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(54) Organic light emitting display device and method for fabricating the same

Organische lichtemittierende Anzeigevorrichtung und Verfahren zu ihrer Herstellung

Dispositif d'affichage électroluminescent organique et son procédé de fabrication

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] Aspects of the present invention relate to an organic light emitting display device and a method for fabricating the same, and more particularly to an organic light emitting display device capable of preventing damage of signal lines and power lines for driving a pixel region, and a method for fabricating the same.

2. Description of the Related Art

[0002] In recent years, there have been many attempts to develop various flat panel displays that are lighter and smaller than cathode ray tubes. In particular, an organic light emitting display device having excellent luminous efficiency, luminance, viewing angle, and rapid response time has attracted public attention. The organic light emitting display device uses an organic light emitting diode (OLED) as an emissive diode. The organic light emitting diode includes an anode electrode, a cathode electrode, and an organic light emission layer arranged between the anode electrode and the cathode electrode. An organic light emission layer emits light by recombining holes and electrons, supplied from the anode electrode and the cathode electrode, to generate excitons.

[0003] FIG. 1 is a perspective view showing a conventional organic light emitting display device.

[0004] Referring to FIG. 1, an organic light emitting display (OLED) device 100 includes a device substrate 110 having a pixel region 140 and a scan driver 150 formed therein; an encapsulation substrate 120 arranged on the device substrate 110 to seal at least the pixel region 140; and a data driver 160 installed onto the device substrate 110 outside a sealing region of the encapsulation substrate 120. The sealing region is the region of the OLED device 100 that is disposed between the device substrate 110 and the encapsulation substrate 120 and sealed therein by a sealing agent 130.

[0005] The pixel region 140 includes a large number of pixels 145 formed on the device substrate 110. The pixels 145 are arranged in regions in which scan lines (S) and data lines (D) cross. The pixels 145 are connected to one of the scan lines (S) and the data lines (D), respectively, and include at least an organic light emitting diode. Such pixels 145 generate light having a luminance corresponding to a data signal supplied from the data lines (D) when a scan signal is supplied from the scan lines (S) connected to the pixels 145. Therefore, the pixel region 140 can display an image.

[0006] Here, the pixels 145 include an organic light emission layer in which the organic light emitting diode, etc., is disposed. The organic light emission layer can easily deteriorate when oxygen or moisture penetrate therein. Accordingly, the pixel region 140 with the pixels 145 formed therein should be sealed to prevent the penetration of oxygen and moisture.

[0007] The scan driver 150 is driven by scan control signals supplied from a device outside the OLED device 100, such as a clock signal, a start pulse, an output enable signal, etc., to generate scan signals. The scan signals generated in the scan driver 150 are supplied to the pixel region 140 through the scan lines (S). If at least one transistor is formed in the pixel region 140, the scan driver 150 is formed on the device substrate 110 together with the transistor, and therefore sealed together with the pixel region 140. However, the scan driver 150 may be installed outside the sealing region in a chip form.

[0008] The encapsulation substrate 120 is arranged on the device substrate 110 to be overlapped with the pixel region 140, thereby to seal at least the pixel region 140. At this time, a sealing agent 130, such as epoxy resin, frit and the like, is formed in an edge of the encapsulation substrate 120. The device substrate 110 and the encapsulation substrate 120 are fused by the sealing agent 130 to seal a space therebetween. The encapsulation substrate 120 is scribed so a portion of the encapsulation substrate 120 may be removed and the encapsulation substrate 120 does not overlap a region in which a data driver 160 is installed. The data driver 160 may be installed in a chip form.

[0009] The data driver 160 generates data signals to correspond to data and control signals supplied from a device, or a data control unit, external to the OLED device 100. The data signal generated in the data driver 160 is supplied to the pixel region 140 through the data lines (D). The data driver 160 is installed onto the device substrate 110 in a region other than the sealing region after a general sealing process. However, the data driver 160 is not limited thereto. The data driver 160 may be formed on the device substrate 110 together with the pixels 140 and arranged inside the sealing region.

[0010] In the case of the above-mentioned conventional OLED device 100, at least one region of the data lines (D) is formed outside the sealing region. Thus, the data lines (D) extend across or through the sealing region as the data lines (D) are formed to connect the data driver 160 to the pixels 145 in the pixel region 140.

[0011] In order to prevent corrosion of the data lines (D) that extend out of the sealing region, at least one inorganic insulator is generally formed on the data lines (D).

[0012] For example, inorganic insulators 230 and 240 are formed on the data lines 220 to prevent moisture from corroding the data lines 220.

[0013] FIG. 2 is a cross-sectional view showing a portion of the OLED device 100 taken along a region "A" of FIG. 1. Data lines and their protective layers are shown in FIG. 2, and only the data lines and the protective layers are shown herein to the exclusion of other wires and insulators.

[0014] Referring to FIG. 2, the inorganic insulators 230 and 240 are formed on the data lines 220.

[0015] The inorganic insulators 230 and 240 are formed of an interlayer insulator 230 and an inorganic planarization layer 240. And, the inorganic insulators 230 and 240 are formed together with the pixel region 140.

[0016] Such inorganic insulators 230 and 240 protect the data lines 220. However, the inorganic insulators 230 and 240 are formed to partially overlap the sealing agent 130 such that the sealing agent 130 is disposed on the surface of the inorganic insulators 230 and 240. The inorganic insulators 230 and 240 are formed of only inorganic materials as oxygen and moisture may penetrate the sealing region via organic materials if such organic materials are included in the insulators 230 and 240.

[0017] However, the inorganic insulators 230 and 240 formed only in the pixel region cannot sufficiently protect the data lines 220 that extend from the pixel region to the data driver 160 from the penetration of oxygen and moisture.

[0018] Further, the inorganic insulators 230 and 240 formed on the data lines 220 may not effectively protect the data lines 220 when the encapsulation substrate 120 is scribed.

[0019] More particularly, the inorganic insulators 230 and 240 may be easily broken by external impacts inflicted during a process for scribing and separating the encapsulation substrate 120. When the inorganic insulators 230 and 240 are broken during scribing and separating of the encapsulation substrate 120, the data lines 220 may be corroded as moisture penetrates via cracks in the broken inorganic insulators 230 and 240. As a result, some of the data lines 220 may be damaged, resulting in poor emission of light from and display of images on the OLED device 100. Reliability testing, carried out at high temperatures and moisture contents, expose weaknesses of the inorganic insulators 230 and 240.

[0020] In addition to damage to the data lines 220, the power lines that supply power from sources outside of the pixel region 140 to the pixel region 140 and the scan driver 150 may be damaged due to inadequate protection; and signal lines that supply scan control signals from a source, or scan control unit, outside of the pixel region 140 to the scan driver 150 disposed in the pixel region 140 may be damaged as the signal lines may be arranged beneath the scribing line of the encapsulation substrate 120.

[0021] FIG. 3A to FIG. 3D are diagrams showing a method for fabricating the organic light emitting display device as shown in FIG. 1.

[0022] Referring to FIG. 3A to FIG. 3D, to fabricate the organic light emitting display (OLED) device 100 as shown in FIG. 1, the pixels 145, the scan lines (S), the data lines (D), and the scan driver 150 are formed first on the device substrate 110 (FIG. 3A).

[0023] Then, the encapsulation substrate 120, coated with the sealing agent 130, is arranged on the device substrate 110, and then a sealing process is performed. The sealing agent 130 is disposed along an inside edge of the scribing line 310 of the encapsulation substrate 120 so that the sealing agent 130 seals the encapsulation substrate 120 about the pixel region 140. The sealing agent 130 is formed to seal at least the pixel region 140 (FIG. 3B).

[0024] Then, a process for scribing the encapsulation substrate 120 is carried out along the scribing line 310, and a removal region (120-1) is separated (FIG. 3C) leaving behind the portion of the encapsulation substrate 120 that covers the sealing region.

[0025] Then, a data driver 160 is installed on the exposed device substrate 110 outside of the sealing region and is connected to ends of the data lines (D) (FIG. 3D).

[0026] In the fabricating process of the above-mentioned OLED device 100, the inorganic insulators 230 and 240 may be broken as the inorganic insulators 230 and 240 on the data lines 220 collide with the removal region (120-1) when the removal region (120-1) of the encapsulation substrate 120 is separated as shown by the ringed portion in FIG. 3C. The inorganic insulators 230 and 240 do not effectively protect signal lines and power lines such as the data lines 240 and the like from such impact, resulting in some of the signal lines or the power lines such as the data lines 240 and the like being exposed during the reliability testing at high temperatures and moisture.

[0027] US2004/090187A1 discloses an OLED having a substrate provided with a first conducting area, a second conductimg area and an active area. A plurality of conducting wires are located outside of the active area on the substrate.

[0028] JP2005227313 discloses an electro optical panel that is manufactured using a method in which a drawing line from the panel is protected from damage.

SUMMARY OF THE INVENTION

[0029] Accordingly, aspects of the present invention are designed to solve such drawbacks and/or others of the prior art, and therefore an aspect of the present invention provides an organic light emitting display device capable of preventing damage of the signal lines and the power lines, as well as of preventing oxygen and moisture from being penetrated into a sealing region, and a method for fabricating the same.

[0030] According to a first aspect of the invention, there is provided an organic light emitting display device as set out in claim 1. Preferred features of this aspect of the invention are set out in claims 2 to 19.

[0031] According to a second aspect of the invention, there is provided a method as set out in claim 20. Preferred features of this aspect of the invention are set out in claims 21 to 31.

[0032] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view showing a conventional organic light emitting display device.
FIG. 2 is a cross-sectional view showing the main part taken along a region "A" of FIG. 1.
FIG. 3A to FIG. 3D are diagrams showing a method for fabricating the organic light emitting display device as shown in FIG. 1.
FIG. 4 is a perspective view showing an organic light emitting display device.
FIG. 5 is a cross-sectional view showing the main part taken along a region "B" of FIG. 4.
FIG. 6A to FIG. 6E are diagrams showing a method for fabricating the organic light emitting display device as shown in FIG. 4.
FIG. 7 is a cross-sectional view taken along a line C-C' of FIG. 6D.
FIG. 8A to FIG. 8B are diagrams showing a result of observing the region "B" of the organic light emitting display device as shown in FIG. 4 after the scribing of the encapsulation substrate is completed.
FIG. 9 is a perspective view showing an organic light emitting display device according to the present invention.
FIG. 10 is a cross-sectional view showing the main part taken along a region "F" of FIG. 9.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0034] Reference will now be made in detail to the present embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

[0035] Hereinafter, examples, not forming part of the present invention, will be described in detail with reference to the accompanying FIGs. 4 to 10, to illustrate the principle of the present invention.

[0036] FIG. 4 is a perspective view showing an organic light emitting display device. FIG. 5 is a cross-sectional view showing a portion taken along a region "B" of FIG. 4. Data lines and their protective layers are shown in FIG. 5, and wires or insulators except for the data lines and the protective layers are not shown herein.

[0037] Referring to FIG. 4 and FIG. 5, the organic light emitting display (OLED) device 400 includes a device substrate 410 having at least a pixel region 440 formed thereon. An encapsulation substrate 420 is arranged to overlap at least one region of the device substrate 410 including the pixel region 440. A sealing agent 430 is arranged between the device substrate 410 and the encapsulation substrate 420 to seal a region between the device substrate 410 and the encapsulation substrate 420. The sealing region is the region of the OLED device 400 that is disposed between the device substrate 410 and the encapsulation substrate 420 and is sealed therein by the sealing agent 430. The sealing agent 430 is arranged in the region of the periphery of the pixel region 440. Wires 510, such as data lines (D), are formed on the device substrate 410 spanning from a pixel region 440 inside the sealing region to a data driver 460 outside the sealing region. The wires 510 (D) cross a border between the sealing region and the pixel region 440 where the encapsulation substrate 420 ceases to overlap with the device substrate 410. A first protective layer 520 is formed on the device substrate 410 to cover the wires 510; and a second protective layer 470 is formed on the first protective layer 520. The second protective layer 470 does not entirely cover the first protective layer 520. The second protective layer 470 extends in a direction so as to cross the wires 510 (D) and extends in another direction along a border between where the encapsulation substrate 420 overlaps the device substrate 410 and where the encapsulation substrate 420 does not overlap the device substrate. In other words, the second protective layer 470 lies adjacent the encapsulation substrate 420. In some embodiments, the second protective layer 470 overlaps with one side edge of the encapsulation substrate 420 which is arranged to cross the wires 510 (D). Therefore, the second protective layer 470 can be arranged to be adjacent to or at least partially overlap with an edge of the encapsulation substrate 420. More particularly, a pixel region 440 including a large number of pixels 445 and a scan driver 450 to supply scan signals to the scan lines (S) are formed in the device substrate 410. The pixels 445 are arranged in a region in which the scan lines (S) and the data lines (D) cross. A data driver 460 arranged to supply data signals to the data lines (D) is also installed in the device substrate 410.

[0038] Each of the pixels 445 includes an organic light emitting diode which generates light corresponding to an electric current supplied to the pixels 445. When the scan signal is supplied to the scan lines (S), the pixels 445 generate light having a luminance corresponding to the data signal supplied from the data line (D). The pixels 445 receive signals from both the scan lines (S) and the data lines (D) connected to the pixels 445. As a result, the pixel region 440 displays an image.

[0039] However, the pixels 445 can easily deteriorate in the presence of oxygen and moisture, which can penetrate into the organic light emitting diode as the organic light emitting diode includes an organic light emission layer. In order to prevent the penetration of oxygen and moisture, the pixel region 440, having the pixels 445 formed therein, is generally sealed by the encapsulation substrate 420 and the sealing agent 430. That is to say, the pixel region 440 is arranged inside the sealing region between the device substrate 410 and the encapsulation substrate 420.

[0040] The scan driver 450 is driven by scan control signals, which include a clock signal, a start pulse, an output enable signal, etc. The scan control signals are supplied to the scan driver 450 from outside of the OLED device 400 through a pad unit or scan control unit (not shown). The scan driver 450 generates scan signals from the scan control signals supplied thereto. The scan signals generated in the scan driver 450 are supplied to the pixels 445 in the pixel region 440 through the scan lines (S). When transistors are formed in the pixel region 440, the scan driver 450 is formed on the device substrate 410 together with the transistors and sealed with the pixel region 440 within the sealing region, or the scan driver 450 may be installed outside the sealing region in a chip form.

[0041] The data driver 460 generates data signals and is driven by data and data driving/controlling signals supplied from outside the OLED device 400 through the pad unit, including a data control unit (not shown). The data signal generated in the data driver 460 is supplied to the pixels 445 in the pixel region 440 through the data lines (D). Such a data driver 460 may be generally installed onto the device substrate 410 outside the sealing region in a chip form, or formed on the device substrate 410 together with the pixel region 440 and arranged inside the sealing region.

[0042] The encapsulation substrate 420 is arranged to overlap with one region of the device substrate 410 that includes at least the pixel region 440. The encapsulation substrate 420 together with the sealing agent 430 seals the pixel region 440. The encapsulation substrate 420 is scribed so as to not overlap with a region in which the data driver 460 will be installed if the data driver 460 is installed in a chip form. The encapsulation substrate 420 is scribed, meaning that a scribing line 610 (in FIG. 6C) is formed in the surface of the encapsulation substrate 420 and a removal region 420-1 (in FIG. 6C) is broken from the encapsulation substrate 420 and then removed.

[0043] The sealing agent 430 is applied to a surface of the encapsulation substrate 420 facing the device substrate 410 to coalesce or fuse the device substrate 410 to the encapsulation substrate 420 and to prevent oxygen and moisture from penetrating into the sealing region. Therefore, the pixel region 440 is protected. Here, epoxy resin, frit, or the like may be used as the sealing agent 430.

[0044] In the OLED device 400, the wires 510 are formed on the device substrate 410 and extend from the inside of the sealing region to the outside of the sealing region. That is to say, the wires 510 are formed on the device substrate 410 so that ends of the wires 510 are arranged inside the sealing region, which is sealed by the sealing agent 430, and the other ends of the wires 510 are arranged outside the sealing region.

[0045] In particular, if the data driver 460 is installed outside the sealing region in a chip form, then the data lines (D) formed between the pixel region 440 and the data driver 460 extend from the inside of the sealing region to the outside of the sealing region.

[0046] Also, power lines and/or signal lines are formed between supply units (not shown), such as power sources and/or scan controllers, and the pixel region 440 and the scan driver 450. There may be only one power line and only one signal line but this is not limited thereto. As the pixel region 440 and the scan driver 450 are arranged inside the sealing region, the power lines and/or signal lines extend from outside the sealing region to inside the sealing region to connect the power sources and/or scan controllers to the pixel region 440 and the scan driver 450. Accordingly, the power lines and/or signal control lines of the pixel region 440 and the scan driver 450 may be treated as or similarly to the wires 510. Hereinafter, the wires 510 are the data line (D) but aspects of the invention drawn to the wires 510 may also be drawn to the power lines and the control signal lines.

[0047] As the wires 510, such as the data lines (D), are generally formed of conductive material such as metal, etc., the wires 510 are corroded when moisture penetrates into the OLED device 400 to the wires 510. If a disconnection is caused by such corrosion, the OLED device 400 produces poor quality display images.

[0048] In order to prevent such corrosion, an inorganic protective layer that prevents the penetration of moisture and the like is formed on the data lines 510 (D). The inorganic protective layer may be formed of the same insulators as formed in the pixel region 440. For example, the insulator materials may be an interlayer insulator and/or an inorganic planarization layer.

[0049] A first protective layer 520 may be formed on the data lines 510 (D), wherein the first protective layer 520 has a laminated structure of a first inorganic insulator 520a and a second inorganic insulator 520b. In other words, the first protective layer is itself made from two layers 520a and 520b. The first inorganic insulator 520a is formed of an oxide film such as SiO_2 and/or a nitride film such as SiN_x which results in the first inorganic insulator 520s being an interlayer insulator formed of the same interlayer insulator as formed in the pixel region 440. The second inorganic insulator 520b is formed of a nitride film such as SiN_x, etc., which is a material composed of the same inorganic planarization layer formed in the pixel region 440. That is to say, the first protective layer 520 is formed of the inorganic materials and arranged to cover the data lines 510 (D), and therefore the first protective layer 520 serves to prevent moisture, etc., from penetrating to the data lines 510 (D). Here, the first protective layer 520 may be arranged to overlap the sealing agent 430 since it is formed of the inorganic materials capable of preventing the penetration of moisture, etc. Alternatively, the first protective layer 520 can be disposed between the device substrate 410 and the sealing agent 430 as the first protective layer 520 is formed of inorganic materials that prevent penetration of moisture to the wires 510 (D) and the sealing region.

[0050] However, the first protective layer 520 alone could be easily broken during the separation process to remove the scribing region 420-1, which occurs after a scribing process of the encapsulation substrate 420. The inorganic layers are brittle such that the inorganic layers are easily broken by external impacts. As such, moisture may penetrate into cracks of the broken first protective layer 520 and corrode the data lines 510 (D).

[0051] In order to prevent the first protective layer 520 from being broken, a second protective layer 470, composed of an organic material, is formed on the first protective layer 520. The second protective layer 470 acts as a protective, shock absorbing layer and is formed in the region of the scribing line of the encapsulation substrate 420. Thus, during the separation process to remove the scribing region 420-1, the scribing region 420-1 may contact the second protective layer 470 which protects the relatively brittle first protective layer 520.

[0052] The second protective layer 470 is formed on the first protective layer 520 so as to overlap with one side edge of the encapsulation substrate 420, which in this case is the side edge of the encapsulation substrate 420 that crosses the data lines 510 (D). The second protective layer 470 is not limited thereto and may be formed to cover other wires such as power lines or signal lines as described above. The second protective layer 470 is disposed on the first protective layer 520 to overlap any scribing line 610 (of FIG. 6C) that may be formed in the encapsulation substrate 420.

[0053] Such a second protective layer 470 prevents direct collision between the removal region 420-1 of the encapsulation substrate 420 that is separated therefrom and the first protective layer 520 in the separation process. The separation process is carried out after scribing the encapsulation substrate 420. Also, the second protective layer 470 absorbs energy from impacts caused by collisions so as to prevent the first protective layer 520 from being broken. The second protective layer 470 is formed of an organic material that is flexible and that has energy absorbing properties. For this purpose, the second protective layer 470 is formed in a scribing tolerance zone of the encapsulation substrate 420. In other words, the second protective layer 470 is formed in the region where the encapsulation substrate 420 is scribed.

[0054] Since the second protective layer 470 is disposed in the scribing tolerance zone of the encapsulation substrate 420, the second protective layer 470 is arranged to be overlapped with or adjacent one side edge of the encapsulation substrate 420 after the scribing process. Therefore, after the scribing process, the scribing region 420-1 does not contact the first protective layer 520. In some configurations, the second protective layer 470 is arranged within a range of 300 μm from the one side edge of the encapsulation substrate 420 that overlaps with the second protective layer 470. In such an arrangement, the second protective layer is partially disposed between the encapsulation substrate 420 and the device substrate 410 after the scribing region 420-1 is removed. Also, the width of the second protective layer 470 and the scribing tolerance zone is less than or about 600 μm - about 300 μm disposed on each side of the edge of the encapsulation substrate 420.

[0055] However, the second protective layer 470 is arranged outside of the sealing region and outside of the sealing agent 430 as the second protective layer 470 is composed of an organic material capable of being penetrated by moisture, etc. That is to say, the second protective layer 470 is formed to cross the data lines 510 (D) in a region between the sealing agent 430 and the data driver 460. Also, the second protective layer 470 is formed to a lower height than or the same height as the sealing agent 430 since the sealing region may be poorly sealed if the second protective layer 470 is formed to a higher height than that of the sealing agent 430.

[0056] The second protective layer 470 is formed with a thickness of at least 1 μm to effectively protect the first protective layer 520. The second protective layer 470 is formed of the same materials as at least one of an organic planarization layer, an organic pixel definition layer, and/or an organic spacer between the pixels 445 in the pixel region 440.

[0057] For example, the second protective layer 470 may be formed having a laminated structure of a first organic insulator 470a and a second organic insulator 470b. In other words, the second protective layer 470 can be formed from a number of layers. The first organic insulator 470a is formed of organic planarization layer materials such as acryl, etc. The second organic insulator 470b is formed of pixel definition layer materials such as polyimide, etc. Also, if a spacer composed of the organic insulator materials is formed inside the pixel region 440, then the second protective layer 470 may further include a third organic insulator 470c formed of the organic spacer materials of the pixel region 440 and arranged on the second organic insulator 470b. Also, the second protective layer 470 may be formed with a single-layered structure formed of one of the materials of the organic spacers between the pixels 445, the organic pixel definition layer, and/or the organic planarization layer. Or, the second protective layer 470 may be formed of the other materials.

[0058] As described above, the organic light emitting display (OLED) device 400 may prevent the corrosion of the data lines 510 (D) by forming a first protective layer 520 on the data lines 510 (D) that extend from the pixel region 440 inside the sealing region to the data driver 460 outside the sealing region, and the first protective layer 520 is composed of at least one inorganic insulator. Therefore, the poor organic light emitting display quality may be prevented by preventing the data lines 510 (D) from corroding and disconnecting.

[0059] Also, the first protective layer 520 may be prevented from being broken by external impacts by forming thereon the second protective layer 470, composed of at least one organic insulator. When the second protective layer 470 is disposed to protect the first protective layer 520, the first protective layer 520 is able to properly protect the wires 510 from moisture. That is to say, the formation of the second protective layer 470 more effectively protects the data lines 510 (D) and prevents damage of the data lines 510 (D) caused by the removal of the scribing region 420-1. Thus, the manufacture of poor OLED devices 400 may be prevented.

[0060] Also, the second protective layer 470, which is an organic layer, is arranged outside the sealing region and outside of the sealing agent 430 and does not overlap the sealing agent 430. The second protective layer 470 is also set to a lower height than or the same height as the sealing agent 430 so as to effectively carry out the sealing process. Accordingly, oxygen and moisture are prevented from penetrating into the sealing region.

[0061] Meanwhile, power lines and/or control signal lines (not shown) of the pixel region 440 and the scan driver 450 may be protected by forming first and second protective layers 520 and 470, respectively, on the power lines and/or control signal lines of the pixel region 440 formed from the inside of the sealing region to the outside of the sealing region.

[0062] Also, although it is shown in FIG. 4 and FIG. 5 that the data driver 460 is installed outside the sealing region, the data driver 460 is not limited thereto. If the data driver 460 is formed inside the sealing region, the power lines and/or signal lines of the data driver 460 may be protected by forming the first and second protective layers 520 and 470, respectively, thereon in the same manner as the first and second protective layers 520 and 470 are formed on the data lines 510 (D) as described above.

[0063] FIGs. 6A to 6E are diagrams showing a method for fabricating the organic light emitting display device as shown in FIG. 4. And, FIG. 7 is a cross-sectional view taken along a line C-C' of FIG. 6D. At least one transistor is included in each of the pixels 445 in FIG. 6A to FIG. 7, but the configurations are not limited thereto.

[0064] Referring to FIGs. 6A to FIG. 7, in order to fabricate the organic light emitting display (OLED) device 400 as shown in FIG. 4, transistors (not shown) of the pixels 445, scan lines (S), data lines (D) and a scan driver 450 are firstly formed on the device substrate 410 in which the pixel region 440 is defined.

[0065] Here, if the pixels 445 include at least one transistor (not shown), then the scan lines (S) and the data lines 510 (D) may be formed together with the pixels 445 during the process for forming the pixels 445. The scan lines (S) and the data lines 510 (D) may be formed of the same material as the material from which the electrodes of the transistors are formed. If the transistors of the pixels 445 are formed, then at least one inorganic planarization layer (not shown) is formed on the transistors.

[0066] At this time, in order to ensure stability of the scan lines (S) and the data lines 510 (D) and to effectively protect them, at least one insulator is generally formed on the scan lines (S) and the data lines 510 (D). The insulator is formed together with the pixels 445 using the same insulator materials as those in the pixel region 440, thus increasing the efficiency of the process.

[0067] For example, the first protective layer 520, as shown in FIG. 5, may be formed on the data lines 510 (D) with a laminated structure of the same inorganic insulator materials as in the pixel region 440 and formed in the same process as for forming an interlayer insulator and/or an inorganic planarization layer of the pixel region 440 (FIG. 6A).

[0068] Then, an organic planarization layer which is composed of acryl, etc., (not shown) and organic light emitting diodes (not shown), are formed on the inorganic planarization layer in the pixel region 440. And, at least one second protective layer 470 is formed in one region of the first protective layer 520 and formed to cross the data lines 510 (D).

[0069] Here, the second protective layer 470 is formed inside a scribing tolerance zone to overlap the scribing line on the encapsulation substrate 420 when the scribing is later carried out. The second protective layer 470 is arranged on the device substrate 410 and arranged to not overlap with the sealing agent 430, which is coated on the encapsulation substrate 420. That is to say, the second protective layer 470 is arranged outside the sealing region and the sealing agent 430. At this time, the scribing tolerance zone, which is a region existing within a predetermined distance from the center of the scribing line, that will be used when the scribing is performed, is a region which is arranged in a region affected by the scribing. The width of the scribing tolerance zone accounts for an error range associated with the application of the scribing line 610. The scribing tolerance zone is arranged about a region scratched by scribing in the scribing process of the encapsulation substrate 420. For example, the scribing tolerance zone may be set to a region within a range of 300 μm from the position of the scribing line. Or, the scribing tolerance zone may be less than or about 600 μm wide.

[0070] The second protective layer 470 is formed together with the pixels 445 in the process for forming the pixels 445 using the same material as at least one organic insulator material disposed in the pixel region 440.

[0071] The second protective layer 470 may be formed with at least one laminated structure formed of an organic planarization layer, a pixel definition layer, and an organic spacer of the pixel region 440 and formed during the process for forming the organic planarization layer, the pixel definition layer, and the organic spacer of the pixel region 440. FIG. 6B shows that the second protective layer 470 is formed with a laminated structure of three organic insulators composed of the organic planarization layer, the pixel definition layer, and the organic spacer material. But, the second protective layer 470 is not limited thereto, and the second protective layer 470 may be formed with a single-layered structure and formed of one of the organic insulator materials in the pixel region 440. For example, the second protective layer 470 may be formed only of a single-layered organic insulator composed of the organic planarization layer materials and formed during the process for forming an organic planarization layer of the pixel region 440 (FIG. 6B).

[0072] Then, the sealing agent 430 is applied to the encapsulation substrate 420 such that when the encapsulation substrate 420 is affixed to the device substrate 410 the sealing agent 430 is formed about the periphery of the pixel region 440 to form the sealing region. If the scan driver 450 and the data driver 460 are to be disposed in the sealing region, then they are formed on the device substrate 410 in an area to become the sealing region before the encapsulation substrate 420 is affixed to the device substrate 410. The sealing agent 430 is then disposed on the encapsulation substrate 420 so as to seal the scan driver 450 and the data driver in the sealing region. The encapsulation substrate 420, having the sealing agent 430 disposed on a surface to face the device substrate 410, is arranged on the device substrate 410. A sealing process for sealing a region between the device substrate 410 and the encapsulation substrate 420 is then effected using the sealing agent 430. At this time, the sealing agent 430 is applied along an edge of a region inside the scribing line 610 of the encapsulation substrate 420 and used to seal the sealing region, which includes at least the pixel region 440. Also, the sealing agent 430 may be formed on the first protective layer 520 to overlap with the first protective layer 520 but arranged to not overlap with the second protective layer 470. That is to say, the second protective layer 470 should be arranged outside the sealing region and the sealing agent 430. The sealing process is effected when the sealing agent 430 is formed at a height higher than or the same as that of the second protective layer 470. The scribing line 610 on the encapsulation substrate 420 and the second protective layer 470 are arranged to overlap with each other (FIG. 6C).

[0073] Then, the scribing process of the encapsulation substrate 420 is effected and a line is scribed along the scribing line 610 on the encapsulation substrate 420, thereby forming a removal region 420-1. The removal region 420-1 is separated from the encapsulation substrate 420 (FIG. 6D).

[0074] Then, a data driver 460 is installed onto an exposed region of the device substrate 410 and connected with the ends of the data lines 510 (D) that extend outside of the sealing region (FIG. 6E).

[0075] If the second protective layer 470 is formed in the fabricating process of the OLED device 400, then the second protective layer 470 prevents the removal region 420-1 of the encapsulation substrate 420 from directly colliding with the first protective layer 520 when the removal region 420-1 is removed. The first protective layer 520 is also prevented from being broken since the second protective layer 470 relieves the impact of the collision with the removal region 420-1 of the encapsulation substrate 420. Therefore, the first protective layer 520 effectively protects the data lines 510 (D) from the penetration of moisture, etc., thereby preventing damage, such as disconnection of the data lines 510 (D) when the OLED device 400 is used in the reliability test at high temperature and moisture.

[0076] FIG. 7 is a cross-section of the OLED device 400 taken along the line C-C' in FIG. 6D and illustrates the protection of the first protective layer 460 as provided by the second protection layer 470. When the removal region 420-1 is removed from the encapsulation substrate 420 and from the OLED device 400, an edge of the removal region 420-1 may contact and pierce the first protective layer 520 but for the protection provided by the second protection layer 470. As a result, the data lines 510 (D), disposed on the device substrate 410, are protected from the scribing process. Also, the sealing agent 430 is disposed between the first protective layer 520 and the encapsulation substrate 420, but the sealing agent 430 does not overlap the second protective layer 470.

[0077] FIGs. 8A and 8B are diagrams showing a result of observing the region "B" of the OLED device 400 as shown in FIG. 4 after the scribing process and a washing process of the encapsulation substrate are completed. The data lines and the first and second protective layer are shown in FIGs. 8A and 8B to the exclusion of other components.

[0078] Referring to FIGs. 8A and 8B, a process for removing particles, etc., produced from scribing, or a washing process, is effected generally when the data driver 460 is not installed and after the scribing process is completed. After the washing process, scratches generated during the scribing process in the second protective layer 470 and arranged beneath the scribing line 610 are evident, as shown in a region "E" of FIG. 8A. However, the first protective layer 520 and the data lines 510 (D), which are protected by the second protective layer 470, are not damaged as the first protective layer 520 and the data lines 510 (D) are arranged beneath the second protective layer 470.

[0079] More particularly, deep grooves are formed beneath the scribing line 610in the second protective layer 470. The deep grooves or scratches are generated during the scribing process and the separation process of the removal region 420-1 of the encapsulation substrate 420, as shown in FIG. 8B. FIG. 8B shows a cross-sectional view of the region "E" of FIG. 8A and shows that the first protective layer 520 and the data line (D, 510) arranged beneath the scribing line 610 are not damaged.

[0080] Accordingly, the first protective layer 520 effectively protects the data lines 510 (D) from oxygen and moisture and prevents a disconnection of the data lines 510 (D) when a subsequent reliability test is carried out at high temperature and moisture.

[0081] Referring to FIGs. 9 and 10, some of the insulators of the second insulator 470' are arranged between the data lines 510 (D) so as to not overlap the data lines 510 (D).

[0082] FIG. 9 is a perspective view showing an organic light emitting display (OLED) device 400 according to the present invention. FIG. 10 is a cross-sectional view showing a portion taken along a region "F" of FIG. 9. In FIGs. 9 and 10, the same parts have the same reference numerals as in the above descriptions and illustrations and as shown in FIG. 4 and FIG. 5, and their detailed descriptions are omitted herein.

[0083] Referring to FIG. 9 and FIG. 10, second and third organic insulators 470b' and 470c' in the second protective layer 470' are arranged between the data lines 510 (D) so as to not overlap the data lines 510 (D). However, the second and third organic insulators 470b' and 470c' prevent direct impacts on the data lines 510 (D) in the scribing process and the separation process of the encapsulation substrate 420.

[0084] As described above, according to the OLED device 400 the wires 510 (D) may be protected from the penetration of oxygen and moisture. Thus, defects in the wires, such as disconnection, etc., may be prevented by forming the first protective layer 520, composed of the inorganic insulators, on the wires 510 (D), such as power lines, signal lines, and data lines, etc., formed to extend from the inside of the sealing region to the outside of the sealing region.

[0085] As is illustrated, it is not necessary that the second protective layer 470' extend to cross the wires 510 (D). The second protective layer 470' may be formed into structures disposed between the wires 510 (D) while maintaining sufficient protection of the first protective layer 520. The second protective layer 470' dissipates energy exerted thereon without breaching the first protective layer 520. Furthermore, the first organic insulator 470a' may be disposed to cross the wires 510 (D) along the scribing tolerance zone but not to overlap the sealing agent 430 as described above. However, the second and third organic insulators 470b' and 470c' may form structures between the wires 510 (D). Again, the second protective layer 470' of embodiments of the invention is not limited thereto. The first and second organic insulators 470a' and 470b' may be formed to cross the wires 510 (D) in the scribing tolerance zone but not to overlap the sealing agent 430; and, the third organic insulator 470c' may form structures disposed between the wires 510 (D).

[0086] Also, the first protective layer 520 may be protected from being broken by external impacts during the scribing process of the encapsulation substrate by forming the second protective layer 470', composed of at least one organic insulator, on the easily broken first protective layer 520. Thus, the first protective layer 520 sufficiently protects the wires 510 (D) from oxygen and moisture. Therefore, the wires 510 (D), such as the data lines, etc., are more effectively protected to prevent disconnection, etc., and poor organic light emitting display device performance.

[0087] Also, the second protective layer 470', which is an organic layer, is arranged outside of the sealing agent 430 and the sealing region so as to not overlap the sealing agent 430. Also, the second protective layer 470' may be formed to a lower height than or the same height as the sealing agent. The forming of the second protective layer 470' to such heights improves the sealing properties of the sealing agent 430 and the sealing process. Accordingly, oxygen and moisture are prevented from penetrating into the sealing region and corroding the wires 510 (D).

[0088] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. An organic light emitting display device, comprising:

a device substrate (410) including at least a pixel region (440) comprising a plurality of pixels (445);
an encapsulation substrate (420) arranged to overlap with at least one region of the device substrate including the pixel region;
a sealing agent (430) arranged between the device substrate and the encapsulation substrate to seal a sealing region between the device substrate and the encapsulation substrate;
at least one wire (510) formed on the device substrate arranged to cross a first edge of the encapsulation substrate so that a first end of the or each wire is arranged inside the sealing region and a second end of the or each wire is arranged outside of the sealing region;
a first protective layer (520) formed of at least one inorganic layer on the or each wire; and
a second protective layer (470') formed of at least one organic layer on a portion of the first protective layer, wherein the second protective layer is arranged to be adjacent to or at least partially overlap with the first edge of the encapsulation substrate and to be outside of the sealing region and outside of the sealing agent;
wherein the second protective layer (470') is formed with a laminated structure of at least two organic insulators, wherein at least one of the organic insulators in the second protective layer is formed in a region that crosses the at least one wire but the at least one of the organic insulators does not overlap the at least one wire.

2. An organic light emitting display device according to claim 1, wherein the second protective layer (470') is arranged to protect the first protective layer (520) from shocks.

3. An organic light emitting display device according to Claim 1 or 2, wherein the first protective layer (520) is formed on the device substrate (410) to cover the pixels.

4. An organic light emitting display device according to any one of claims 1 to 3, wherein the first protective layer (520) is formed of at least one inorganic insulator selected from the group comprising insulators disposed in the pixel region (440).

5. An organic light emitting display device according to any one of claims 1 to 4, wherein the first protective layer (520) is formed of at least one layer selected from the group comprising an interlayer insulator of the pixel region (440) and an inorganic planarization layer of the pixel region.

6. An organic light emitting display device according to any one of claims 1 to 5, wherein the second protective layer (470') is formed of at least one organic insulator selected from the group comprising insulators disposed in the pixel region (440).

7. An organic light emitting display device according to any one of claims 1 to 6, wherein the second protective layer (470') is formed of same materials as at least one structure selected from the group comprising an organic planarization layer, a pixel definition layer, and spacers disposed between pixels of the pixel region.

8. An organic light emitting display device according to any one of claims 1 to 7, wherein the second protective layer (470') is formed with a laminated structure of at least two insulators selected from the group comprising an organic planarization layer (470a') a pixel definition layer (470b') and spacers (470c') disposed between pixels (445) of the pixel region.

9. An organic light emitting display device according to any one of claims 1 to 8, wherein the second protective layer (470') includes at least one material selected from the group comprising acryl and polyimide.

10. An organic light emitting display device according to any one of claims 1 to 9, wherein the second protective layer (470') is formed so as to not overlap with the sealing agent (430).

11. An organic light emitting display device according to any one of claims 1 to 10, wherein the second protective layer (470') is formed to a lower height than or a same height as the sealing agent (430).

12. An organic light emitting display device according to any one of claims 1 to 11, wherein the second protective layer (470') is formed within about 300 μm of the first edge of the encapsulation substrate (420).

13. An organic light emitting display device according to any one of claims 1 to 12, wherein a data driver (460) for supplying data signals to the pixel region (440) is installed on the device substrate (410) outside the sealing region, and the at least one wire is a plurality of data lines formed between the pixel region (440) and the data driver.

14. An organic light emitting display device according to any one of claims 1 to 13, wherein the at least one wire comprises a plurality of data lines.

15. An organic light emitting display device according to claim 13 or 14, wherein the second protective layer (470') is formed between the sealing agent (430) and the data driver (460).

16. An organic light emitting display device according to any one of the preceding claims, further comprising supply units arranged to apply electrical signals to the pixels, wherein at least one of the supply units is disposed outside of the sealing region, and the scribing tolerance zone is disposed so as to cross the or each wire between the sealing agent and the at least one of the supply units disposed outside of the sealing region.

17. An organic light emitting display device according to claim 16, further comprising:

a data driver (460) formed inside the sealing region; and
a scan driver formed inside the sealing region,

wherein the at least one of the supply units disposed outside of the sealing region is a power supply, and the at least one wire is a power supply wire.

18. An organic light emitting display device according to claim 17, further comprising:

a data driver (460) formed inside the sealing region; and
a scan driver (450) formed inside the sealing region,

wherein the at least one of the supply units disposed outside of the sealing region is a pad unit arranged to supply data control signals to the data driver, and the pad unit is arranged to supply scan control signals to the scan driver, and the at least one wire is a plurality of data control lines and a plurality of scan control lines.

19. An organic light emitting display device according to any one of claims 1 to 18, wherein the second protective layer (470') is formed on the first protective layer in a scribing tolerance zone outside the sealing agent.

20. A method for fabricating an organic light emitting display device, the method comprising:

forming data lines on a device substrate (410) in which a pixel region (440) is defined;
forming a first protective layer (520) of at least one inorganic insulator to cover the data lines;
forming a second protective layer (470') of at least one organic insulator on the first protective layer so as to cross the data lines;
sealing at least one region on the device substrate including the pixel region with an encapsulation substrate (420) and a sealing agent to form a sealing region between the device substrate and the encapsulation substrate; and
scribing the encapsulation substrate in an area corresponding to the second protective layer;

wherein the second protective layer (470') is arranged to be outside of the sealing region and outside of the sealing agent and the second protective layer (470') is formed by laminating at least two organic insulators, wherein at least one of the organic insulators in the second protective layer is formed to not overlap the data lines.

21. A method according to claim 20, wherein the second protective layer (470') is arranged to protect the first protective layer from shocks caused by the removal of a portion of the encapsulation substrate after scribing.

22. A method according to claims 20 or 21, further comprising:

forming pixels (445) in the pixel region.

23. A method according to claim 22, further comprising:

forming the first protective layer (520) together with the pixels (445) in the operation of forming the pixels,
wherein the first protective layer (520) is formed of at least one material selected from the group consisting of inorganic insulator materials formed in the pixel region.

24. A method according to claim 22 or 23, further comprising:

forming the second protective layer (470') together with the pixels in the operation of forming the pixels,
wherein the second protective layer (470') is formed of at least one material selected from the group consisting of organic insulator materials formed in the pixel region (440).

25. A method according to any one of claims 20 to 24, further comprising:

forming the second protective layer (470') in an operation to form an insulator material of the pixel region,
wherein the second protective layer (470') is formed to have a laminated structure of at least one insulator from the group of insulators consisting of an organic planarization layer (470a') a pixel definition layer (470b') and an organic spacer (470c') of the pixel region.

26. A method according to any one of claims 20 to 25, wherein the sealing of the at least one region on the device substrate (410), further comprises:

applying a sealing agent (430) along an edge of the scribing line of the encapsulation substrate to seal a region between the device substrate (410) and the encapsulation substrate (420).

27. A method according to claim 26, wherein the sealing agent (430) is formed to contact the first protective layer (520).

28. A method according to claim 26 or 27, wherein the second protective layer (470') is formed outside the sealing region sealed by the sealing agent, and the second protective layer is disposed to not overlap the sealing agent.

29. A method according to any one of claims 20 to 28, wherein the second protection layer is formed corresponding to a scribing tolerance zone.

30. A method according to claim 29, wherein the scribing tolerance zone is set to a region within about 300 μm from the scribing line of the encapsulation substrate.

31. A method according to claim 26 or any claim dependent on claim 26, wherein the second protective layer is formed at a lower height than or a same height as the sealing agent.

Patentansprüche

1. Organische lichtemittierende Anzeigevorrichtung, die Folgendes umfasst:

ein Vorrichtungssubstrat (410) einschließlich mindestens eines Pixelbereichs (440), der eine Vielzahl von Pixeln (445) umfasst;
ein Verkapselungssubstrat (420), das so angeordnet ist, dass es mindestens einen Bereich des Vorrichtungssubstrats einschließlich des

Pixelbereichs überdeckt;
ein Dichtungsmittel (430), das zwischen dem Vorrichtungssubstrat und dem Verkapselungssubstrat zum Dichten eines Dichtungsbereichs zwischen dem Vorrichtungssubstrat und dem Verkapselungssubstrat angeordnet ist;
mindestens ein Leiter (510), der auf dem Vorrichtungssubstrat gebildet wird und so angeordnet ist, dass er einen ersten Rand des Verkapselungssubstrats kreuzt, so dass sich ein erstes Ende des oder jeden Leiters innerhalb des Dichtungsbereichs befindet und ein zweites Ende des oder jeden Leiters sich außerhalb des Dichtungsbereichs befindet;
eine erste Schutzschicht (520), die aus mindestens einer anorganischen Schicht auf dem oder auf jedem Leiter gebildet wird; und
eine zweite Schutzschicht (470'), die aus mindestens einer organischen Schicht auf einem Teil der ersten Schutzschicht gebildet wird, wobei die zweite Schutzschicht so angeordnet ist, dass sie dem ersten Rand des Verkapselungssubstrats benachbart ist oder diesen mindestens teilweise überdeckt und sich außerhalb des Dichtungsbereichs und außerhalb des Dichtungsmittels befindet;

wobei die zweite Schutzschicht (470') mit einer laminierten Struktur aus mindestens zwei organischen Isolatoren gebildet wird, wobei der mindestens eine der organischen Isolatoren in der zweiten Schutzschicht in einem Bereich gebildet wird, der den mindestens einen Leiter kreuzt, der mindestens eine der organischen Isolatoren jedoch nicht den mindestens einen Leiter überdeckt.

2. Organische lichtemittierende Anzeigevorrichtung nach Anspruch 1, wobei die zweite Schutzschicht (470') so angeordnet ist, dass die erste Schutzschicht (520) vor Stößen geschützt wird.

3. Organische lichtemittierende Anzeigevorrichtung nach Anspruch 1 oder 2, wobei die erste Schutzschicht (520) auf dem Vorrichtungssubstrat (410) gebildet wird, um die Pixel zu bedecken.

4. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 3, wobei die erste Schutzschicht (520) aus mindestens einem anorganischen Isolator gebildet wird, der aus der Gruppe ausgewählt wird, die Isolatoren umfasst, die im Pixelbereich (440) angeordnet sind.

5. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 4, wobei die erste Schutzschicht (520) aus mindestens einer Schicht gebildet wird, die aus der Gruppe ausgewählt wird, die einen Zwischenschichtisolator des Pixelbereichs (440) und eine anorganische Planarisierungsschicht des Pixelbereichs umfasst.

6. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 5, wobei die zweite Schutzschicht (470') aus mindestens einem organischen Isolator gebildet wird, der aus der Gruppe ausgewählt wird, die Isolatoren umfasst, die im Pixelbereich (440) angeordnet sind.

7. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 6, wobei die zweite Schutzschicht (470') aus den gleichen Materialien wie mindestens eine Schicht gebildet wird, die aus der Gruppe ausgewählt wird, die eine organische Planarisierungsschicht, eine Pixeldefinitionsschicht und Abstandhalter umfasst, die zwischen Pixeln des Pixelbereichs angeordnet sind.

8. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 7, wobei die zweite Schutzschicht (470') mit einer laminierten Struktur aus mindestens zwei Isolatoren gebildet wird, die aus der Gruppe ausgewählt werden, die eine organische Planarisierungsschicht (470a'), eine Pixeldefinitionsschicht (470b') und Abstandshalter (470c') umfasst, die zwischen Pixeln (445) des Pixelbereichs angeordnet sind.

9. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 8, wobei die zweite Schutzschicht (470') mindestens ein Material umfasst, das aus der Gruppe ausgewählt wird, die Acryl und Polyimid umfasst.

10. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 9, wobei die zweite Schutzschicht (470') so geformt ist, dass sie das Dichtungsmittel (430) nicht überdeckt.

11. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 10, wobei die zweite Schutzschicht (470') auf eine geringere Höhe als oder die gleiche Höhe wie das Dichtungsmittel (430) geformt ist.

12. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 11, wobei die zweite Schutzschicht (470') innerhalb von ungefähr 300 μm des ersten Rands des Verkapselungssubstrats (420) gebildet wird.

13. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 12, wobei ein Datentreiber (460) für die Lieferung der Datensignale an den Pixelbereich (440) auf dem Vorrichtungsträger (410) außerhalb des Dichtungsbereichs installiert ist, und der mindestens eine Leiter eine Vielzahl aus Datenleitungen ist, die zwischen dem Pixelbereich (440) und dem Datentreiber gebildet werden.

14. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 13, wobei der mindestens eine Leiter eine Vielzahl von Datenleitungen enthält.

15. Organische lichtemittierende Anzeigevorrichtung nach Anspruch 13 oder 14, wobei die zweite Schutzschicht (470') zwischen dem Dichtungsmittel (430) und dem Datentreiber (460) gebildet wird.

16. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der vorherigen Ansprüche, die weiterhin Zufuhreinheiten umfasst, die so angeordnet sind, dass sie elektrische Signale auf die Pixel anwenden, wobei sich mindestens eine der Zufuhreinheiten außerhalb des Dichtungsbereichs befindet, und die Ritztoleranzzone so angeordnet ist, dass sie den oder jeden Leiter zwischen dem Dichtungsmittel und der mindestens einen der Zufuhreinheiten kreuzt, die außerhalb des Dichtungsbereichs angeordnet sind.

17. Organische lichtemittierende Anzeigevorrichtung nach Anspruch 16, die weiterhin Folgendes umfasst:

einen Datentreiber (460), der im Innern des Dichtungsbereichs gebildet wird; und
einen Scantreiber, der im Innern des Dichtungsbereichs gebildet wird;

wobei die mindestens eine der Zufuhreinheiten, die außerhalb des Dichtungsbereichs angeordnet sind, eine Stromzufuhr ist, und der mindestens eine Leiter eine Spannungszuleitung ist.

18. Organische lichtemittierende Anzeigevorrichtung nach Anspruch 17, die weiterhin Folgendes umfasst:

einen Datentreiber (460), der im Innern des Dichtungsbereichs gebildet wird; und
einen Scantreiber (450), der im Innern des Dichtungsbereichs gebildet wird,

wobei die mindestens eine der Zufuhreinheiten, die außerhalb des Dichtungsbereichs angeordnet ist, eine Pad-Einheit ist, die so angeordnet ist, dass sie Datensteuersignale an den Datentreiber liefert, und die Pad-Einheit so angeordnet ist, dass sie Scansteuersignale an den Scantreiber liefert, und der mindestens eine Leiter eine Vielzahl von Datensteuerleitungen und eine Vielzahl von Scansteuerleitungen ist.

19. Organische lichtemittierende Anzeigevorrichtung nach einem beliebigen der Ansprüche 1 bis 18, wobei die zweite Schutzschicht (470') auf der ersten Schutzschicht in einer Ritztoleranzzone außerhalb des Dichtungsmittels gebildet wird.

20. Verfahren zur Herstellung einer organischen lichtemittierenden Anzeigevorrichtung, wobei das Verfahren Folgendes umfasst:

Bilden von Datenleitungen auf einem Vorrichtungssubstrat (410), in dem ein Pixelbereich (440) definiert ist;
Bilden einer ersten Schutzschicht (520) von mindestens einem anorganischen Isolator, um die Datenzeilen zu bedecken;
Bilden einer zweiten Schutzschicht (470') aus mindestens einem organischen Isolator auf der ersten Schutzschicht quer zu den Datenleitungen;
Abdichten mindestens eines Bereichs auf dem Vorrichtungssubstrat einschließlich des Pixelbereichs mit einem Verkapselungssubstrat (420) und einem Dichtungsmittel, um einen Dichtungsbereich zwischen dem Vorrichtungssubstrat und dem Verkapselungssubstrat zu bilden; und
Ritzen des Verkapselungssubstrats in einem Bereich, welcher der zweiten Schutzschicht entspricht;

wobei die zweite Schutzschicht (470') so angeordnet ist, dass sie sich außerhalb des Dichtungsbereichs und außerhalb des Dichtungsmittels befindet, und die zweite Schutzschicht (470') durch das Laminieren von mindestens zwei organischen Isolatoren gebildet wird, wobei mindestens einer der organischen Isolatoren in der zweiten Schutzschicht so geformt ist, dass er die Datenleitungen nicht überdeckt.

21. Verfahren nach Anspruch 20, wobei die zweite Schutzschicht (470') so angeordnet ist, dass sie die erste Schutzschicht vor Stößen schützt, die durch das Entfernen eines Teils des Verkapselungssubstrats nach dem Ritzen verursacht werden.

22. Verfahren nach Anspruch 20 oder 21, das weiterhin Folgendes umfasst:

Bildung von Pixeln (445) im Pixelbereich.

23. Verfahren nach Anspruch 22, das weiterhin Folgendes umfasst:

Bildung der ersten Schutzschicht (520) zusammen mit den Pixeln (445) im Vorgang der Pixelbildung,
wobei die erste Schutzschicht (520) aus mindestens einem Material gebildet wird, das aus

der Gruppe ausgewählt wird, die aus anorganischen Isolatormaterialien besteht, die im Pixelbereich gebildet werden.

24. Verfahren nach Anspruch 22 oder 23, das weiterhin Folgendes umfasst:

Bildung der zweiten Schutzschicht (470') zusammen mit den Pixeln im Vorgang der Pixelbildung, wobei die zweite Schutzschicht (470') aus mindestens einem Material gebildet wird, das aus der Gruppe ausgewählt wird, die aus organischen Isolatormaterialien besteht, die im Pixelbereich (440) gebildet werden.

25. Verfahren nach einem der Ansprüche 20 bis 24, das weiterhin Folgendes umfasst:

Bildung der zweiten Schutzschicht (470') in einem Vorgang zur Bildung eines Isolatormaterials des Pixelbereichs,
wobei die zweite Schutzschicht (470') gebildet wird, um eine laminierte Struktur aus mindestens einem Isolator aus der Gruppe der Isolatoren zu haben, die aus einer organischen Planarisationsschicht (470a'), einer Pixeldefinitionsschicht (470b') und einem organischen Abstandshalter (470c') des Pixelbereichs besteht.

26. Verfahren nach einem der Ansprüche 20 bis 25, wobei das Abdichten des mindestens einen Bereichs auf dem Vorrichtungssubstrat (410) weiterhin Folgendes umfasst:

Aufbringen eines Dichtungsmittels (430) entlang eines Rands der Ritzlinie des Verkapselungssubstrats zum Dichten eines Bereichs zwischen dem Vorrichtungssubstrat (410) und dem Verkapselungssubstrat (420).

27. Verfahren nach Anspruch 26, wobei das Dichtungsmittel (430) so geformt ist, dass es die erste Schutzschicht (520) berührt.

28. Verfahren nach Anspruch 26 oder 27, wobei die zweite Schutzschicht (470') außerhalb des Dichtungsbereichs gebildet wird, der von dem Dichtungsmittel abgedichtet wird, und die zweite Schutzschicht so angeordnet ist, dass sie das Dichtungsmittel nicht überdeckt.

29. Verfahren nach einem der Ansprüche 20 bis 28, wobei die zweite Schutzschicht einer Ritztoleranzzone entsprechend geformt ist.

30. Verfahren nach Anspruch 29, wobei die Ritztoleranzzone auf einen Bereich innerhalb von 300 μm von der Ritzlinie des Verkapselungssubstrats eingestellt ist.

31. Verfahren nach Anspruch 26 oder einem beliebigen Anspruch, der von Anspruch 26 abhängt, wobei die zweite Schutzschicht auf einer geringeren Höhe oder einer gleichen Höhe wie das Dichtungsmittel gebildet wird.

Revendications

1. Dispositif d'affichage à émission de lumière organique, comprenant :

un substrat de dispositif (410) qui inclut au moins une région de pixels (440) qui comprend une pluralité de pixels (445) ;
un substrat d'encapsulation (420) qui est agencé de manière à ce qu'il chevauche au moins une région du substrat de dispositif qui inclut la région de pixels ;
un agent de scellement (430) qui est agencé entre le substrat de dispositif et le substrat d'encapsulation de manière à ce qu'il scelle une région de scellement entre le substrat de dispositif et le substrat d'encapsulation ;
au moins un fil (510) qui est formé sur le substrat de dispositif et qui est agencé de manière à ce qu'il croise un premier bord du substrat d'encapsulation de telle sorte qu'une première extrémité du ou de chaque fil soit agencée à l'intérieur de la région de scellement et qu'une seconde extrémité du ou de chaque fil soit agencée à l'extérieur de la région de scellement ;
une première couche de protection (520) qui est formée par au moins une couche inorganique sur le ou chaque fil ; et
une seconde couche de protection (470') qui est formée par au moins une couche organique sur une partie de la première couche de protection, dans lequel la seconde couche de protection est agencée de telle sorte qu'elle soit adjacente au premier bord du substrat d'encapsulation ou qu'elle chevauche au moins partiellement ce premier bord et de telle sorte qu'elle soit à l'extérieur de la région de scellement et à l'extérieur de l'agent de scellement ;

dans lequel la seconde couche de protection (470') est formée de manière à ce qu'elle présente une structure empilée qui est constituée par au moins deux isolants organiques, dans lequel au moins l'un des isolants organiques dans la seconde couche de protection est formé dans une région qui croise l'au moins un fil mais l'au moins un des isolants organiques ne chevauche pas l'au moins un fil.

2. Dispositif d'affichage à émission de lumière organique selon la revendication 1, dans lequel la seconde couche de protection (470') est agencée de manière à ce qu'elle protège la première couche de protection (520) vis-à-vis des chocs.

3. Dispositif d'affichage à émission de lumière organique selon la revendication 1 ou 2, dans lequel la première couche de protection (520) est formée sur le substrat de dispositif (410) de manière à ce qu'elle recouvre les pixels.

4. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 3, dans lequel la première couche de protection (520) est formée par au moins un isolant inorganique qui est sélectionné parmi le groupe qui comprend des isolants qui sont disposés dans la région de pixels (440).

5. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 4, dans lequel la première couche de protection (520) est formée par au moins une couche qui est sélectionnée parmi le groupe qui comprend un isolant inter-couche de la région de pixels (440) et une couche de planarisation inorganique de la région de pixels.

6. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 5, dans lequel la seconde couche de protection (470') est formée par au moins un isolant organique qui est sélectionné parmi le groupe qui comprend des isolants qui sont disposés dans la région de pixels (440).

7. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 6, dans lequel la seconde couche de protection (470') est formée par des mêmes matériaux qu'au moins une structure qui est sélectionnée parmi le groupe qui est constitué par une couche de planarisation organique, par une couche de définition de pixel(s), et par des espaceurs qui sont disposés entre des pixels de la région de pixels.

8. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 7, dans lequel la seconde couche de protection (470') est formée de manière à ce qu'elle présente une structure empilée qui est constituée par au moins deux isolants qui sont sélectionnés parmi le groupe qui est constitué par une couche de planarisation organique (470a'), par une couche de définition de pixel(s) (470b'), et par des espaceurs (470c') qui sont disposés entre des pixels (445) de la région de pixels.

9. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 8, dans lequel la seconde couche de protection (470') inclut au moins un matériau qui est sélectionné parmi le groupe qui comprend un acryle et un polyimide.

10. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 9, dans lequel la seconde couche de protection (470') est formée de manière à ce qu'elle ne chevauche pas l'agent de scellement (430).

11. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 10, dans lequel la seconde couche de protection (470') est formée selon une hauteur plus basse que celle de l'agent de scellement (430) ou selon la même hauteur que celui-ci.

12. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 11, dans lequel la seconde couche de protection (470') est formée à l'intérieur d'environ 300 μm du premier bord du substrat d'encapsulation (420).

13. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 12, dans lequel un dispositif de pilotage de données (460) pour alimenter des signaux de données sur la région de pixels (440) est installé sur le substrat de dispositif (410) à l'extérieur de la région de scellement, et l'au moins un fil est une pluralité de lignes de données qui sont formées entre la région de pixels (440) et le dispositif de pilotage de données.

14. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications 1 à 13, dans lequel l'au moins un fil comprend une pluralité de lignes de données.

15. Dispositif d'affichage à émission de lumière organique selon la revendication 13 ou 14, dans lequel la seconde couche de protection (470') est formée entre l'agent de scellement (430) et le dispositif de pilotage de données (460).

16. Dispositif d'affichage à émission de lumière organique selon l'une quelconque des revendications qui précèdent, comprenant en outre des unités d'alimentation qui sont agencées de manière à ce qu'elles appliquent des signaux électriques sur les pixels, dans lequel au moins l'une des unités d'alimentation est disposée à l'extérieur de la région de scellement, et la zone de tolérance de rainurage pour découpe est disposée de manière à ce qu'elle croise le ou chaque fil entre l'agent de scellement et l'au moins une des unités d'alimentations qui est disposée à l’extérieur de la région de scellement.

17. Dispositif d’affichage à émission de lumière organique selon la revendication 16, comprenant en outre :

un dispositif de pilotage de données (460) qui est formé à l’intérieur de la région de scellement ; et
un dispositif de pilotage de balayage qui est formé à l’intérieur de la région de scellement ;

dans lequel l’au moins une des unités d’alimentation qui est disposée à l’extérieur de la région de scellement est une alimentation électrique et l’au moins un fil est un fil d’alimentation électrique.

18. Dispositif d’affichage à émission de lumière organique selon la revendication 17, comprenant en outre :

un dispositif de pilotage de données (460) qui est formé à l’intérieur de la région de scellement ; et
un dispositif de pilotage de balayage (450) qui est formé à l’intérieur de la région de scellement ;

dans lequel l’au moins une des unités d’alimentation qui est disposée à l’extérieur de la région de scellement est une unité de plot qui est agencée de manière à ce qu’elle alimente des signaux de commande de données sur le dispositif de pilotage de données, et l’unité de plot est agencée de manière à ce qu’elle alimente des signaux de commande de balayage sur le dispositif de pilotage de balayage, et l’au moins un fil est une pluralité de lignes de commande de données et une pluralité de lignes de commande de balayage.

19. Dispositif d’affichage à émission de lumière organique selon l’une quelconque des revendications 1 à 18, dans lequel la seconde couche de protection (470’) est formée sur la première couche de protection dans une zone de tolérance de rainurage pour découpe à l’extérieur de l’agent de scellement.

20. Procédé pour fabriquer un dispositif d’affichage à émission de lumière organique, le procédé comprenant :

la formation de lignes de données sur un substrat de dispositif (410) dans lequel une région de pixels (440) est définie ;
la formation d’une première couche de protection (520) en au moins un isolant inorganique de manière à ce qu’elle recouvre les lignes de données ;
la formation d’une seconde couche de protection (470’) en au moins un isolant organique sur la première couche de protection de manière à ce qu’elle croise les lignes de données ;
le scellement d’au moins une région sur le substrat de dispositif qui inclut la région de pixels à l’aide d’un substrat d’encapsulation (420) et d’un agent de scellement de manière à former une région de scellement entre le substrat de dispositif et le substrat d’encapsulation ; et
le rainurage pour découpe du substrat d’encapsulation dans une zone qui correspond à la seconde couche de protection ;

dans lequel la seconde couche de protection (470’) est agencée de telle sorte qu’elle soit à l’extérieur de la région de scellement et à l’extérieur de l’agent de scellement et la seconde couche de protection (470’) est formée en empilant au moins deux isolants organiques, dans lequel au moins l’un des isolants organiques dans la seconde couche de protection est formé de manière à ce qu’il ne chevauche pas les lignes de données.

21. Procédé selon la revendication 20, dans lequel la seconde couche de protection (470’) est agencée de manière à ce qu’elle protège la première couche de protection vis-à-vis de chocs provoqués par l’enlèvement d’une partie du substrat d’encapsulation après le rainurage pour découpe.

22. Procédé selon la revendication 20 ou 21, comprenant en outre :

la formation de pixels (445) dans la région de pixels.

23. Procédé selon la revendication 22, comprenant en outre :

la formation de la première couche de protection (520) en association avec les pixels (445) lors de l’opération de formation des pixels ; dans lequel :

la première couche de protection (520) est formée par au moins un matériau qui est sélectionné parmi le groupe qui est constitué par des matériaux d’isolant inorganique qui sont formés dans la région de pixels.

24. Procédé selon la revendication 22 ou 23, comprenant en outre :

la formation de la seconde couche de protection (470’) en association avec les pixels lors de l’opération de formation des pixels ;
dans lequel la seconde couche de protection (470’) est formée par au moins un matériau qui est sélectionné parmi le groupe qui est constitué

par des matériaux d'isolant organique qui sont formés dans la région de pixels (440).

25. Procédé selon l'une quelconque des revendications 20 à 24, comprenant en outre :

la formation de la seconde couche de protection (470') lors d'une opération pour former un matériau d'isolant de la région de pixels ;
dans lequel la seconde couche de protection (470') est formée de manière à ce qu'elle présente une structure empilée qui est constituée par au moins un isolant pris parmi le groupe d'isolants qui est constitué par une couche de planarisation organique (470a'), par une couche de définition de pixel(s) (470b') et par un espaceur organique (470c') de la région de pixels.

26. Procédé selon l'une quelconque des revendications 20 à 25, dans lequel le scellement de l'au moins une région sur le substrat de dispositif (410) comprend en outre :

l'application d'un agent de scellement (430) le long d'un bord de la ligne de rainurage pour découpe du substrat d'encapsulation de manière à sceller une région entre le substrat de dispositif (410) et le substrat d'encapsulation (420).

27. Procédé selon la revendication 26, dans lequel l'agent de scellement (430) est formé de manière à ce qu'il entre en contact avec la première couche de protection (520).

28. Procédé selon la revendication 26 ou 27, dans lequel la seconde couche de protection (470') est formée à l'extérieur de la région de scellement qui est scellée au moyen de l'agent de scellement, et la seconde couche de protection est disposée de manière à ce qu'elle ne chevauche pas l'agent de scellement.

29. Procédé selon l'une quelconque des revendications 20 à 28, dans lequel la seconde couche de protection est formée de manière à ce qu'elle corresponde à une zone de tolérance de rainurage pour découpe.

30. Procédé selon la revendication 29, dans lequel la zone de tolérance de rainurage pour découpe est définie selon une région à l'intérieur d'environ 300 μm par rapport à la ligne de rainurage pour découpe du substrat d'encapsulation.

31. Procédé selon la revendication 26 ou selon une quelconque revendication qui dépend de la revendication 26, dans lequel la seconde couche de protection est formée à une hauteur plus basse que celle de l'agent de scellement ou à la même hauteur que celui-ci.

FIG. 1
(PRIOR ART)

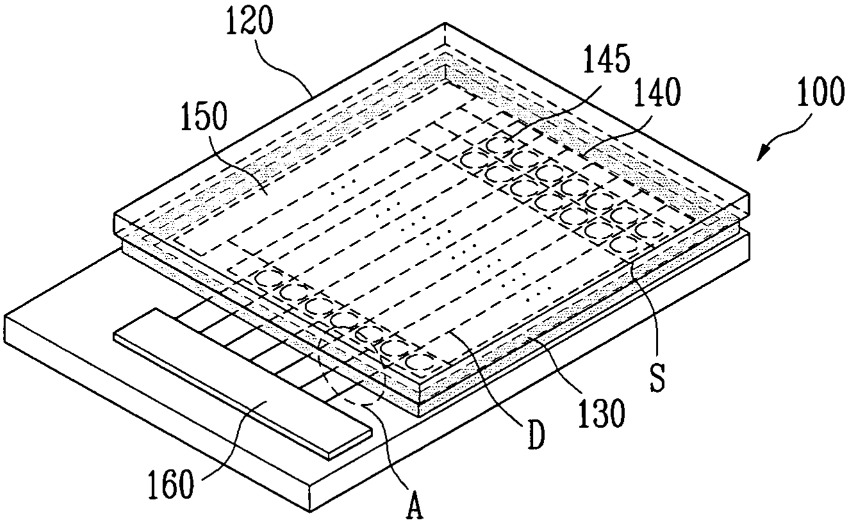


FIG. 2
(PRIOR ART)

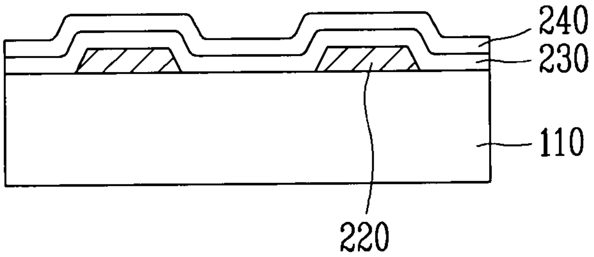


FIG. 3A
(PRIOR ART)

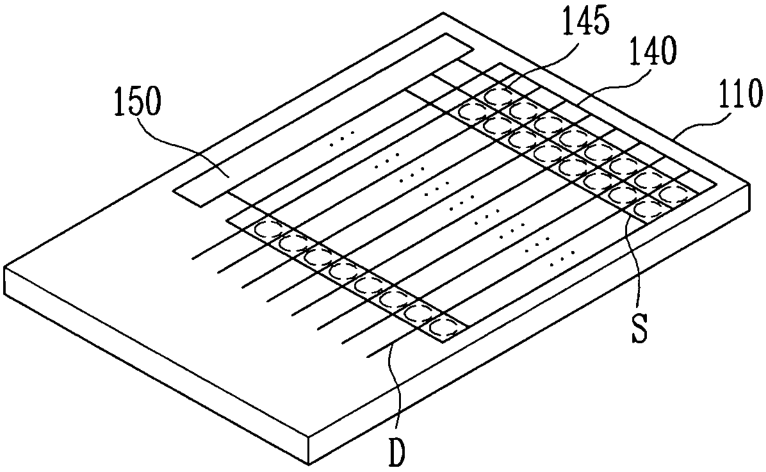


FIG. 3B
(PRIOR ART)

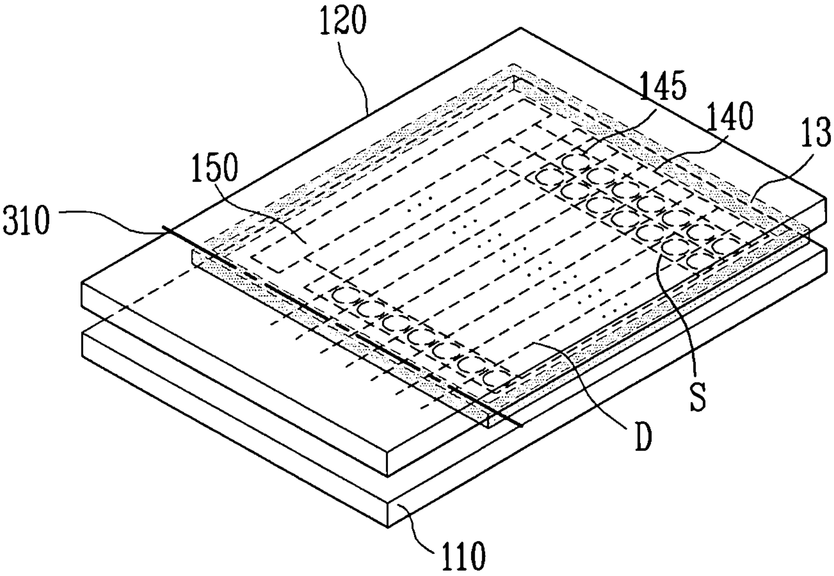


FIG. 3C
(PRIOR ART)

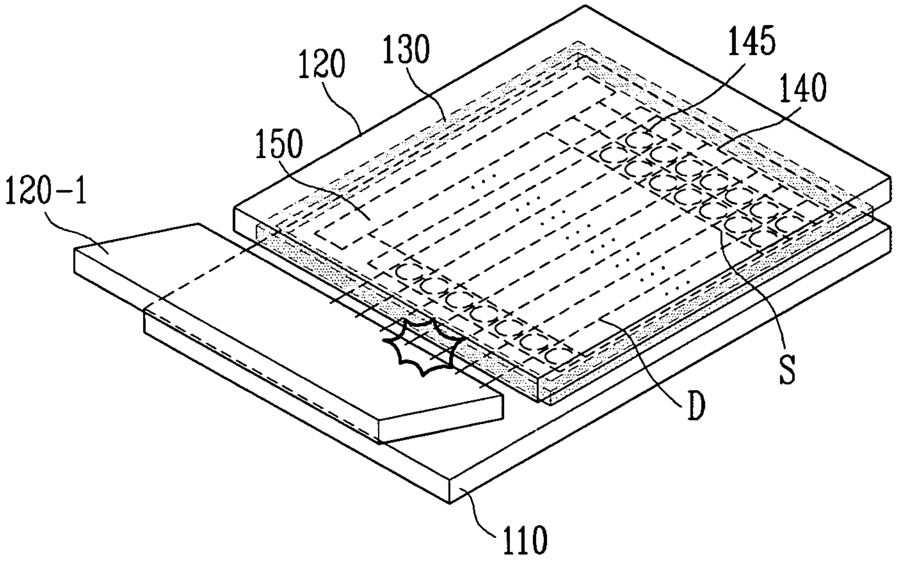


FIG. 3D
(PRIOR ART)

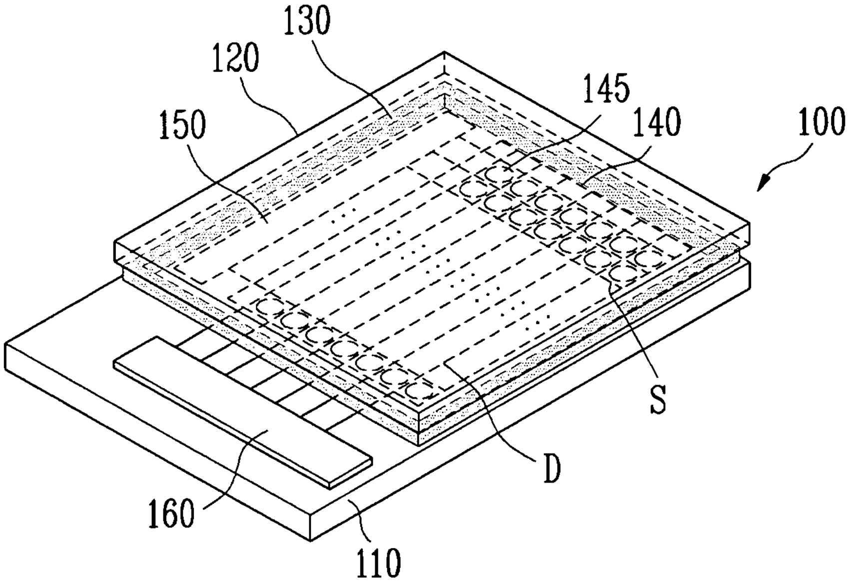


FIG. 4

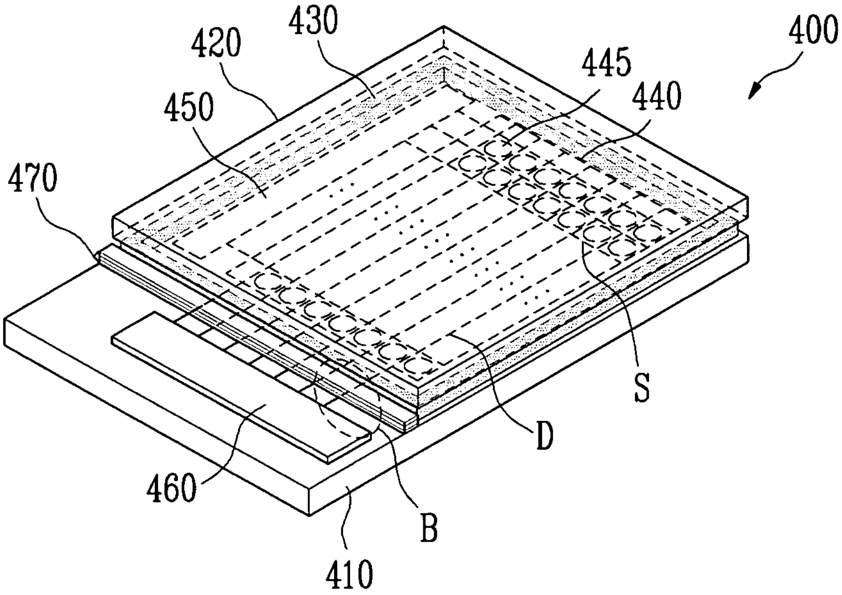

400
420
430
445
440
450
470
S
D
460
B
410

FIG. 5

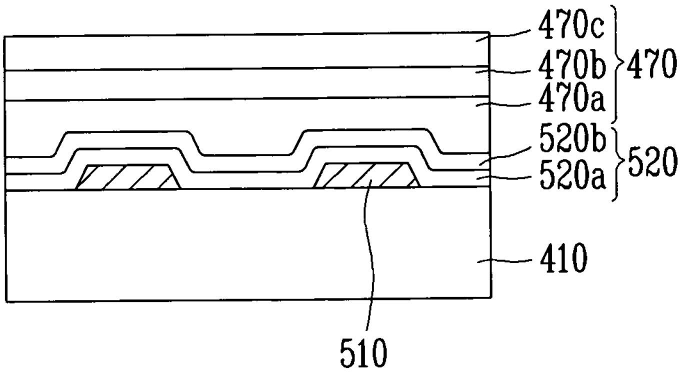

470c
470b
470a
470
520b
520a
520
410
510

FIG. 6A

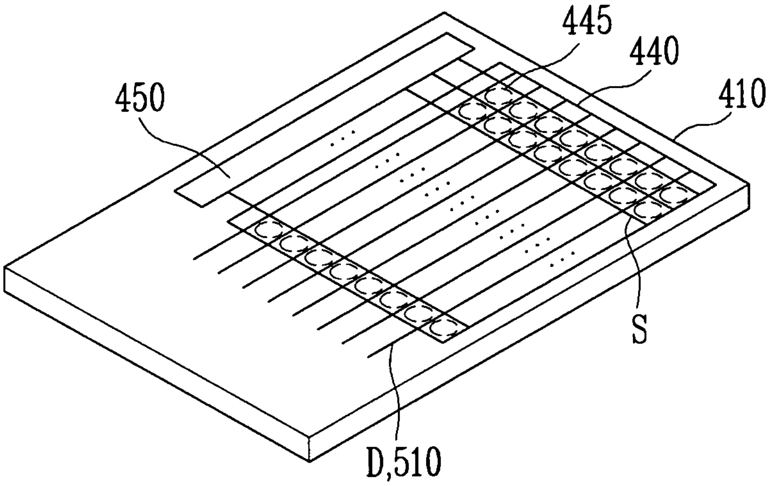


FIG. 6B

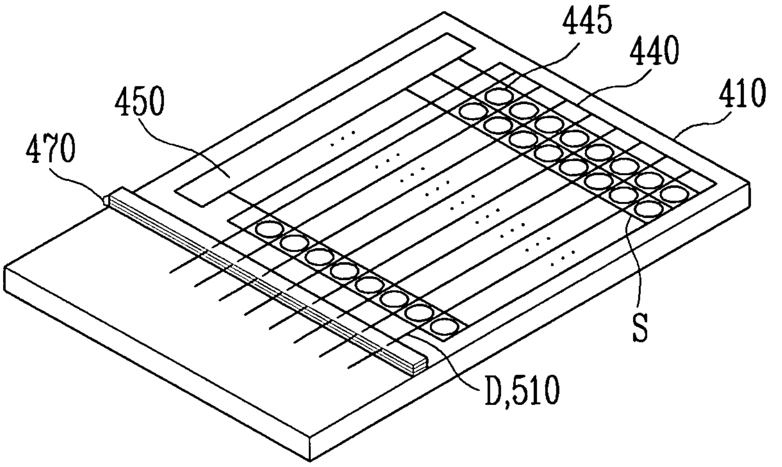


FIG. 6C

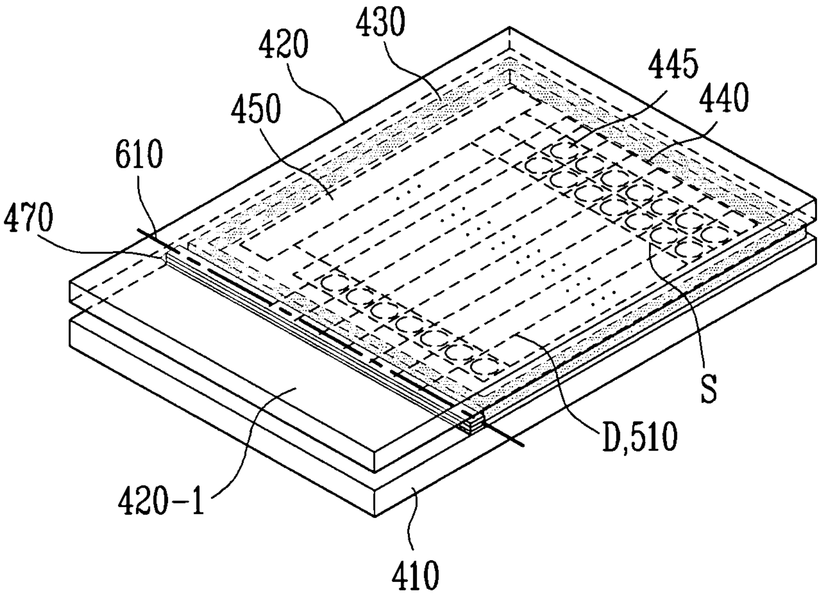

420
430
445
440
450
610
470
S
D,510
420-1
410

FIG. 6D

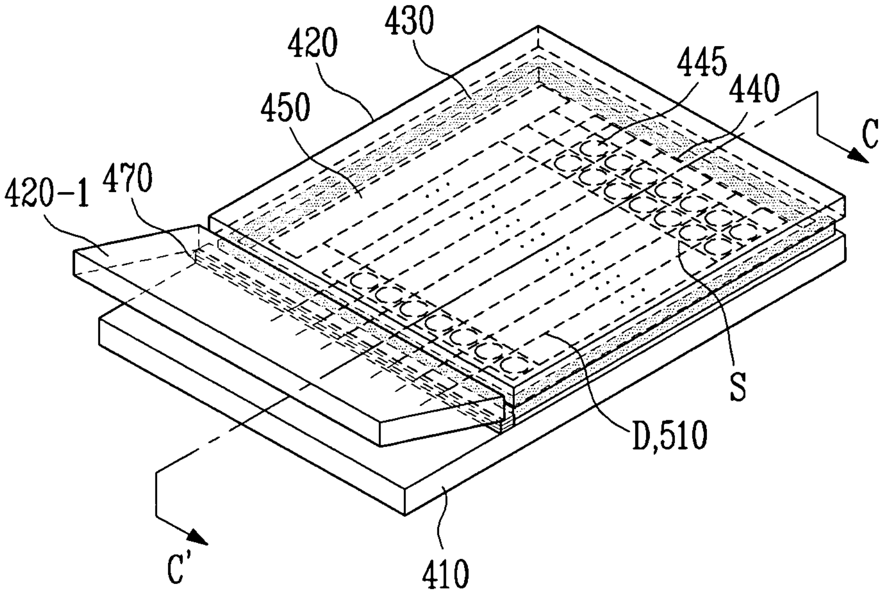

420
430
445
440
C
450
420-1
470
S
D,510
C'
410

FIG. 6E

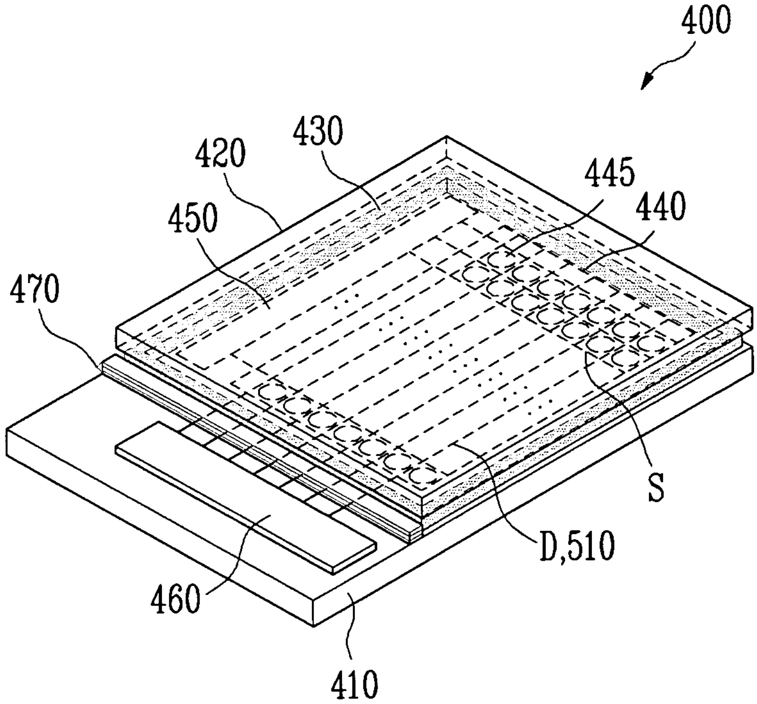

400
430
420
445
440
450
470
S
D,510
460
410

FIG. 7

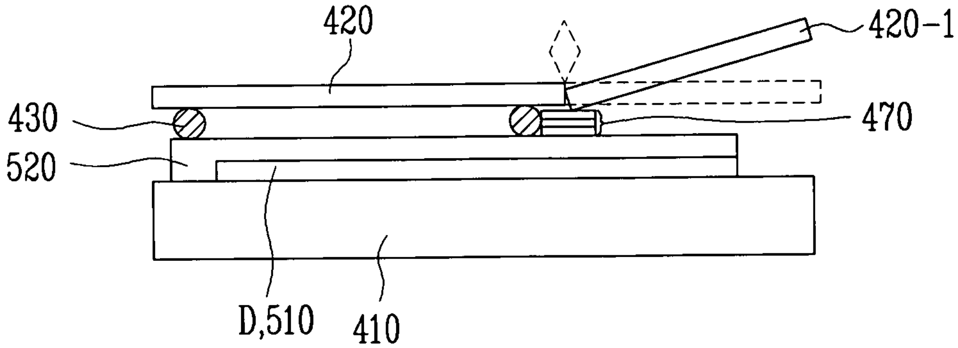

420
420-1
430
470
520
D,510
410

FIG. 8A

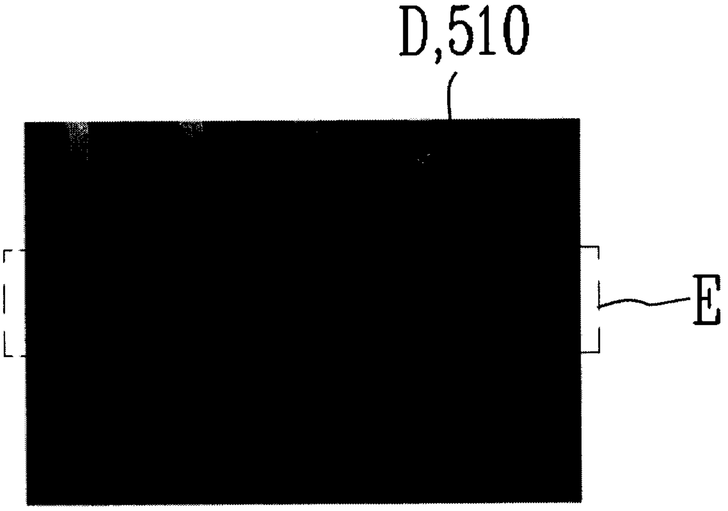


FIG. 8B

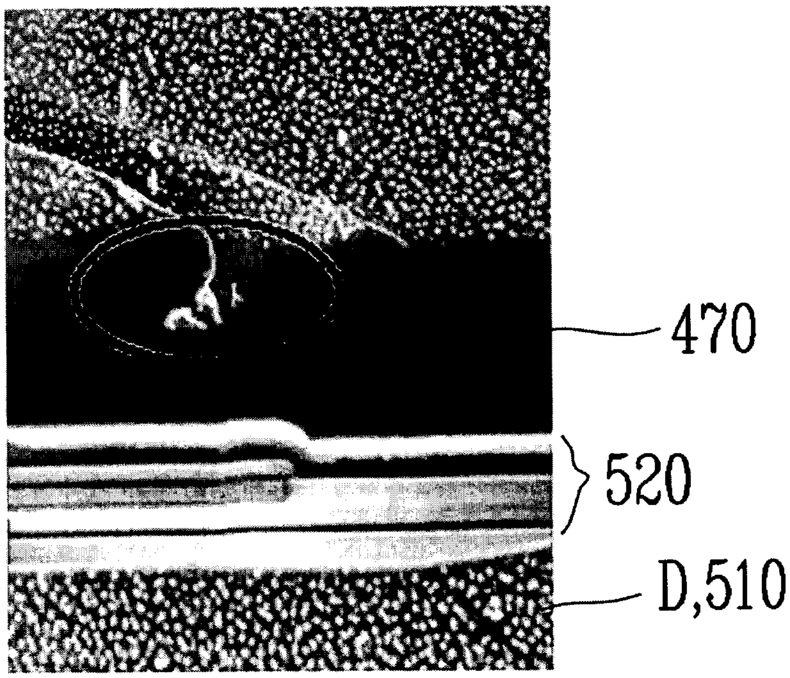


FIG. 9

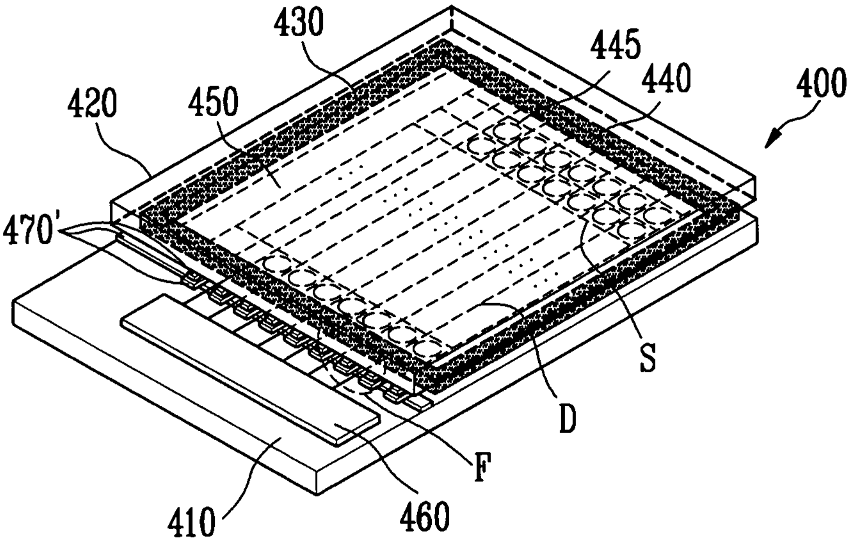
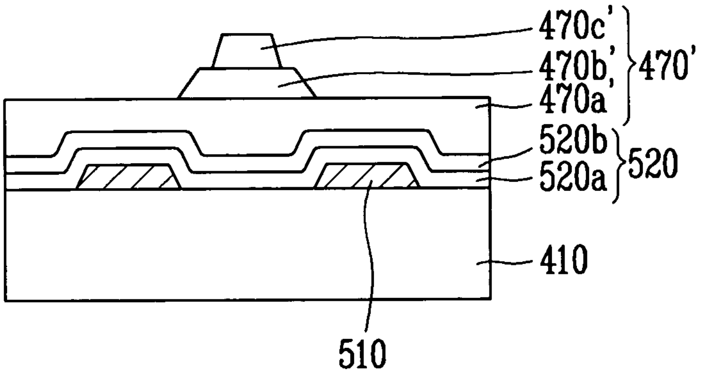

430
445
440
400
420
450
470'
S
D
F
410
460

FIG. 10


470c'
470b'
470a'
470'
520b
520a
520
410
510

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- US 2004090187 A1 **[0027]**
- JP 2005227313 B **[0028]**

专利名称(译)	有机发光显示装置及其制造方法		
公开(公告)号	EP1921680B1	公开(公告)日	2019-01-16
申请号	EP2007254434	申请日	2007-11-12
[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	KWAK WON KYU LEGAL & IP TEAM CHUN HAE JIN LEGAL & IP TEAM		
发明人	KWAK, WON-KYU, LEGAL & IP TEAM CHUN, HAE-JIN, LEGAL & IP TEAM		
IPC分类号	H01L27/32 H01L51/52		
CPC分类号	H01L51/5253 H01L27/3276 H01L51/524		
优先权	1020060111076 2006-11-10 KR		
其他公开文献	EP1921680A3 EP1921680A2		
外部链接	Espacenet		

摘要(译)

一种能够防止对驱动像素区域的信号和电源线造成损坏的有机发光显示装置及其制造方法。有机发光显示装置包括器件基板（410），其包括至少像素区域（440）;封装基板（420），用于与包括像素区域的器件基板的至少一个区域重叠;密封剂（430）设置在器件基板和封装基板之间，以密封其间的区域;至少一根导线形成在器件基板上，以从密封区域内部延伸到密封区域的外部;在导线上形成第一保护层;第二保护层（470）形成在第一保护层上，以与封装基板的至少一个边缘重叠，该边缘设置成与导线交叉。

FIG. 1
(PRIOR ART)

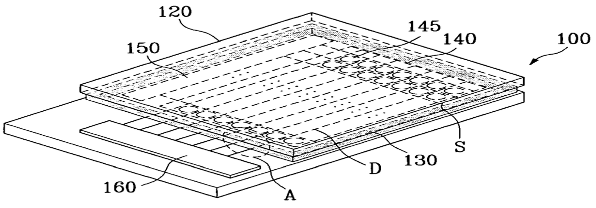


FIG. 2
(PRIOR ART)