(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 835 555 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.09.2007 Bulletin 2007/38

(51) Int Cl.:
H01L 51/52 *(2006.01)* ***H01L 27/32*** *(2006.01)*

(21) Application number: **07101708.1**

(22) Date of filing: **05.02.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **14.03.2006 KR 20060023692**
14.03.2006 KR 20060023693

(71) Applicant: **Samsung SDI Co., Ltd.**
Suwon-si
Gyeonggi-do (KR)

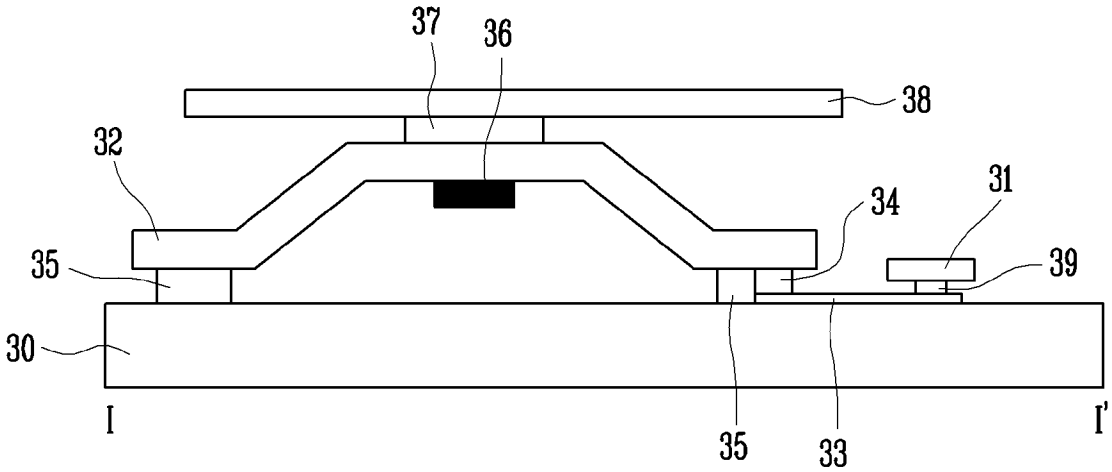
(72) Inventor: **NAM, Wi Jin,**
Samsung SDI Co., Ltd.
Yongin-si,
Gyeonggi-do (KR)

(74) Representative: **Hengelhaupt, Jürgen et al**
Anwaltskanzlei
Gulde Hengelhaupt Ziebig & Schneider
Wallstrasse 58/59
10179 Berlin (DE)

(54) Organic light emmiting display (OLED)

(57) The invention relates to Organic Light Emitting Display (OLED) comprising:
a substrate (30, 40) having defined pixel region and non-pixel regions and including an organic light emitting element arranged in the pixel region;
(i) a driver IC (31) arranged in the non-pixel region of the substrate, connected to signal wires of the organic light emitting element and adapted to supply a signal to the organic light emitting element; or
(ii) a driver IC (45) arranged on a Tape Carrier Package (43), connected via the Tape Carrier Package (43) to signal wires of the organic light emitting element and adapted to supply a signal to the organic light emitting element;
a sealant (35, 49) arranged on the non-pixel region of the substrate (30, 40);
a metal cap (32, 41) spaced away from the substrate (30, 40) and affixed with the sealant (35, 49) to a position corresponding to the substrate (30, 40);
a ground wire (33, 46) electrically connecting the driver IC (31, 45) to the metal cap (32, 41); and
a printed circuit board (38, 52) electrically connected to and arranged on an outer surface side of the metal cap (32, 41).

FIG. 4



EP 1 835 555 A2

Description

[0001] The present invention relates to an Organic Light Emitting Display (OLED), and more particularly to an OLED capable of assuring a reduced module mounting space by reducing the number of input pins of a driver IC

Description of the Related Art

[0002] In general, an organic light emitting element emits light when the combined excitons of electrons and holes fall from an excitation state to a ground state by injecting electrons and holes from an electron injecting electrode (cathode) and a hole injecting electrode (anode) into an emission layer.

[0003] With this principle, it has an advantage in that unlike a conventional a thin film Liquid Crystal Display (LCD) element, the organic light emitting element does not require a separate light source and is thus able to reduce its volume and weight.

[0004] Also, the organic light emitting element has a excellent characteristics including low power requirements, high brightness, high response speed, and low weight. Due to these characteristics, the OLED is believed to be a next generation display, which will be used for almost all electronic application products, such as mobile communication terminals, CNSs, PDAs, camcoders, palm PCs, etc.

[0005] Furthermore, it has an advantage in that the overall production cost of the organic light emitting element can significantly be reduced over that of an existing LCD, since its manufacturing process is simple.

[0006] FIG. 1 is a view of an Organic Light Emitting Display (OLED) according to a Chip On Glass (COG) structure of the related art and FIG. 2 is a view of an Organic Light Emitting Display (OLED) according to a Tape Carrier Package (TCP) structure of the related art.

[0007] Referring to FIG. 1, the OLED having a COG structure according to the related art includes an organic light emitting element that is formed in a pixel region 11 on a substrate 10 having defined pixel and non-pixel regions, and a driver IC 12 formed in the non-pixel region to supply a signal to the organic light emitting element. The driver IC 12 is formed with a plurality of input pins including a ground input pin 13.

[0008] When the driver IC 12 is mounted on the substrate as shown in FIG. 1, if the number of the input pins of the driver IC 12 is large, its size is increased and therefore, the mounting area of the substrate must be wide.

[0009] The OLED having a TCP structure as shown in FIG. 2 includes an organic light emitting element formed in a pixel region 21 on a substrate 20 having defined pixel and non-pixel regions, and a Tape Carrier Package (TCP) 22 and a driver IC 23 that are formed in the non-pixel region. The TCP 22 has a signal wire for connection to a printed circuit board (not shown) and the organic light emitting element and the driver IC 23 to supply a signal to the organic light emitting element. The driver IC 23 is formed with a plurality of input pins including a ground input pin 24.

[0010] When the driver IC 23 is mounted on the printed circuit board as shown in FIG. 2, if the number of the input pins of the driver IC 23 is large, the space for mounting it must be wide.

[0011] As a result, in desiring a compact display device, such OLEDs are disadvantageous in that their size becomes large and their appearance poor, since the area for mounting the driver IC and the TCP must be wide.

SUMMARY OF THE INVENTION

[0012] According to the invention there is provided an Organic Light Emitting Display (OLED) comprising:

a substrate having defined pixel region and non-pixel regions and including an organic light emitting element arranged in the pixel region;

(i) a driver IC arranged in the non-pixel region of the substrate, connected to signal wires of the organic light emitting element and adapted to supply a signal to the organic light emitting element; or

(ii) a driver IC arranged on a Tape Carrier Package (TCP), connected via the Tape Carrier Package to signal wires of the organic light emitting element and adapted to supply a signal to the organic light emitting element;

a sealant arranged on the non-pixel region of the substrate;

a metal cap spaced away from the substrate and affixed with the sealant to a position corresponding to the substrate;

a ground wire electrically connecting the driver IC to the metal cap; and

a printed circuit board electrically connected to and arranged on an outer surface side of the metal cap.

[0013] The OLED may further comprise a desiccant arranged on an inner surface side of the metal cap.

[0014] The OLED may further comprise a conductive adhesive member arranged between the metal cap and the printed circuit board and wherein a ground pattern of the printed circuit board is electrically connected to the metal cap via the conductive adhesive member. Preferably, the conductive adhesive member is a conductive tape.

[0015] The OLED may further comprising a conductive paste arranged between the metal cap and the ground wire wherein the ground wire is electrically connected to

the metal cap via the conductive paste. Preferably, the conductive paste consists of an Ag paste.

[0016] The OLED may further comprise a ground unit arranged between the ground wire and the driver IC wherein the driver IC is electrically connected to the ground wire via the ground unit. Preferably, ground units are arranged on both sides of an outmost portion of the driver IC.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] A more complete appreciation of the present invention, and many of the attendant advantages thereof, will be readily apparent as the present invention becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

FIG. 1 is a view of an Organic Light Emitting Display (OLED) according to a COG structure of the related art;

FIG. 2 is a view of an Organic Light Emitting Display (OLED) according to a TCP structure of the related art;

FIG. 3 is a view of an Organic Light Emitting Display (OLED) according to one embodiment of the present invention;

FIG. 4 is a cross-sectional view taken along line (I-I') of FIG. 3;

FIG. 5 is a view of an Organic Light Emitting Display (OLED) according to another embodiment of the present invention; and

FIG. 6 is a cross-sectional view taken along line (II-II') of FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

[0018] Hereinafter, exemplary embodiments of the present invention are described with reference to the accompanying drawings.

[0019] FIG. 3 is a view of an OLED according to one embodiment of the present invention and FIG. 4 is a cross-sectional view taken along line (I-I') of FIG. 3.

[0020] However, in the embodiment of FIG. 3 and FIG. 4, the driver IC is implemented by one chip and consists of a COG structure, which is directly formed on the substrate.

[0021] Referring to FIG. 3 and FIG. 4, the OLED according to one embodiment of the present invention includes a substrate 30 having defined pixel and non-pixel regions and including an organic light emitting element that is formed in the pixel region; a driver IC 31 formed in the non-pixel region of the substrate to supply a signal to the organic light emitting element; a sealant 35 applied on the non-pixel region of the substrate 30; a metal cap 32 spaced away from the substrate 30 by a predetermined interval and attached to a position corresponding to the substrate 30 with the sealant; a ground wire 33 connecting the driver IC 31 to the metal cap 32; a conductive paste 34 composed of conductive substances arranged between the metal cap 32 and the ground wire 33; and a printed circuit board 38 arranged to correspond to one side (the outer surface side) of the metal cap 32.

[0022] Also, the inside of the metal cap 32 is further provided with a desiccant 36. The desiccant 36 eliminates moisture and is contained within an oxygen permeable capsule affixed to a portion of the metal cap 32 (i.e. the desiccant 36 is arranged on an inner surface side of the metal cap 32).

[0023] The pixel region of the substrate 30 is formed with a plurality of light emitting elements connected between scan lines and data lines in a matrix scheme. Each light emitting element has an anode electrode and a cathode electrode, and has an organic thin film layer formed between the anode electrode and the cathode electrode and includes a hole transport layer, an organic emission layer and an electron transport layer.

[0024] The driver IC 31 is formed in the non-pixel region of the substrate 31 and supplies a signal to the organic light emitting element via signal wires (not shown). Since the driver IC 31 does not have a ground pin, the number of input pins is reduced, thereby easily performing a module mounting.

[0025] The driver IC 31 functions to respectively provide scan signals and a data signals to a plurality of scan lines and a plurality of data lines formed in the pixel region.

[0026] That is, the inside of the driver IC 31 is provided with a scan driver and a data driver on one chip.

[0027] The metal cap 32 is spaced away from the substrate 30 by a predetermined interval and is arranged in a position corresponding to the substrate 30.

[0028] The metal cap 32 is provided to prevent the degradation of electrical and emission properties caused by the organic light emitting element formed in the pixel region of the substrate 30 being vulnerable to hydrogen and oxygen from included organic matter and the cathode electrode composed of metal materials that are easily oxidized by moisture in air. The metal cap 32 is configured as a vessel manufactured in the form of a cap of metal materials.

[0029] Also, the desiccant 36 is contained within the metal cap 32 in a powder form or is adhered to the inside the metal cap 32 in a film form, eliminating moisture, oxygen and hydrogen permeated from various sources.

[0030] The metal cap 32 overlaps both the pixel and non-pixel regions of the substrate 30. The sealant 35 is formed along the periphery of the metal cap 32 corresponding to the non-pixel region of the substrate 30 to seal it.

[0031] That is, the substrate 30 is bonded by the sealant 35 to the metal cap 32 having the desiccant 36, resulting in a completed capsulated organic light emitting element.

[0032] The ground wire 33 is formed in the non-pixel region of the substrate 30 to electrically connect the driver IC 31 to the metal cap 32. That is, a separate ground unit 39 is formed on both sides of the outmost portion of the input terminal of the driver IC 31, instead of the ground pin that is not formed in the driver IC 31.

[0033] A conductive paste 34 is arranged between the metal cap 32 and the ground wire 33 to electrically connect them. An Ag paste can be utilized as the conductive paste 34.

[0034] The printed circuit board 38 is arranged to correspond to one side (outer surface side) of the metal cap 32 so that it is electrically connected to the metal cap 32. That is, the one side of the printed circuit board 38 connected to the metal cap 32 is formed with a ground pattern and a conductive adhesive member 37 is formed between the ground pattern of the printed circuit board 38 and the metal cap 32.

[0035] That is, the ground pattern of the printed circuit board 38 is electrically connected to the metal cap 32 through the conductive adhesive member 37.

[0036] The conductive adhesive member 37 can be coated and formed with a conductive tape or other conductive substances.

[0037] As a result, the ground connection of the driver IC 31 is made through the ground connection wire 33, the conductive paste 34, the metal cap 32, the conductive adhesive member 37, and the ground pattern of the printed circuit board 38.

[0038] That is, according to the embodiment of the present invention of FIG. 3 and FIG. 4, the number of the input pins of the driver IC 31 is reduced, thereby assuring a reduced module mounting space.

[0039] FIG. 5 is a view of an OLED according to another embodiment of the present invention and FIG. 6 is a cross-sectional view taken along line (II-II') of FIG. 5.

[0040] In the embodiment FIG. 5 and FIG. 6, the driver IC is implemented by two chips and consists of a TCP structure, which directly is formed on the substrate.

[0041] Referring to FIG. 5 and FIG. 6, the OLED according to another embodiment of the present invention includes: a substrate 40 having defined pixel and non-pixel regions and including at least one an organic light emitting element that is formed in the pixel region; a sealant 49 applied to the non-pixel region of the substrate 40; a metal cap 41 spaced away from the substrate 40 by a predetermined interval and attached to a position corresponding to the substrate 40 with the sealant 49; TCPs 42 and 43 connecting the signal wires of the organic light emitting element on the substrate 40; driver ICs 44 and 45 connected to the TCPs 42 and 43 to supply a signal to the organic light emitting element; a ground wire46 (divided in parts 46a and 46b) electrically connecting the driver IC 45 to the metal cap 41; a conductive paste 47 composed of conductive substances and arranged between the metal cap 41 and the ground wire 46; and a printed circuit board 52 arranged to correspond to one side of the metal cap 41.

[0042] Also, the inside of the metal cap 41 is further provided with a desiccant 50. The desiccant 50 is to eliminate moisture and oxygen and is contained within a permeable capsule affixed to a portion of the metal cap 41.

[0043] The pixel region of the substrate 40 is formed with a plurality of light emitting elements connected between scan lines and data lines in a matrix scheme. The light emitting element includes an anode electrode and a cathode electrode, and an organic thin film layer is formed between the anode electrode and the cathode electrode and includes a hole transport layer, an organic emission layer and an electron transport layer.

[0044] The driver ICs 44 and 45 include a data driver IC 44 supplying a data signal and a scan driver IC 45 supplying a scan signal.

[0045] The data and scan driver ICs 44 and 45 are respectively connected to the TCP 42 of the side of the data driver and the TCP 43 of the side of the scan driver and the data driver IC 44 and the scan driver IC 45 respectively supply the data signal and the scan signal to the organic light emitting element.

[0046] Furthermore, as shown in FIG. 5, the Tape Carrier Package (TCP) has a signal wire connected to the periphery of the substrate 40 to supply a signal to the organic light emitting element.

[0047] Since the input terminal of the scan driver IC 45 does not have a ground pin, the number of input pins is reduced, thereby easily performing a module mounting.

[0048] A ground unit 48 is directly formed at the input terminal of the scan driver IC 45, instead of using a ground pin.

[0049] The metal cap 41 is spaced away from the substrate 40 by a predetermined interval and is arranged in a position corresponding to the substrate 40.

[0050] The metal cap 41 is provided to prevent the degradation of electrical and emission properties caused by the organic light emitting element formed in the pixel region of the substrate 40 being vulnerable to hydrogen and oxygen from included organic matter and the cathode electrode composed of metal materials that are easily oxidized by moisture in air. The metal cap is configured as a vessel manufactured in the form of a cap of metal materials.

[0051] Also, the desiccant 50 is contained within the metal cap 41 in a powder form or is adhered to the inside the metal cap 41 in a film form, eliminating moisture, oxygen and hydrogen.

[0052] The metal cap 41 overlaps the pixel and non-pixel regions of the substrate 40. The sealant 49 is formed along the periphery of the metal cap 41 corresponding to the non-pixel region of the substrate 40 to seal it.

[0053] That is, the substrate 40 is bonded by the sealant 49 to the metal cap 41 having the desiccant 50, resulting in a completed capsulated organic light emitting

element.

[0054] The ground wires 46a and 46b are wires connecting the scan driver IC 45 to the metal cap 41 and are formed on the TCP 43 of the side of the scan driver IC 45. That is, they are connected to the ground unit 48 of the scan driver IC 45, instead of using a ground pin that is not formed in the scan driver IC 45.

[0055] The conductive paste 47 is arranged between the metal cap 41 and the ground wire 46a to electrically connect them. An Ag paste can be used as the conductive paste 47.

[0056] Also, the printed circuit board 52 is arranged to correspond to one side of the metal cap 41 so that it is electrically connected to the metal cap. That is, the one side of the printed circuit board 52 connected to the metal cap 41 is formed with a ground pattern and a conductive adhesive member 51 is formed between the ground pattern of the printed circuit board 52 and the metal cap 41. That is, the ground pattern of the printed circuit board 52 is electrically connected to the metal cap 41 through the conductive adhesive member 51.

[0057] The conductive adhesive member 51 can be coated and formed by a conductive tape or other conductive substances.

[0058] As a result, the ground connection of the scan driver IC 45 is made through the ground wires 46a and 46b, the conductive paste 47, the metal cap 41, the conductive adhesive member 51, and the ground pattern of the printed circuit board 52.

[0059] Since the 2-chip OLED forms a ground terminal separately, the number of input pins of the driver IC can be reduced.

[0060] Furthermore, with the construction according to the embodiments of the present invention, the present invention can implement a superior image quality by lowering a ground level depending on reducing a potential difference due to a low wire resistance in a scan waveform.

[0061] That is, according to the embodiments of the present invention, the present invention can assure a reduced module mounting space by reducing the number of input pins of a driver IC by connecting ground input terminals of the driver IC using a metal cap and implement a superior image quality by lowering a ground level depending on reducing a potential difference due to a low wire resistance in a scan waveform of a scan driver IC.

Claims

1. An Organic Light Emitting Display (OLED) comprising:

a substrate (30, 40) having defined pixel region and non-pixel regions and including an organic light emitting element arranged in the pixel region;

(i) a driver IC (31) arranged in the non-pixel region of the substrate, connected to signal wires of the organic light emitting element and adapted to supply a signal to the organic light emitting element; or
(ii) a driver IC (45) arranged on a Tape Carrier Package (43), connected via the Tape Carrier Package (43) to signal wires of the organic light emitting element and adapted to supply a signal to the organic light emitting element;

a sealant (35, 49) arranged on the non-pixel region of the substrate (30, 40);
a metal cap (32, 41) spaced away from the substrate (30, 40) and affixed with the sealant (35, 49) to a position corresponding to the substrate (30, 40);
a ground wire (33, 46) electrically connecting the driver IC (31, 45) to the metal cap (32, 41); and
a printed circuit board (38, 52) electrically connected to and arranged on an outer surface side of the metal cap (32, 41).

2. The OLED as claimed in claim 1, further comprising a desiccant (36, 50) arranged on an inner surface side of the metal cap (32, 41).

3. The OLED as claimed in claim 1, further comprising a conductive adhesive member (37, 51) arranged between the metal cap (32, 41) and the printed circuit board (38, 52) and wherein a ground pattern of the printed circuit board (38, 52) is electrically connected to the metal cap (32, 41) via the conductive adhesive member (37, 51).

4. The OLED as claimed in claim 3, wherein the conductive adhesive member (37, 51) is a conductive tape.

5. The OLED as claimed in claim 1, further comprising a conductive paste (34, 47) arranged between the metal cap (32, 41) and the ground wire (33, 46) wherein the ground wire (33, 46) is electrically connected to the metal cap (32, 41) via the conductive paste (34,47).

6. The OLED as claimed in claim 5, wherein the conductive paste (34, 47) consists of an Ag paste.

7. The OLED as claimed in claim 1, further comprising a ground unit (39, 48) arranged between the ground wire (33, 46) and the driver IC (31, 45) wherein the driver IC (31, 45) is electrically connected to the ground wire (33, 46) via the ground unit (39, 48).

8. The OLED as claimed in claim 7, wherein ground

units (39, 48) are arranged on both sides of an outmost portion of the driver IC (31, 45).

FIG. 1
(RELATED ART)

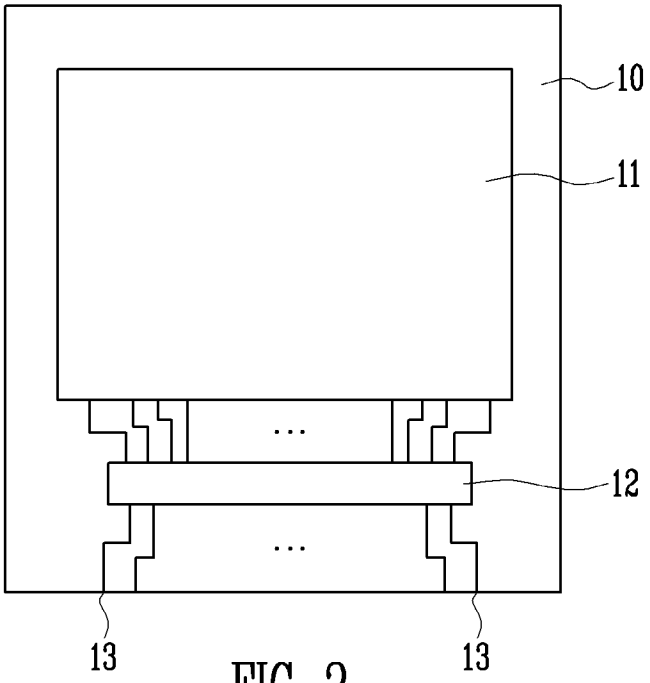


FIG. 2
(RELATED ART)

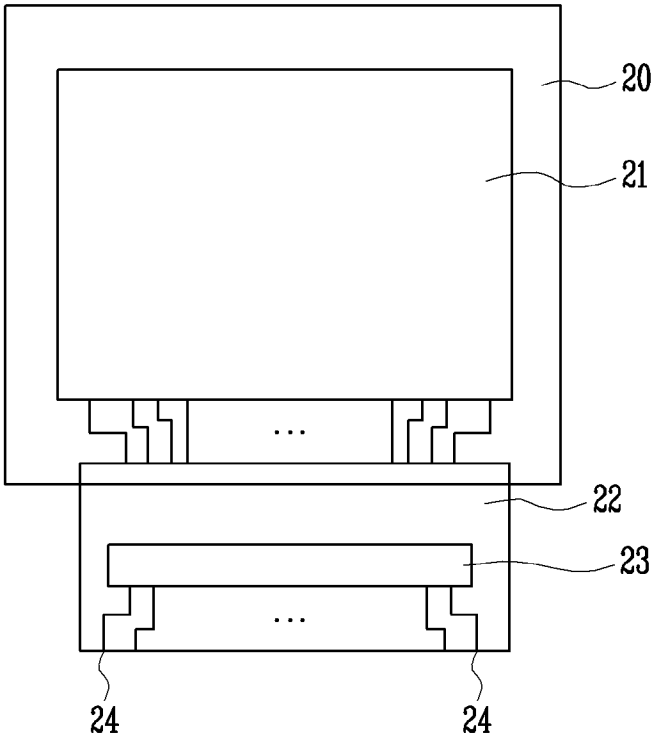


FIG. 3

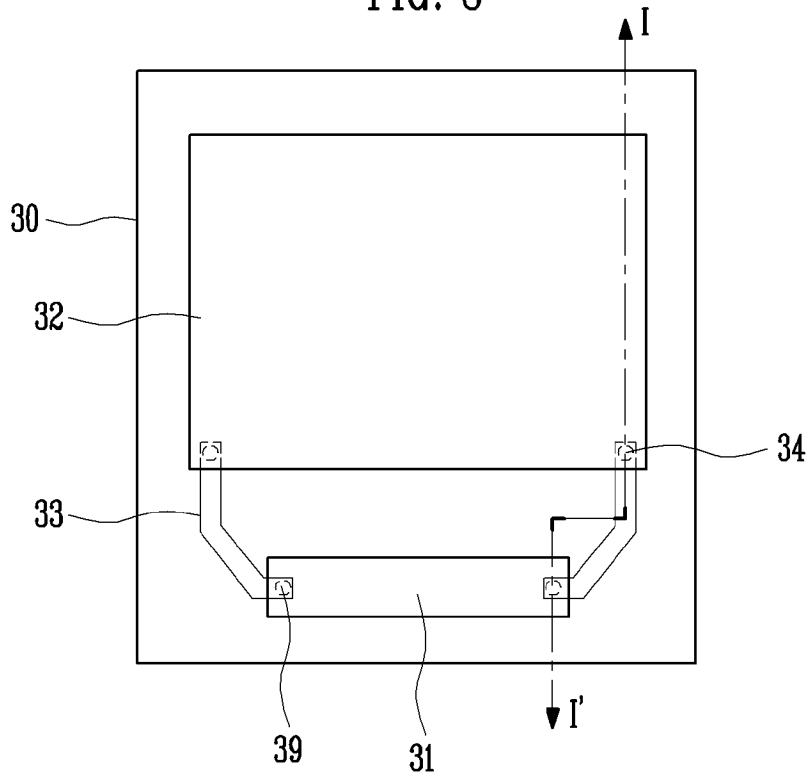


FIG. 4

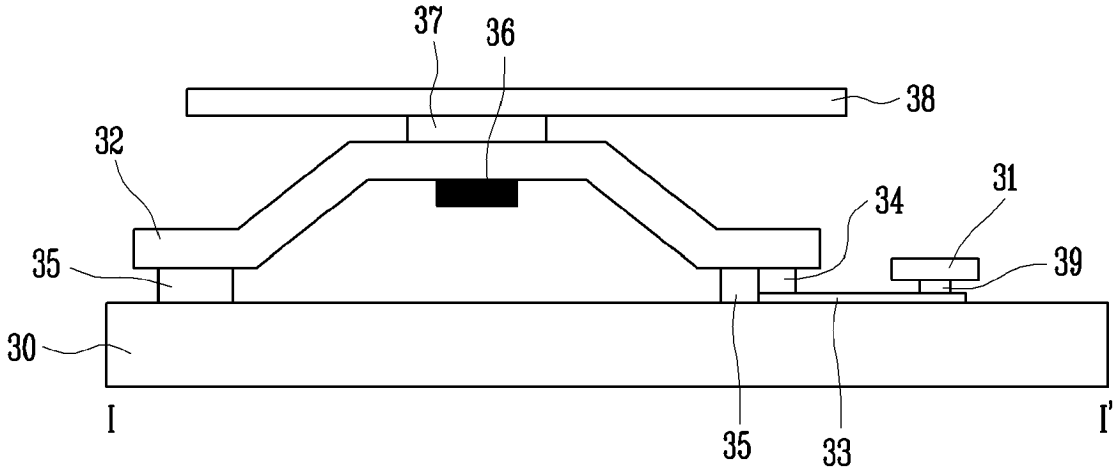


FIG. 5

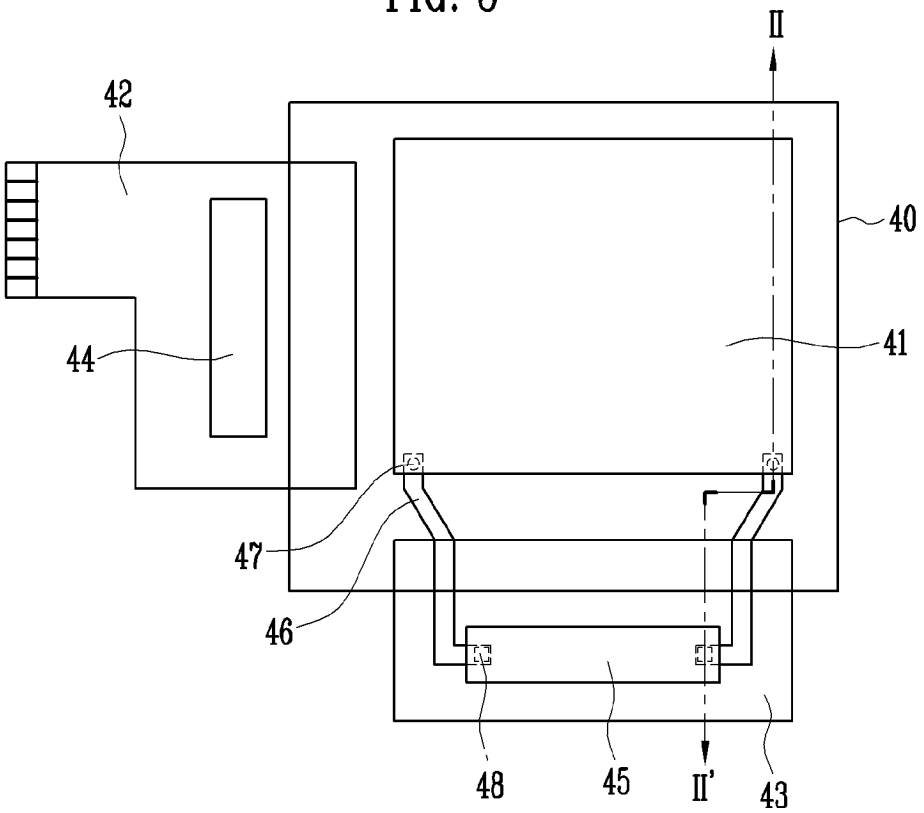
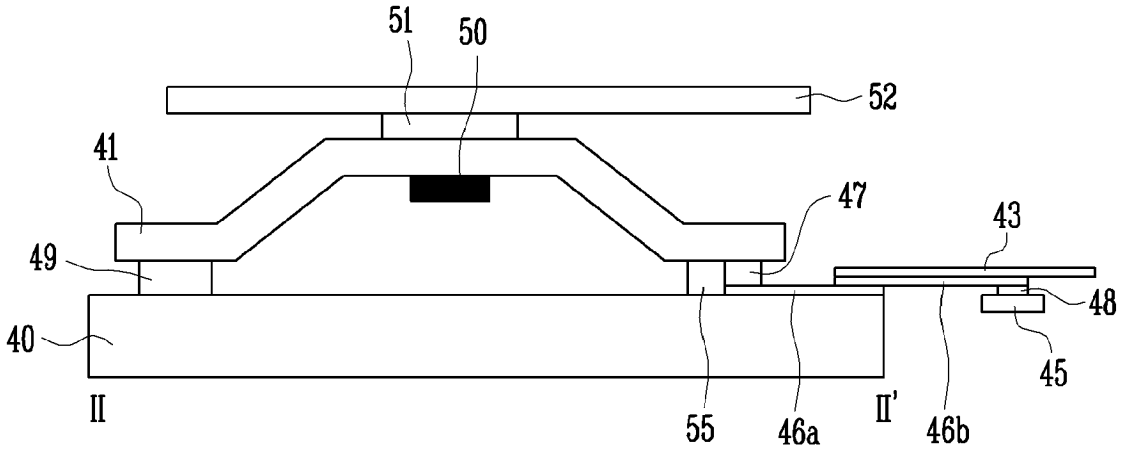

II
42
40
44
41
47
46
48
45
II'
43

FIG. 6


51
50
52
41
47
43
49
48
40
45
II
55
46a
II'
46b

专利名称(译)	有机发光显示器（OLED）		
公开(公告)号	EP1835555A2	公开(公告)日	2007-09-19
申请号	EP2007101708	申请日	2007-02-05
[标]申请(专利权)人(译)	三星斯笛爱股份有限公司		
申请(专利权)人(译)	三星SDI CO.，LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
[标]发明人	NAM WI JIN SAMSUNG SDI CO LTD		
发明人	NAM, WI JIN, SAMSUNG SDI CO., LTD.		
IPC分类号	H01L51/52 H01L27/32		
CPC分类号	H01L51/5243 H01L27/3276 H01L27/3288 H01L51/5259		
代理机构(译)	hengelhaupt，Jürgen		
优先权	1020060023693 2006-03-14 KR 1020060023692 2006-03-14 KR		
其他公开文献	EP1835555A3		
外部链接	Espacenet		

摘要(译)

本发明涉及有机发光显示器（OLED），包括：基板（30,40），其具有限定的像素区域和非像素区域，并且包括布置在像素区域中的有机发光元件;（i）布置在基板的非像素区域中的驱动器IC（31），其连接到有机发光元件的信号线并适于向有机发光元件提供信号;或（ii）布置在带载封装（43）上的驱动器1C（45），经由带载封装（43）连接到有机发光元件的信号线并适于向有机发光元件提供信号;密封剂（35,49），设置在基板（30,40）的非像素区域上;金属盖（32,41），与基板（30,40）间隔开，并与密封剂（35,49）固定在与基板（30,40）对应的位置;接地线（33,46）将驱动器1C（31,45）电连接到金属盖（32,41）;印刷电路板（38,52）电连接并布置在金属盖（32,41）的外表面侧上。