organic light emitting device having a first surface toward which the first organic light emitting device illuminates. A second organic light emitting device has a second surface opposite to the first surface, and is deposited above the first organic light emitting device, illuminating toward the second surface. The first organic light emitting device is separated from the second organic light emitting device by a gap. A controller, coupled to the first and second organic light emitting devices, receives a control signal to individually switch power of the first and second organic light emitting devices.

The double-sided display may comprise a first transparent substrate, where the first organic light emitting device is deposited on its first surface. A second organic light emitting device is deposited above the second transparent substrate. A sealant is filled between the first and second organic light emitting devices, forming an isolated sealed space therebetween.

The controller may comprise first and second switches. The first switch is coupled to the first organic light emitting

device, conducting a power signal to the first organic light emitting device. The second switch is coupled to the second organic light emitting device, conducting the power signal to the second light emitting device. The control signal control on and off status of the first and second organic light emitting devices through the first and second switches.

BRIEF DESCRIPTION OF DRAWINGS

The 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 cross section of a conventional double-sided organic light emitting display;

FIG. 2 is a schematic view of an embodiment of a double-sided organic light emitting display; and

FIGS. 3a and 3b show embodiments of collapsible devices according to the invention.

DETAILED DESCRIPTION OF INVENTION

The following description is of the best-contemplated mode of carrying out the invention. This description is made for the purpose of illustrating the general principles of the invention and should not be taken in a limiting sense. The scope of the invention is best determined by reference to the appended claims.

FIG. 2 is a schematic view of an embodiment of the double-sided organic light emitting display. The double-sided display **100** comprises the following components. A first organic light emitting device **102** and a first transparent substrate **110** on it form the first panel. The first organic light emitting device **102** illuminates toward the first surface through the transparent substrate **110**. Similarly, a second organic light emitting device **104** and a second transparent substrate **120** on it form the second panel. The second organic light emitting device **104** illuminates toward the second surface through the second transparent substrate **120**. A sealant **122** between the first organic light emitting device **102** and second organic light emitting device **104** acts as a sidewall, sealing the space therebetween. A controller **200** is coupled to the first organic light emitting device **102** and the second organic light emitting device **104** to receive a control signal #ctrl, and the power switches of the first organic light emitting device **102** and second organic light emitting device **104** are controlled thereby. A power signal V_{IN} is individually sent to the first organic light emitting device **102** and second organic light emitting device **104** according to the switch status thereof. The controller **200** comprises a first switch **210** and a second switch **220**. The first switch **210** is coupled to the first organic light emitting device **102**, and the power signal is conducted thereby. The second switch **220** is coupled to the second organic light emitting device **104**, conducting the power signal thereto. The control signal #ctrl individually activates or deactivates the first switch **210** and the second switch **220**, with the first organic light emitting device **102** and the second organic light emitting device **104** turned on or off correspondingly. The control signal may be generated by a control module **230** implemented by software or a hardware controller.

FIGS. 3a and 3b are embodiments of collapsible devices according to the invention. The collapsible mobile phone **300** comprises an upper shell **310** and a lower shell **320**. The transparent substrate **110** is deposited in the upper shell **310**, and the controller **200** is in the lower shell **320**. The lower shell **320** comprises a battery **302** coupled to the controller **200**, providing power supply for the double-sided display **100**. The collapsible mobile phone **300** may comprise a but-

3

ton (such as the control module **230** in FIG. **2**) detecting the positions of the upper shell **310** and lower shell **320**. FIG. **3a** shows the collapsible device in collapsed status. In this case, the second organic light emitting device **104** is inside, and the button sends the control signal #ctrl to the controller **200**, deactivating the second switch **220** to disable the second organic light emitting device **104**. The first organic light emitting device **102** is outside the upper shell **310**, and operation thereof is determined by software.

FIG. **3b** shows the collapsible mobile phone **300** opened. The first organic light emitting device **102** and second organic light emitting device **104** on the upper shell **310** are fully functional in this case. Operations of the first organic light emitting device **102** and second organic light emitting device **104** are thus controlled by software. Additionally, the control module **230** may also be manually controllable by users. The first organic light emitting device **102** and second organic light emitting device **104** may be AMOLED or PMOLED simultaneously or individually. The first organic light emitting device **102** and the second organic light emitting device **104** may also be RGB side-by-side OLED or white OLED (WOLED) simultaneously or individually. As well as the collapsible mobile phone in FIGS. **3a** and **3b**, the double-sided display may also be adapted for digital camera, digital video recorder, laptop, and portable media player use.

While the invention has been described by way of example and in terms of preferred embodiment, it is to be understood that the invention is not limited thereto. 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 double-sided display, comprising
 - a first substrate;
 - a second substrate;

4

- a first organic light emitting device, disposed on the first substrate, for illuminating toward the first substrate;
- a second organic light emitting device, disposed on the second substrate, for illuminating toward the second substrate, wherein the first organic light emitting device is separated from the second organic light emitting device by a gap;

- a first switch coupled to the first organic light emitting device for conducting a power supply to the first organic light emitting device;

- a second switch coupled to the second organic light emitting device for conducting the power supply to the second organic light emitting device; and

- a controller, coupled to the first and second switches, for individually controlling the first and second switches based on a control signal.

2. The double-sided display as claimed in claim 1, further comprising:

- an encapsulant filled between the first and second substrates and forming an isolated sealed space therebetween.

3. The double-sided display as claimed in claim 1, further comprising a software module for generating the control signal applied to the controller.

4. The double-sided display as claimed in claim 1, further comprising a hardware module for generating the control signal applied to the controller.

5. The double-sided display as claimed in claim 1, wherein at least one of the first and second organic light emitting devices comprises an active matrix organic light emitting diode or a passive matrix organic light emitting diode.

6. The double-sided display as claimed in claim 1, wherein at least one of the first and second organic light emitting devices comprises a side-by-side organic light emitting diode or a white organic light emitting diode.

* * * * *

专利名称(译)	双面显示		
公开(公告)号	US7507993	公开(公告)日	2009-03-24
申请号	US11/424974	申请日	2006-06-19
[标]申请(专利权)人(译)	友达光电股份有限公司		
申请(专利权)人(译)	友达光电.		
当前申请(专利权)人(译)	友达光电.		
[标]发明人	LEE CHUNG CHUN CHIU CHUN YI		
发明人	LEE, CHUNG-CHUN CHIU, CHUN-YI		
IPC分类号	H01L51/10		
CPC分类号	G06F3/1423 H01L25/048 G09G3/3208 G09G2300/02 G09G2330/021 H01L27/3267 H01L27/3286 H01L2924/0002		
优先权	095101846 2006-01-18 TW		
其他公开文献	US20070164659A1		
外部链接	Espacenet USPTO		

摘要(译)

双面显示器包括具有第一透明基板的第一有机发光装置，并且第一有机发光装置朝向第一基板照射。第二有机发光装置，具有与第一基板相对的第二透明基板，第二有机发光装置朝向第二基板照射。第一有机发光器件通过间隙与第二有机发光器件分离。耦合到第一和第二有机发光装置的控制单元接收控制信号以单独地切换第一和第二有机发光装置的功率。

