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(54) **ORGANIC ELECTROLUMINESCENT DISPLAY DEVICE**

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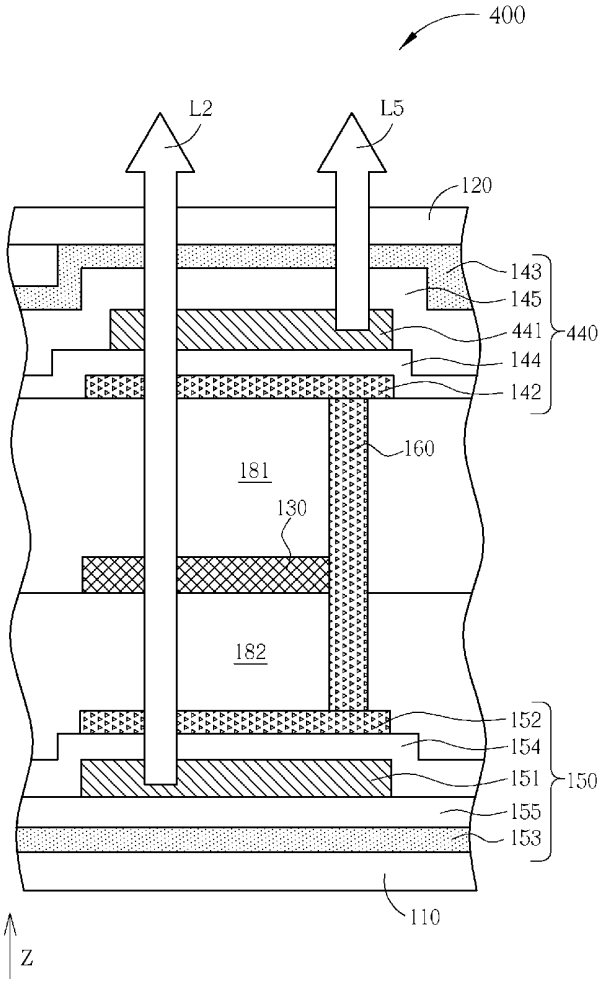
(57) **ABSTRACT**

An organic electroluminescent display device includes a bottom substrate, a covering substrate, a pixel controlling unit, a first organic light emitting unit, and a second organic light emitting unit. The covering substrate is disposed oppositely to the bottom substrate. The pixel controlling unit is disposed between the bottom substrate and the covering substrate. The first organic light emitting unit is disposed between the pixel controlling unit and the covering substrate. The second organic light emitting unit is disposed between the pixel controlling unit and the bottom substrate. The pixel controlling unit is electrically connected to the first organic light emitting unit and the second organic light emitting unit.



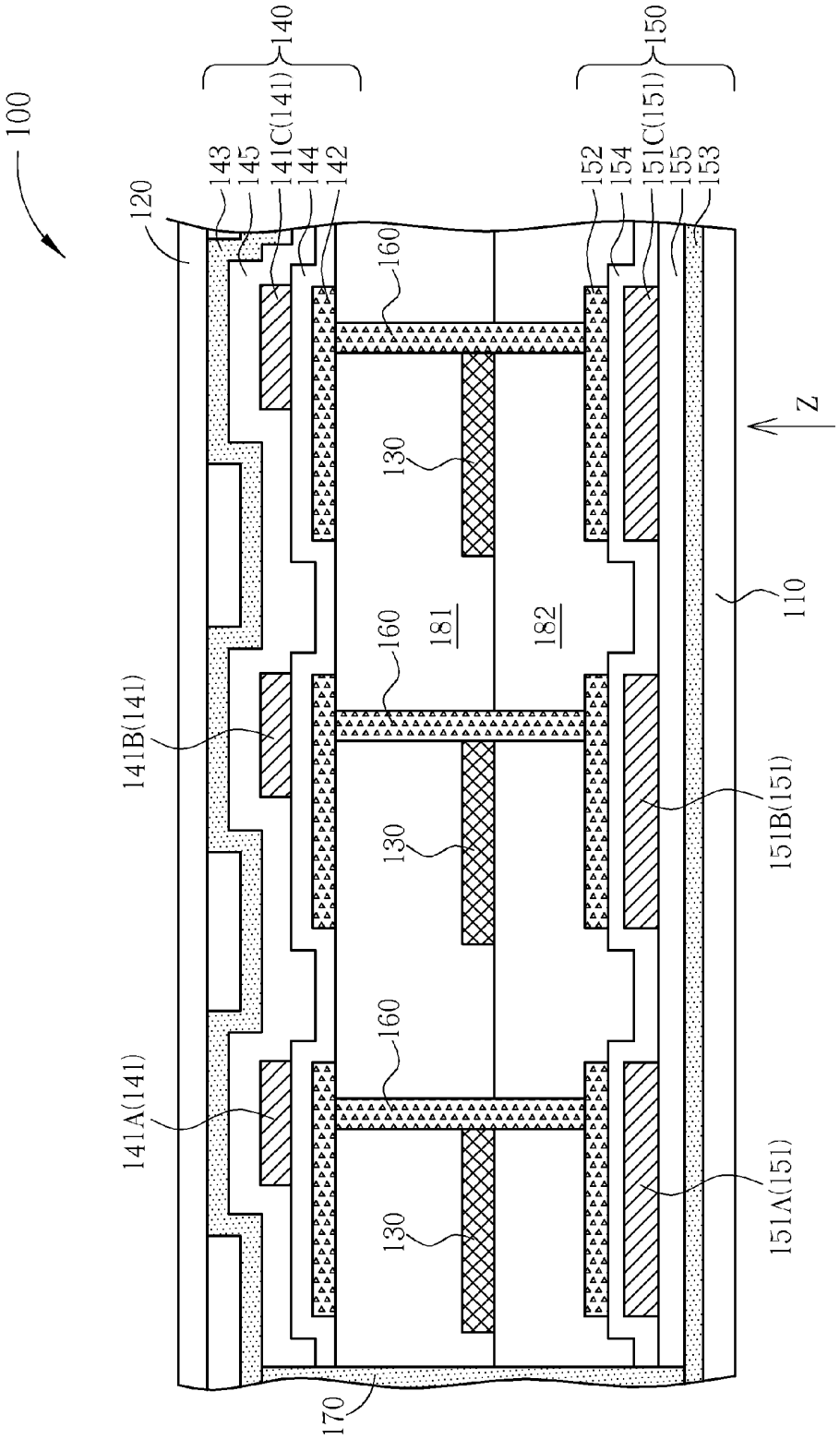

100
120
140
150
143
145
141C(141)
144
142
152
154
151C(151)
155
153
160
130
181
182
110
141B(141)
151B(151)
141A(141)
151A(151)
170
Z

FIG. 1

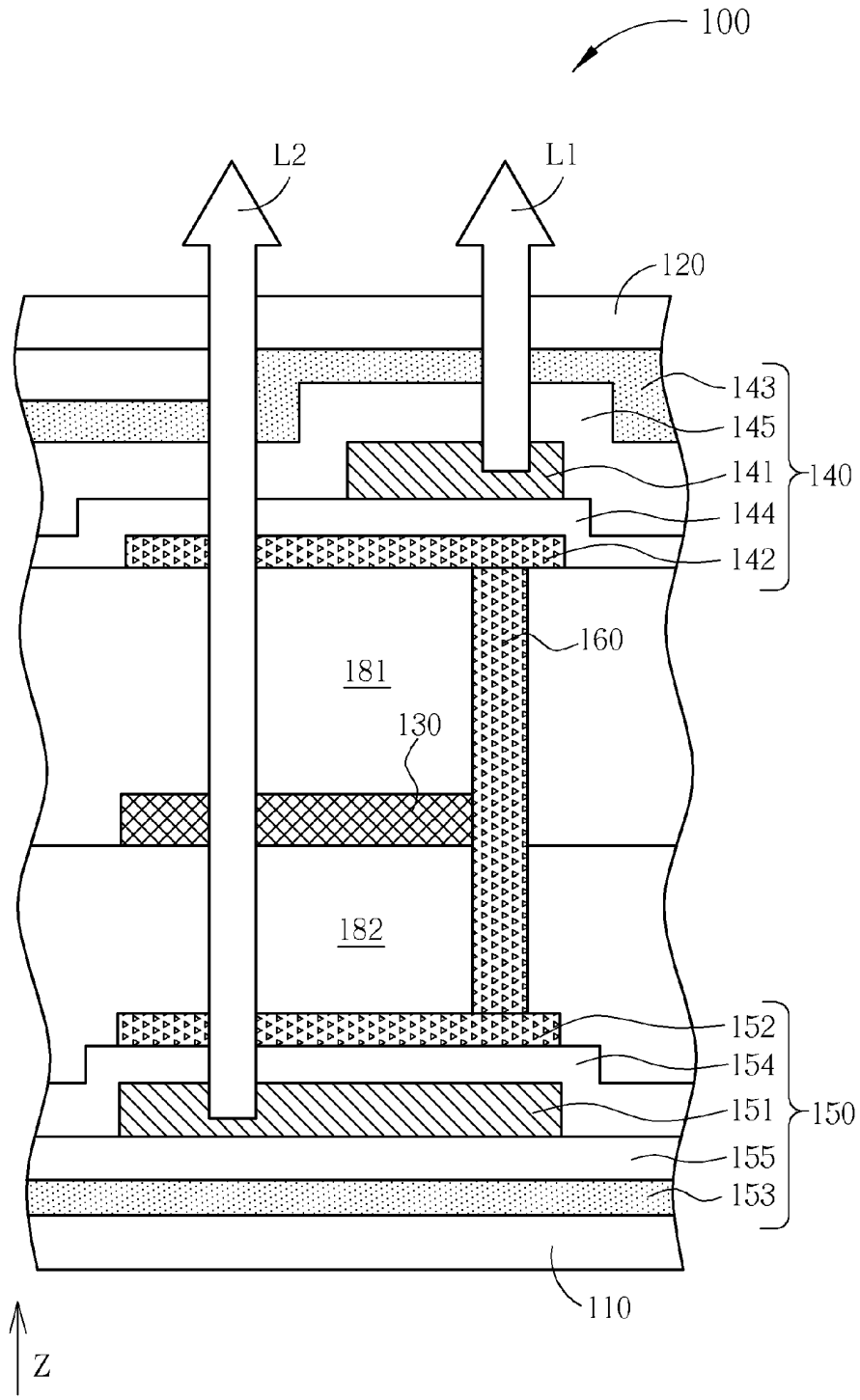

100
L2
L1
120
143
145
141
140
144
142
160
181
130
182
152
154
151
150
155
153
110
Z

FIG. 2

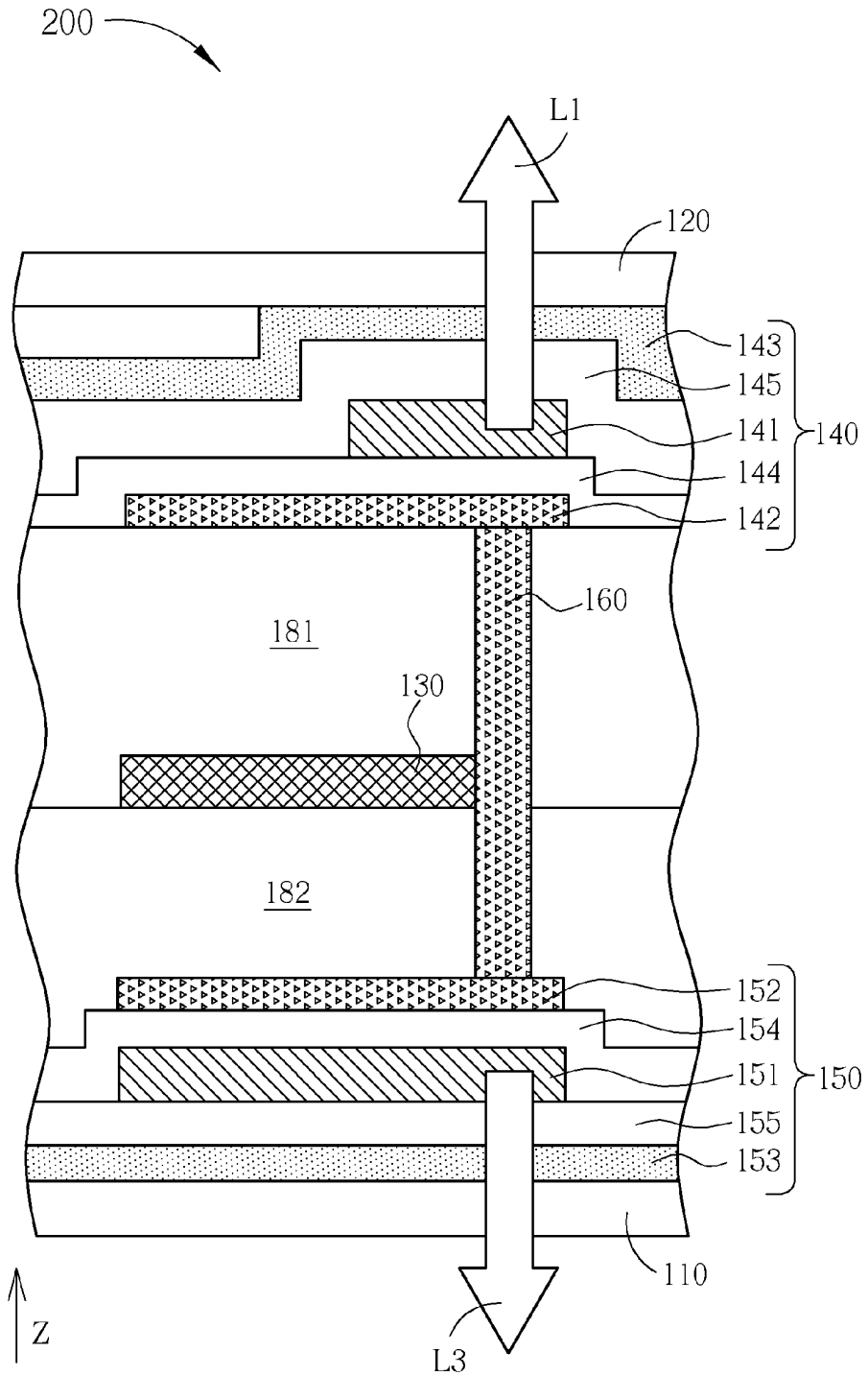

200
L1
120
143
145
141
140
144
142
160
181
130
182
152
154
151
150
155
153
110
Z
L3

FIG. 3

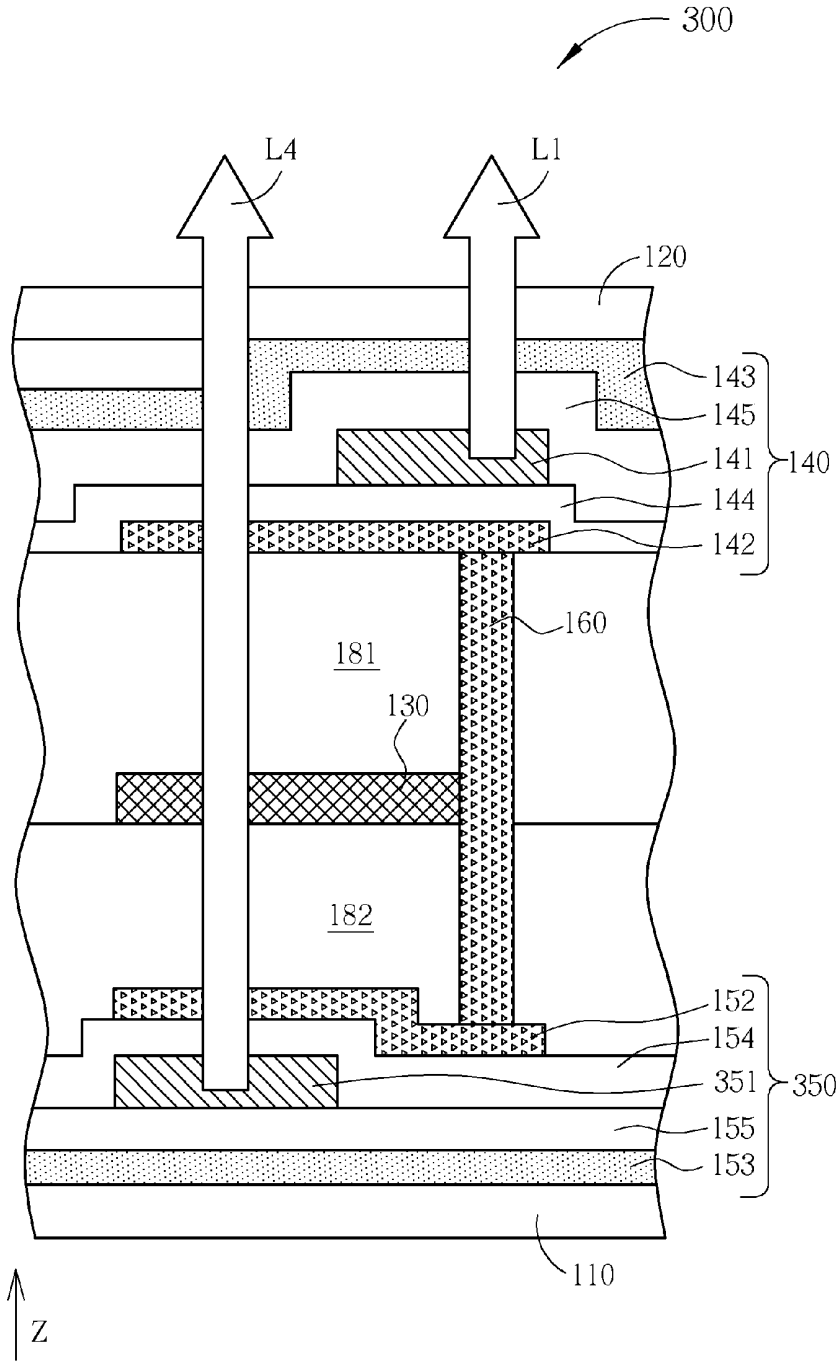

300
L4
L1
120
143
145
141
140
144
142
160
181
130
182
152
154
351
350
155
153
110
Z

FIG. 4

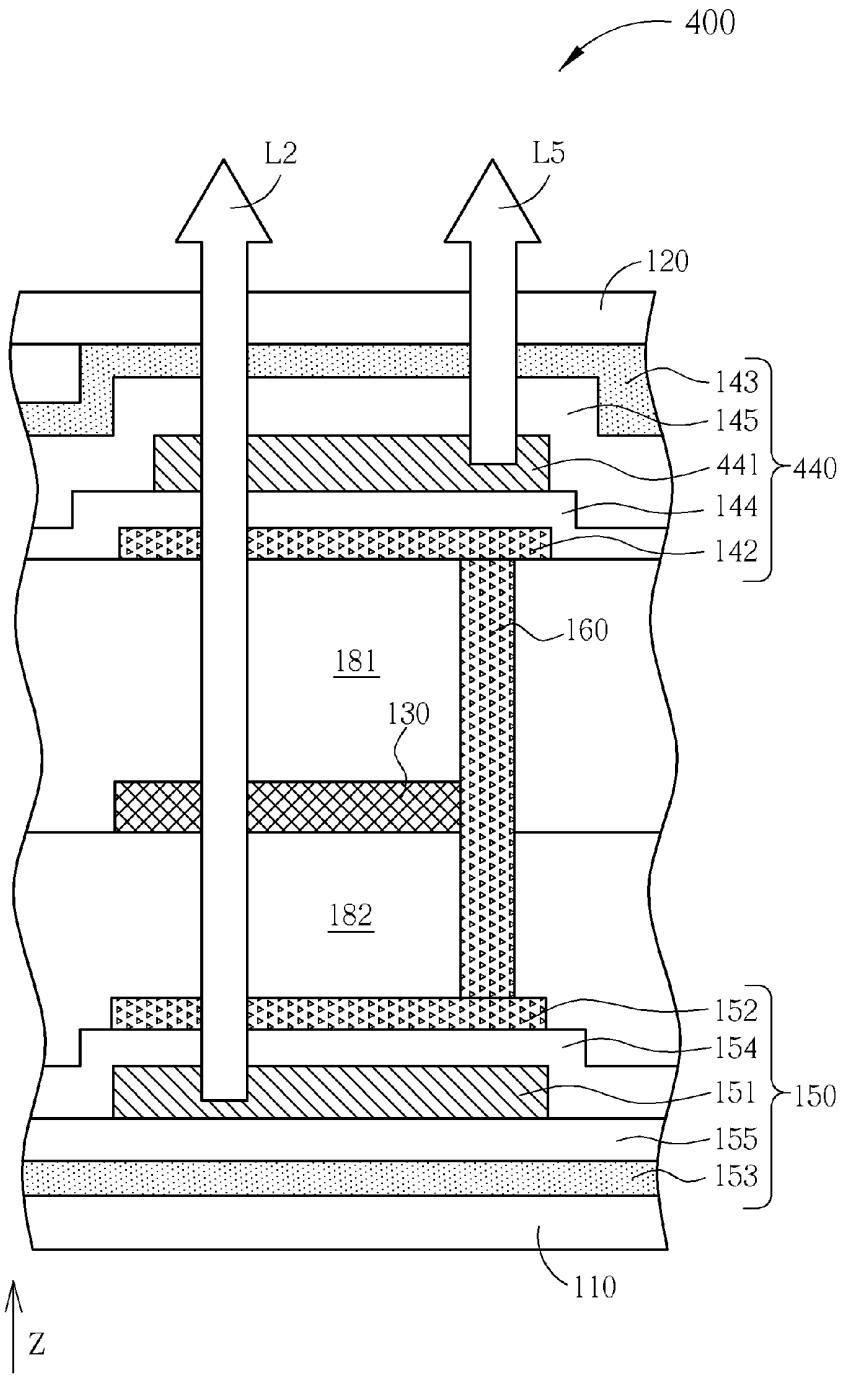

400
L2
L5
120
143
145
441
440
144
142
160
181
130
182
152
154
151
150
155
153
110
Z

FIG. 5

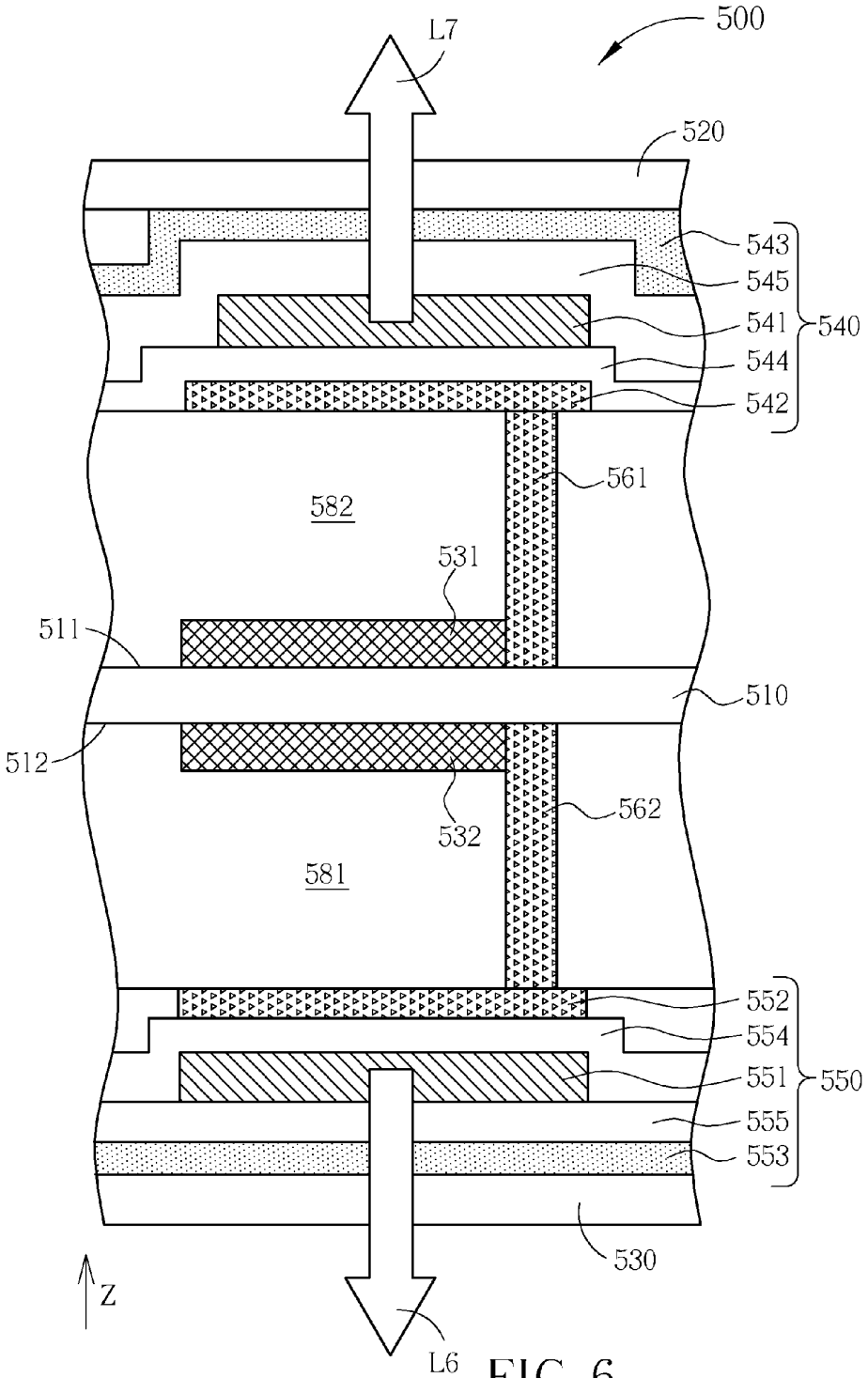

500
L7
520
543
545
541
544
542
540
561
582
531
511
510
512
562
532
581
552
554
551
550
555
553
530
Z
L6

FIG. 6

ORGANIC ELECTROLUMINESCENT DISPLAY DEVICE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an organic electroluminescent display device, and more particularly, to an organic electroluminescent display device having organic light emitting units disposed over and under a pixel controlling unit so as to enhance the luminous efficacy, enhance the chromaticity condition, or emit light from both sides of the device.

[0003] 2. Description of the Prior Art

[0004] Because of certain advantages, such as being color filter free, self-lighting, backlight module free, and having low power consumption, the electroluminescent display devices are regarded as a front runner to replace the conventional liquid crystal display devices and become the mainstream display products of the next generation. Organic light emitting diode (OLED) display technology may be the most mature technology among all the electroluminescent display technologies. However, according to developments of related technologies, problems such as low luminous efficacy and high cost are sill hard to be overcome in the organic light emitting diodes. Therefore, related industries still work on modifying other aspects, such as the design of the structure in the display device, so as to enhance the integrated luminous efficacy and the display quality.

SUMMARY OF THE INVENTION

[0005] It is one of the objectives of the present invention to provide an organic electroluminescent display device. Organic light emitting units are disposed over and under a pixel controlling unit. The organic light emitting unit disposed over the pixel controlling unit complements the organic light emitting unit disposed under the pixel controlling unit so as to enhance the integrated luminous efficacy and the chromaticity condition of the organic electroluminescent display device, or to emit light from both sides of the organic electroluminescent display device.

[0006] To achieve the purposes described above, a preferred embodiment of the present invention provides an organic electroluminescent display device. The organic electroluminescent display device includes a bottom substrate, a covering substrate, a pixel controlling unit, a first organic light emitting unit, and a second organic light emitting unit. The covering substrate is disposed oppositely to the bottom substrate. The pixel controlling unit is disposed between the bottom substrate and the covering substrate. The first organic light emitting unit is disposed between the pixel controlling unit and the covering substrate. The second organic light emitting unit is disposed between the pixel controlling unit and the bottom substrate. The pixel controlling unit is electrically connected to the first organic light emitting unit and the second organic light emitting unit.

[0007] To achieve the purposes described above, a preferred embodiment of the present invention provides an organic electroluminescent display device. The organic electroluminescent display device includes a main substrate, a first covering substrate, a second covering substrate, a first pixel controlling unit, a second pixel controlling unit, a first organic light emitting unit, and a second organic light emitting unit. The main substrate has an upper surface and a lower surface. The first covering substrate is disposed oppositely to the upper surface of the main substrate. The second covering substrate is disposed oppositely to the lower surface of the main substrate. The first pixel controlling unit is disposed on the upper surface of the main substrate, and the second pixel controlling unit is disposed on the lower surface of the main substrate. The first organic light emitting unit is disposed between the first pixel controlling unit and the first covering substrate. The second organic light emitting unit is disposed between the second pixel controlling unit and the second covering substrate. The first organic light emitting unit is used to generate light toward the first covering substrate, and the second organic light emitting unit is used to generate light toward the second covering substrate. The first pixel controlling unit is electrically connected to the first organic light emitting unit, and the second pixel controlling unit is electrically connected to the second organic light emitting unit.

[0008] These and other objectives of the present invention will no doubt become obvious to those of ordinary skill in the art after reading the following detailed description of the preferred embodiment that is illustrated in the various figures and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** and FIG. **2** are schematic diagrams illustrating an organic electroluminescent display device according to a first preferred embodiment of the present invention.

[0010] FIG. **3** is a schematic diagram illustrating an organic electroluminescent display device according to a second preferred embodiment of the present invention.

[0011] FIG. **4** is a schematic diagram illustrating an organic electroluminescent display device according to a third preferred embodiment of the present invention.

[0012] FIG. **5** is a schematic diagram illustrating an organic electroluminescent display device according to a fourth preferred embodiment of the present invention.

[0013] FIG. **6** is a schematic diagram illustrating an organic electroluminescent display device according to a fifth preferred embodiment of the present invention.

DETAILED DESCRIPTION

[0014] Certain terms are used throughout the description and following claims to refer to particular components. As one skilled in the art will understand, electronic equipment manufacturers may refer to a component by different names. This document does not intend to distinguish components that differ in name but not function. In the following description and in the claims, the term "include" is used in an open-ended fashion, and thus should be interpreted to mean "include, but not limited to . . . " In addition, to simplify the descriptions and make it more convenient to compare embodiments between each other, identical components are marked with the same reference numerals in each of the following embodiments. Please note that the figures are only for illustration and the figures may not be to scale. Additionally, the terms such as "first" and "second" in this context are only used to distinguish different components and do not constrain the order of generation.

[0015] Please refer to FIG. **1** and FIG. **2**. FIG. **1** and FIG. **2** are schematic diagrams illustrating an organic electroluminescent display device according to a first preferred embodiment of the present invention. More specifically, FIG. **2** is a schematic diagram illustrating a display condition of the

organic electroluminescent display device according to the first preferred embodiment of the present invention. As shown in FIG. **1** and FIG. **2**, the first preferred embodiment of the present invention provides an organic electroluminescent display device **100**. The organic electroluminescent display device **100** includes a bottom substrate **110**, a covering substrate **120**, a plurality of pixel controlling units **130**, a plurality of first organic light emitting units **140**, and a plurality of second organic light emitting units **150**. The covering substrate **120** is disposed oppositely to the bottom substrate **110**. The pixel controlling units **130** are disposed between the bottom substrate **110** and the covering substrate **120**. Each of the first organic light emitting units **140** is disposed between the corresponding pixel controlling unit **130** and the covering substrate **120**. Each of the second organic light emitting units **150** is disposed between the corresponding pixel controlling unit **130** and the bottom substrate **110**. Each of the pixel controlling units **130** is electrically connected to one first organic light emitting unit **140** and one second organic light emitting unit **150** so as to control the first organic light emitting unit **140** and the second organic light emitting unit **150** disposed oppositely along a direction Z perpendicular to the bottom substrate **110**.

[0016] In this embodiment, each of the first organic light emitting units **140** may include a first anode electrode **142**, a first cathode electrode **143**, and a first organic light emitting layer **141**. The first organic light emitting layer **141** is disposed between the first anode electrode **142** and the first cathode electrode **143**. Each of the second organic light emitting units **150** may include a second anode electrode **152**, a second cathode electrode **153**, and a second organic light emitting layer **151**. The second organic light emitting layer **151** is disposed between the second anode electrode **152** and the second cathode electrode **153**. Additionally, the organic electroluminescent display device **100** in this embodiment further includes a plurality of first connecting lines **160**. Each of the connecting lines **160** is disposed between the first organic light emitting unit **140** and the corresponding second organic light emitting unit **150**. Each of the pixel controlling units **130** may be electrically connected to the first organic light emitting unit **140** and the second organic light emitting unit **150** through the corresponding connecting line **160** so as to control the first organic light emitting unit **140** and the second organic light emitting unit **150** disposed oppositely along the direction Z. It is worth noting that, in this embodiment, each of the first organic light emitting units **140** and each corresponding second organic light emitting unit **150** are connected in parallel. For example, each of the pixel controlling units **130** may be electrically connected to the corresponding first organic light emitting unit **140** and the corresponding light emitting unit **150** through the connecting line **160**, and the first organic light emitting unit **140** and the corresponding light emitting unit **150** may be connected in parallel through the corresponding connecting line **160**. An identical signal may be transmitted from the pixel controlling unit **130** to the corresponding first organic light emitting unit **140** and the corresponding second organic light emitting unit **150**. The first organic light emitting unit **140** and the second organic light emitting unit **150** may be driven by the identical signal, and the luminous conditions of the first organic light emitting unit **140** and the second organic light emitting unit **150** may be controlled by the corresponding pixel controlling unit **130**. In addition, the organic electroluminescent display device **100** in this embodiment may further include a second connecting line **170** disposed between the first cathode electrode **143** and the second cathode electrode **153**. The first cathode electrode **143** may be electrically connected to the second cathode electrode **153** through the second connecting line **170**. Differences between the luminous condition of the first organic light emitting unit **140** and the luminous condition of the corresponding second organic light emitting unit **150** may be accordingly minimized, and the related driving approach may also be accordingly simplified. In this embodiment, each of the pixel controlling units **130** may be a switching circuit, and each of the pixel controlling units **130** may include an oxide semiconductor thin film transistor, an amorphous silicon thin film transistor, a poly silicon thin film transistor, or an organic semiconductor thin film transistor, but not limited thereto.

[0017] Based on the structure and the allocation approach described above, the first organic light emitting unit **140** may generate a light L**1** toward the covering substrate **120**, and the second organic light emitting unit **150** may generate a light L**2** toward the covering substrate **120**. In this embodiment, a color of the light L**1** generated by the first organic light emitting unit **140** may be identical to a color of the light L**2** generated by the second organic light emitting unit **150** so as to contribute to a better luminous efficacy of the organic electroluminescent display device **100**, but the present invention is not limited to this. The color of the light L**1** may also be different from the color of the light L**2** so as to contribute to a better white balance performance and enhance a chromaticity condition of the organic electroluminescent display device **100**. Additionally, each of the first organic light emitting layer **141** and the corresponding second organic light emitting layer **151** may only partially overlap with each other along the direction Z perpendicular to the bottom substrate **110** so as to lower an influence of the first organic light emitting unit **140** on the light L**2** generated from the second organic light emitting unit **150**. It is worth noting that the organic electroluminescent display device **100** in this embodiment may further include a first organic light emitting layer **141**A, a first organic light emitting layer **141**B, and a first organic light emitting layer **141**C respectively disposed in different first organic light emitting units **140**. The first organic light emitting layer **141**A, the first organic light emitting layer **141**B, and the first organic light emitting layer **141**C may be used to generate light with different colors. Light generated from the first organic light emitting layer **141**A, the first organic light emitting layer **141**B, and the first organic light emitting layer **141**C may be mixed to provide a full color display effect. Comparatively, the organic electroluminescent display device **100** in this embodiment may further include a second organic light emitting layer **151**A, a second organic light emitting layer **151**B, and a second organic light emitting layer **151**C respectively disposed in different second organic light emitting units **150**. Colors of light generated from the second organic light emitting layer **151**A, the second organic light emitting layer **151**B, and the second organic light emitting layer **151**C may be modified to accompany the corresponding first organic layer **141**. The above-mentioned purposes of enhancing the luminous efficacy or enhancing the chromaticity condition through white balance compensation may be therefore achieved.

[0018] In this embodiment, each of the first organic light emitting units **140** may further include a transporting layer **144** and a transporting layer **145**. The transporting layer **144** is disposed between the first organic light emitting layer **141**

and the first anode electrode **142**, and the transporting layer **145** is disposed between the first organic light emitting layer **141** and the first cathode electrode **143**. Each of the second organic light emitting units **150** may further include a transporting layer **154** and a transporting layer **155**. The transporting layer **154** is disposed between the second organic light emitting layer **151** and the second anode electrode **152**, and the transporting **155** is disposed between the second organic light emitting layer **151** and the second cathode electrode **153**. The transporting layer **144**, the transporting layer **145**, the transporting layer **154**, and the transporting layer **155** may respectively be an electron transporting layer or a hole transporting layer according to different design combinations, but not limited thereto. In addition, the organic electroluminescent display device **100** may further include a first insulating layer **181** and a second insulating layer **182**. The first insulating layer **181** is disposed between the pixel controlling unit **130** and the first organic light emitting unit **140**, and the second insulating layer **182** is disposed between the pixel controlling unit **130** and the second organic light emitting unit **150**. The first insulating layer **181** and the second insulating layer **182** may include inorganic materials, such as silicon nitride, silicon oxide, or silicon oxynitride, organic materials, such as acrylic resin, or other appropriate materials. Additionally, the first organic light emitting units **140** and the second organic light emitting units **150** may be top emission organic light emitting display units, but not limited thereto.

[0019] The following description will detail the different embodiments of the organic electroluminescent display device in the present invention. To simplify the description, identical components in each of the following embodiments are marked with identical symbols. For making it easier to understand the differences between the embodiments, the following description will detail the dissimilarities among different embodiments and the identical features will not be redundantly described.

[0020] Please refer to FIG. **3**. FIG. **3** is a schematic diagram illustrating an organic electroluminescent display device according to a second preferred embodiment of the present invention. As shown in FIG. **3**, the difference between an organic electroluminescent display device **200** of this embodiment and the organic electroluminescent display device **100** of the first preferred embodiment detailed above is that the second organic light emitting unit **150** in this embodiment may be used to generate a light L**3** toward the bottom substrate **110**. The light L**3** may cooperate with the light L**1** generated from the first organic light emitting unit **140**, and the organic electroluminescent display device **200** may then emit light from both sides of the device. Apart from the light L**3** in this embodiment, the other components, allocations, and material properties in this embodiment are similar to those of the organic electroluminescent display device **100** in the first preferred embodiment detailed above and will not be redundantly described.

[0021] Please refer to FIG. **4**. FIG. **4** is a schematic diagram illustrating an organic electroluminescent display device according to a third preferred embodiment of the present invention. As shown in FIG. **4**, an organic electroluminescent display device **300** in this embodiment includes a bottom substrate **110**, a covering substrate **120**, a pixel controlling unit **130**, a first organic light emitting unit **140**, and a second organic light emitting unit **350**. The second organic light emitting unit **350** includes a second anode electrode **152**, a second cathode electrode **153**, and a second organic light emitting layer **351**. The second organic light emitting layer **351** is disposed between the second anode electrode **152** and the second cathode electrode **153**. The difference between the organic electroluminescent display device **300** of this embodiment and the organic electroluminescent display device **100** of the first preferred embodiment detailed above is that the first organic light emitting layer **141** and the second organic light emitting layer **351** do not overlap each other along the direction Z perpendicular to the bottom substrate **110**, and a light L**4** generated from the second organic light emitting layer **351** may not be influenced by the position of the first organic light emitting layer **141**. Additionally, a color of the light L**1** may be identical to a color of the light L**4** so as to contribute to a better luminous efficacy of the organic electroluminescent display device **300**, but the present invention is not limited to this. The color of the light L**1** may also be different from the color of the light L**4** so as to contribute to a better white balance performance and enhance a chromaticity condition of the organic electroluminescent display device **300**. Apart from the second organic light emitting layer **351** in this embodiment, the other components, allocations, and material properties in this embodiment are similar to those of the organic electroluminescent display device **100** in the first preferred embodiment detailed above and will not be redundantly described. In this embodiment, the second organic light emitting unit **350** may also be used to generate light toward the bottom substrate (not shown), which is similar to the second preferred embodiment detailed above, and the organic electroluminescent display device **300** may then emit light from dual sides.

[0022] Please refer to FIG. **5**. FIG. **5** is a schematic diagram illustrating an organic electroluminescent display device according to a fourth preferred embodiment of the present invention. As shown in FIG. **5**, an organic electroluminescent display device **400** in this embodiment includes a bottom substrate **110**, a covering substrate **120**, a pixel controlling unit **130**, a first organic light emitting unit **440**, and a second organic light emitting unit **150**. The first organic light emitting units **440** includes a first anode electrode **142**, a first cathode electrode **143**, and a first organic light emitting layer **441**. The first organic light emitting layer **441** is disposed between the first anode electrode **142** and the first cathode electrode **143**. The difference between the organic electroluminescent display device **400** of this embodiment and the organic electroluminescent display device **100** of the first preferred embodiment detailed above is that the first organic light emitting layer **441** and the second organic light emitting layer **151** overlap each other along the direction Z perpendicular to the bottom substrate **110** so as to further enhance a compensation effect of the light L**2** generated from the second organic light emitting layer **151** on a light L**5** generated from the first organic light emitting layer **441**. In addition, a color of the light L**2** may be identical to a color of the light L**5** so as to contribute to a better luminous efficacy of the organic electroluminescent display device **400**, but the present invention is not limited to this. The color of the light L**2** may also be different from the color of the light L**5** so as to contribute to a better white balance performance and enhance a chromaticity condition of the organic electroluminescent display device **400**. Apart from the first organic light emitting layer **441** in this embodiment, the other components, allocations, and material properties in this embodiment are similar to those of the organic electroluminescent display device **100** in the first preferred embodiment detailed above and will not be redun-

dantly described. In this embodiment, the second organic light emitting unit **150** may also be used to generate light toward the bottom substrate (not shown), which is similar to the second preferred embodiment detailed above, and the organic electroluminescent display device **400** may then emit light from dual sides.

[0023] Please refer to FIG. **6**. FIG. **6** is a schematic diagram illustrating an organic electroluminescent display device according to a fifth preferred embodiment of the present invention. As shown in FIG. **6**, an organic electroluminescent display device **500** in this embodiment includes a main substrate **510**, a first covering substrate **520**, a second covering substrate **530**, a first pixel controlling unit **531**, a second pixel controlling unit **532**, a first organic light emitting unit **540**, and a second organic light emitting unit **550**. The main substrate **510** has an upper surface **511** and a lower surface **512**. The first covering substrate **520** is disposed oppositely to the upper surface **511** of the main substrate **510**. The second covering substrate **530** is disposed oppositely to the lower surface **512** of the main substrate **510**. The first pixel controlling unit **531** is disposed on the upper surface **511** of the main substrate **510**, and the second pixel controlling unit **532** is disposed on the lower surface **512** of the main substrate **510**. The first organic light emitting unit **540** is disposed between the first pixel controlling unit **531** and the first covering substrate **520**. The second organic light emitting unit **550** is disposed between the second pixel controlling unit **532** and the second covering substrate **530**. The first organic light emitting unit **540** is used to generate light toward the first covering substrate **520**, and the second organic light emitting unit **550** is used to generate light toward the second covering substrate **530**. The first pixel controlling unit **531** is electrically connected to the first organic light emitting unit **540**, and the second pixel controlling unit **532** is electrically connected to the second organic light emitting unit **550**.

[0024] In this embodiment, the first organic light emitting units **540** may include a first anode electrode **542**, a first cathode electrode **543**, and a first organic light emitting layer **541**. The first organic light emitting layer **541** is disposed between the first anode electrode **542** and the first cathode electrode **543**. Each of the second organic light emitting units **550** may include a second anode electrode **552**, a second cathode electrode **553**, and a second organic light emitting layer **551**. The second organic light emitting layer **551** is disposed between the second anode electrode **552** and the second cathode electrode **553**. Additionally, the organic electroluminescent display device **500** in this embodiment may further include a third connecting line **561** and a fourth connecting line **562**. The third connecting line **561** is disposed between the first organic light emitting unit **540** and the main substrate **510** so as to electrically connect the first pixel controlling unit **531** and the first organic light emitting unit **540**. The fourth connecting line **562** is disposed between the second organic light emitting unit **550** and the main substrate **510** so as to electrically connect the second pixel controlling unit **532** and the second organic light emitting unit **550**. In this embodiment, the first pixel controlling unit **531** and the second pixel controlling unit **532** respectively include an oxide semiconductor thin film transistor, an amorphous silicon thin film transistor, a poly silicon thin film transistor, or an organic semiconductor thin film transistor, but not limited thereto. The main substrate **510** in this embodiment may include a flexible substrate, such as a plastic substrate or other substrates made of appropriate materials, and the organic electroluminescent display device **500** may accordingly become flexible. Based on the structure and the allocation approach described above, the first organic light emitting unit **540** may generate a light L**7** toward the first covering substrate **520**, the second organic light emitting unit **550** may generate a light L**6** toward the second covering substrate **530**, and the organic electroluminescent display device **500** may then emit light from both sides of the device.

[0025] In this embodiment, the first organic light emitting unit **540** may further include a transporting layer **544** and a transporting layer **545**. The transporting layer **544** is disposed between the first organic light emitting layer **541** and the first anode electrode **542**, and the transporting layer **545** is disposed between the first organic light emitting layer **541** and the first cathode electrode **543**. The second organic light emitting unit **550** may further include a transporting layer **554** and a transporting layer **555**. The transporting layer **554** is disposed between the second organic light emitting layer **551** and the second anode electrode **552**, and the transporting **555** is disposed between the second organic light emitting layer **551** and the second cathode electrode **553**. The transporting layer **544**, the transporting layer **545**, the transporting layer **554**, and the transporting layer **555** may respectively be an electron transporting layer or a hole transporting layer according to different design combinations, but not limited thereto. In addition, the organic electroluminescent display device **500** may further include a first insulating layer **581** and a second insulating layer **582**. The first insulating layer **581** is disposed between the main substrate **510** and the first organic light emitting unit **540**, and the second insulating layer **582** is disposed between the main substrate **510** and the second organic light emitting unit **550**. Apart from the first pixel controlling unit **531** and the second pixel controlling unit **532**, which are used to respectively control the first organic light emitting unit **540** and the second organic light emitting unit **550**, in this embodiment, the other components, allocations, and material properties in this embodiment are similar to those of the organic electroluminescent display device **100** in the first preferred embodiment detailed above and will not be redundantly described.

[0026] To summarize the above descriptions, in the organic electroluminescent display device of the present invention, the organic light emitting units are disposed over and under the pixel controlling unit. The colors and the directions of the light generated from the organic light emitting units are modified to enhance the integrated luminous efficacy and the chromaticity condition of the organic electroluminescent display device, or to emit light from both sides of the organic electroluminescent display device.

[0027] Those skilled in the art will readily observe that numerous modifications and alterations of the device and method may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

1. An organic electroluminescent display device, comprising:

a bottom substrate;

a covering substrate, disposed oppositely to the bottom substrate;

a pixel controlling unit, disposed between the bottom substrate and the covering substrate;

a first organic light emitting unit, disposed between the pixel controlling unit and the covering substrate; and

a second organic light emitting unit, disposed between the pixel controlling unit and the bottom substrate,

wherein the pixel controlling unit is electrically connected to the first organic light emitting unit and the second organic light emitting unit.

2. The organic electroluminescent display device of claim **1**, wherein the first organic light emitting unit and the second organic light emitting unit are connected in parallel.

3. The organic electroluminescent display device of claim **1**, wherein a color of light generated by the first organic light emitting unit is identical to a color of light generated by the second organic light emitting unit.

4. The organic electroluminescent display device of claim **1**, wherein a color of light generated by the first organic light emitting unit is different from a color of light generated by the second organic light emitting unit.

5. The organic electroluminescent display device of claim **1**, wherein the first organic light emitting unit comprises a first organic light emitting layer, the second organic light emitting unit comprises a second organic light emitting layer, and the first organic light emitting layer and the second organic light emitting layer do not overlap each other along a direction perpendicular to the bottom substrate.

6. The organic electroluminescent display device of claim **1**, wherein the first organic light emitting unit comprises a first organic light emitting layer, the second organic light emitting unit comprises a second organic light emitting layer, and the first organic light emitting layer and the second organic light emitting layer at least partially overlap each other along a direction perpendicular to the bottom substrate.

7. The organic electroluminescent display device of claim **1**, wherein the first organic light emitting unit comprises a first cathode electrode, the second organic light emitting unit comprises a second cathode electrode, and the first cathode electrode is electrically connected to the second cathode electrode.

8. The organic electroluminescent display device of claim **1**, wherein the pixel controlling unit comprises an oxide semiconductor thin film transistor, an amorphous silicon thin film transistor, a poly silicon thin film transistor, or an organic semiconductor thin film transistor.

9. An organic electroluminescent display device, comprising:

a main substrate, having an upper surface and a lower surface;

a first covering substrate, disposed oppositely to the upper surface of the main substrate;

a second covering substrate, disposed oppositely to the lower surface of the main substrate;

a first pixel controlling unit, disposed on the upper surface of the main substrate;

a second pixel controlling unit, disposed on the lower surface of the main substrate;

a first organic light emitting unit, disposed between the first pixel controlling unit and the first covering substrate, wherein the first organic light emitting unit is used to generate light toward the first covering substrate; and

a second organic light emitting unit, disposed between the second pixel controlling unit and the second covering substrate, wherein the second organic light emitting unit is used to generate light toward the second covering substrate,

wherein the first pixel controlling unit is electrically connected to the first organic light emitting unit, and the second pixel controlling unit is electrically connected to the second organic light emitting unit.

10. The organic electroluminescent display device of claim **9**, wherein the main substrate comprises a flexible substrate.

11. The organic electroluminescent display device of claim **9**, wherein the first pixel controlling unit and the second pixel controlling unit respectively comprise an oxide semiconductor thin film transistor, an amorphous silicon thin film transistor, a poly silicon thin film transistor, or an organic semiconductor thin film transistor.

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专利名称(译)	有机电致发光显示装置		
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摘要(译)

一种有机电致发光显示装置，包括底部基板，覆盖基板，像素控制单元，第一有机发光单元和第二有机发光单元。覆盖基板与底部基板相对设置。像素控制单元设置在底部基板和覆盖基板之间。第一有机发光单元设置在像素控制单元和覆盖基板之间。第二有机发光单元设置在像素控制单元和底部基板之间。像素控制单元电连接到第一有机发光单元和第二有机发光单元。