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Choi et al.

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(45) **Date of Patent: Feb. 21, 2012**

(54) **ORGANIC LIGHT EMITTING DISPLAY AND METHOD OF FABRICATING THE SAME**

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(73) Assignee: **Samsung Mobile Display Co., Ltd.**, Yongin (KR)

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(22) Filed: **Sep. 29, 2006**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**

H01L 51/52	(2006.01)
H01L 51/50	(2006.01)
H01L 51/56	(2006.01)
H05B 33/00	(2006.01)

(52) **U.S. Cl.** **313/512**; 313/503; 313/509; 257/72; 257/E33.056; 445/24; 445/25

(58) **Field of Classification Search** 313/500–512; 345/44–46, 76–81, 90–92; 315/169.3; 257/40, 257/100, E33.056

See application file for complete search history.

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Primary Examiner — Mariceli Santiago

(74) *Attorney, Agent, or Firm* — Knobbe Martens Olson & Bear LLP

(57) **ABSTRACT**

Provided are an organic light emitting display and a method of fabricating the same that are capable of preventing an element from being damaged due to a large amount of heat generated when the laser irradiates a glass frit for sealing a substrate. The organic light emitting display includes: a first substrate comprising a pixel region and a non-pixel region; an array of organic light emitting pixels formed over the pixel region; a conductive line formed over the non-pixel region; a second substrate placed over the first substrate such that the array and the conductive line are interposed between the first and second substrates; and a frit seal interposed between the first and second substrates and surrounding the array, the frit seal interconnecting the first and second substrates, the frit seal comprising a portion overlapping the conductive line, wherein when viewed from the second substrate, the portion of the flit seal substantially eclipses the conductive line.

20 Claims, 9 Drawing Sheets

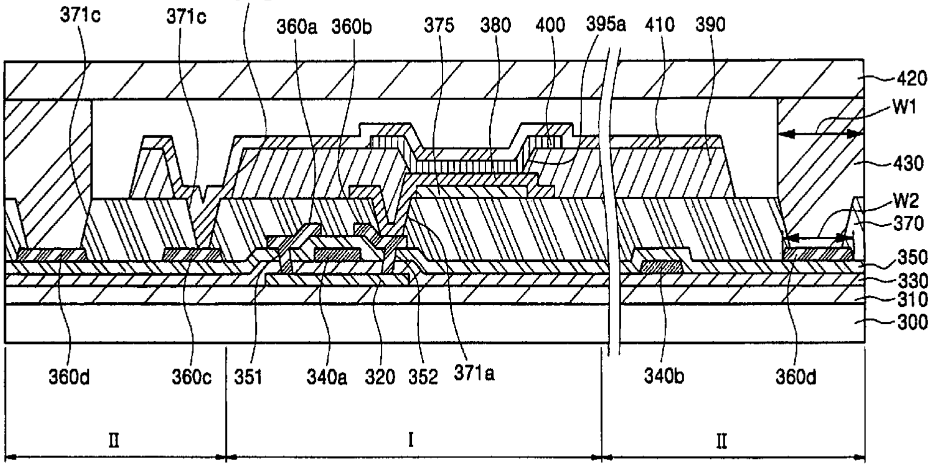

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FIG. 1
PRIOR ART

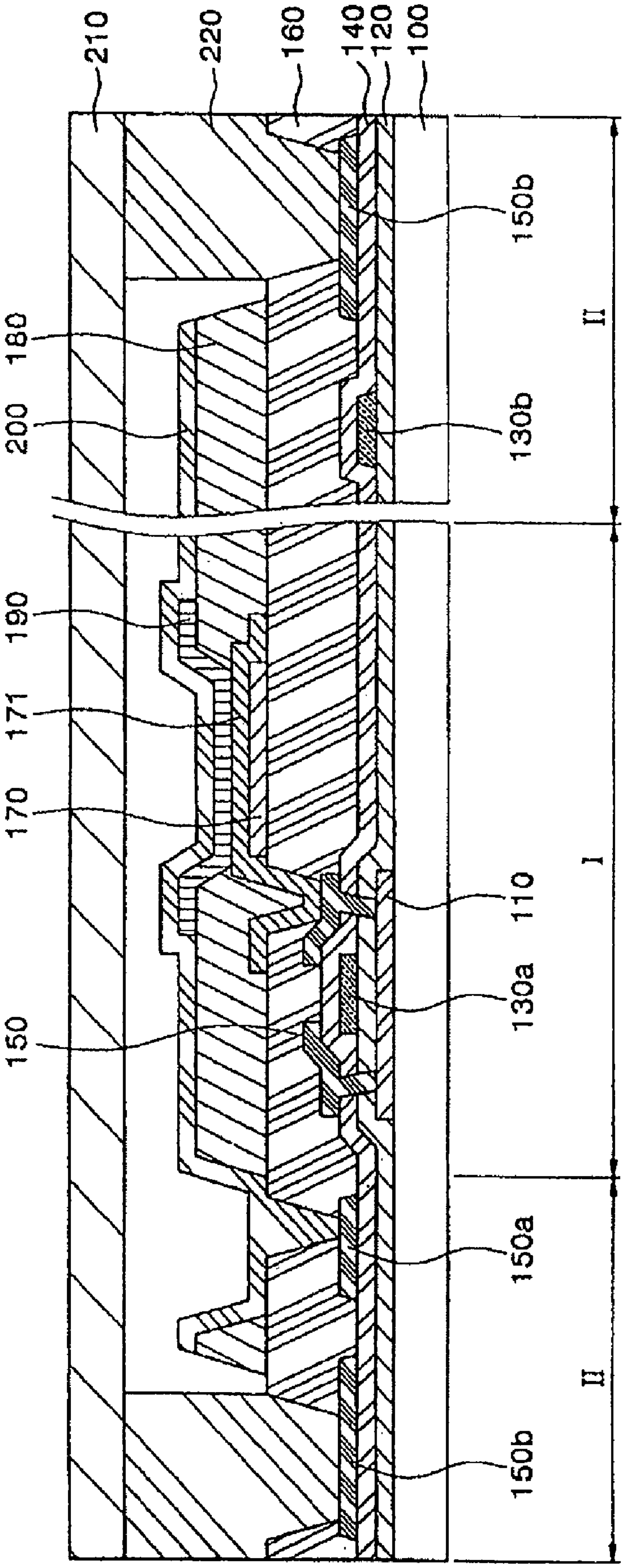

FIG. 2

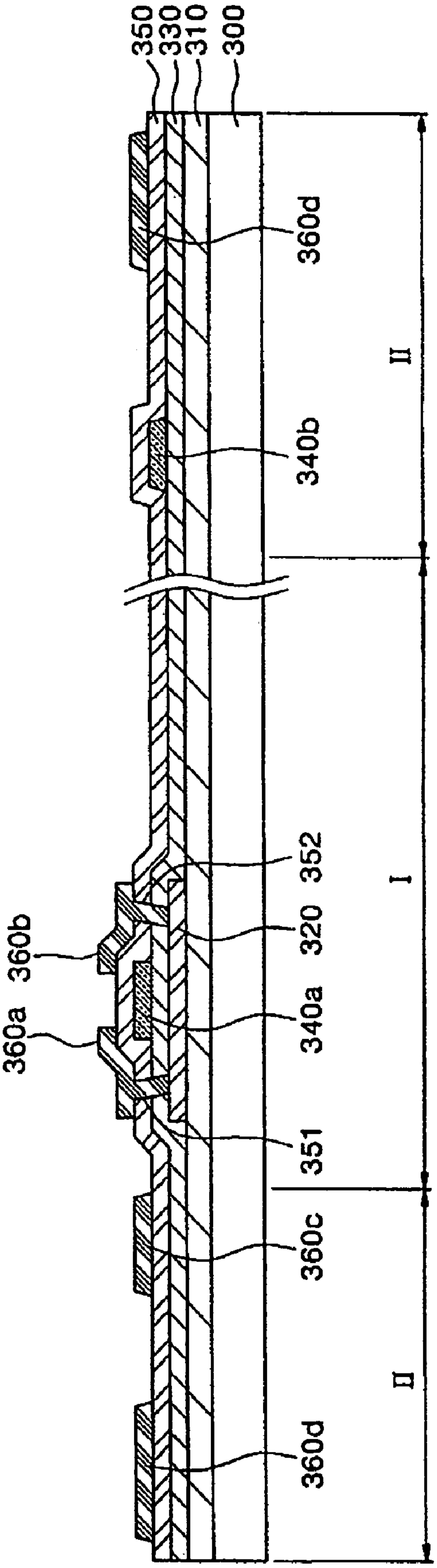
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FIG. 3

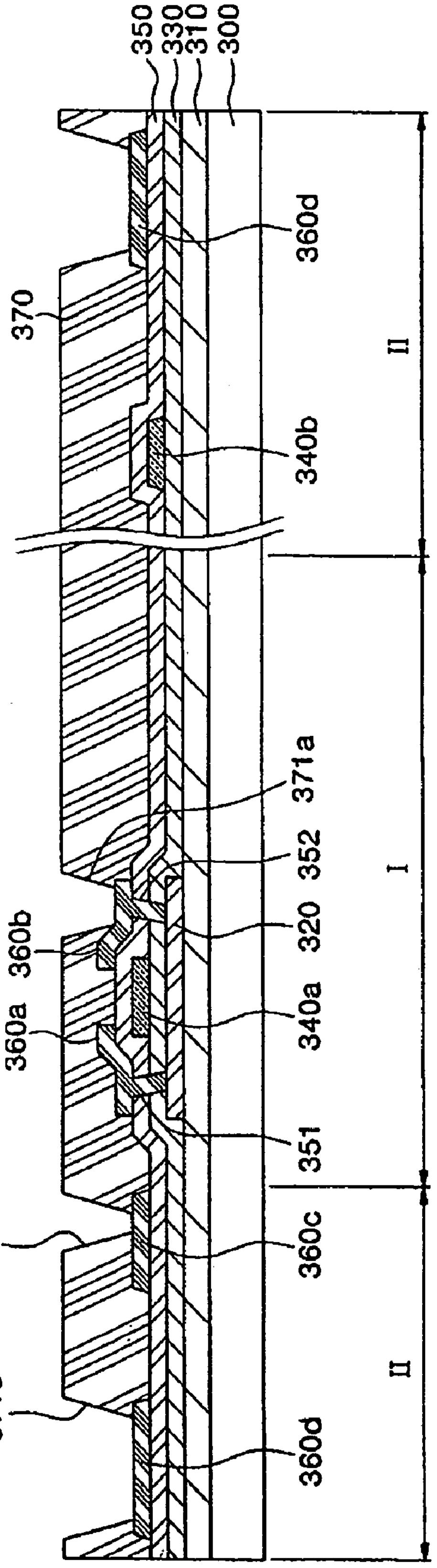
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FIG. 4

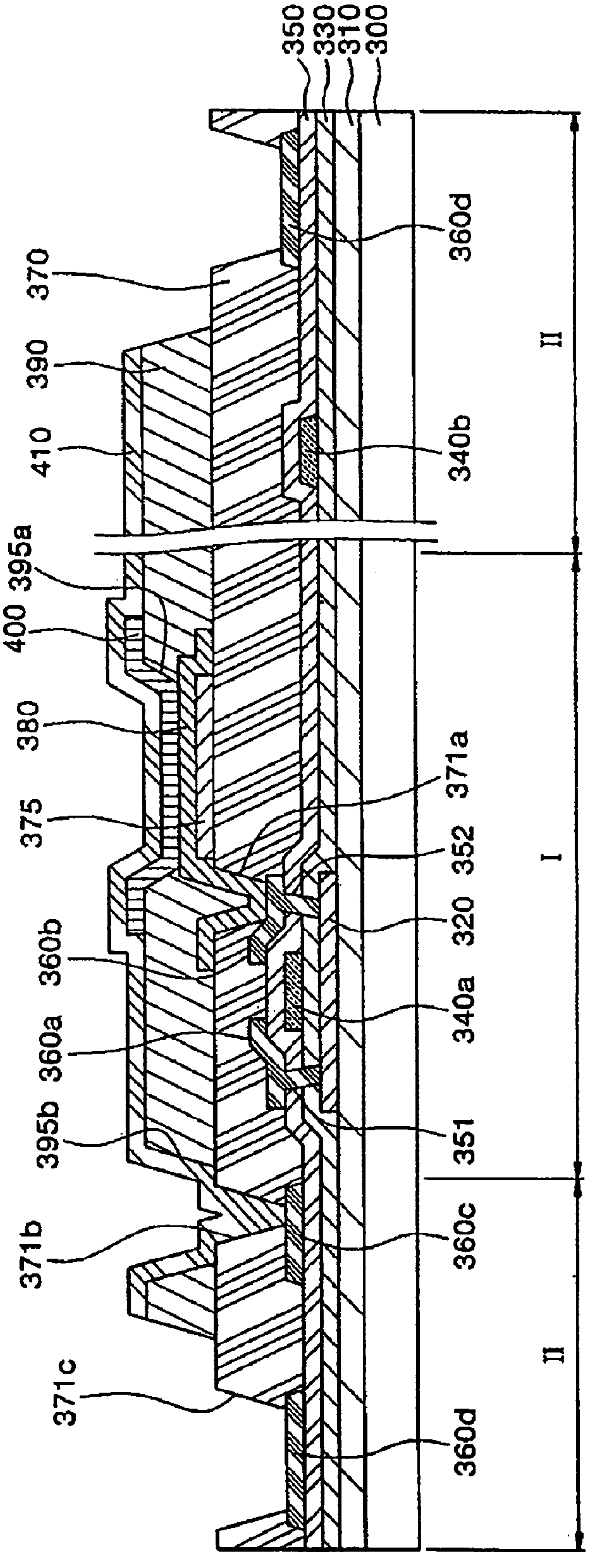
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FIG. 5

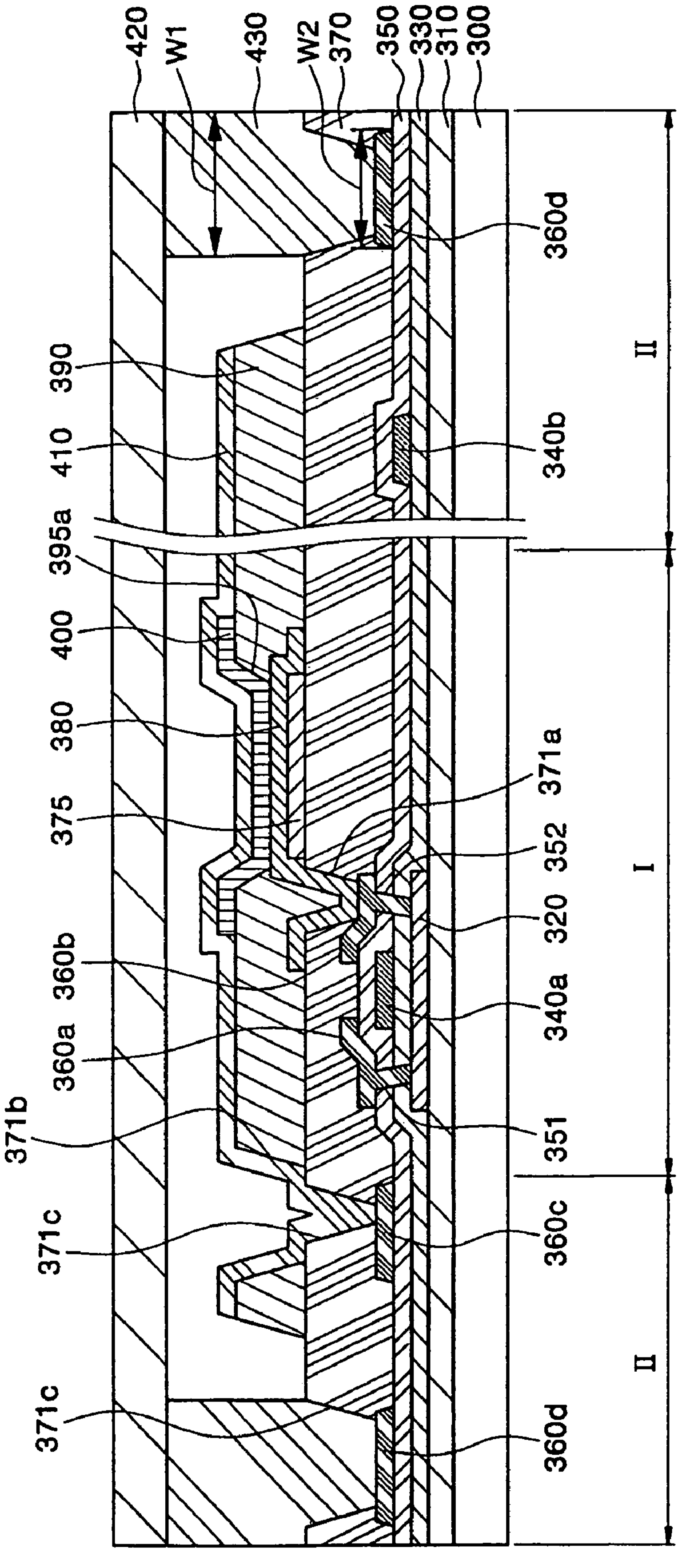
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FIG. 6A

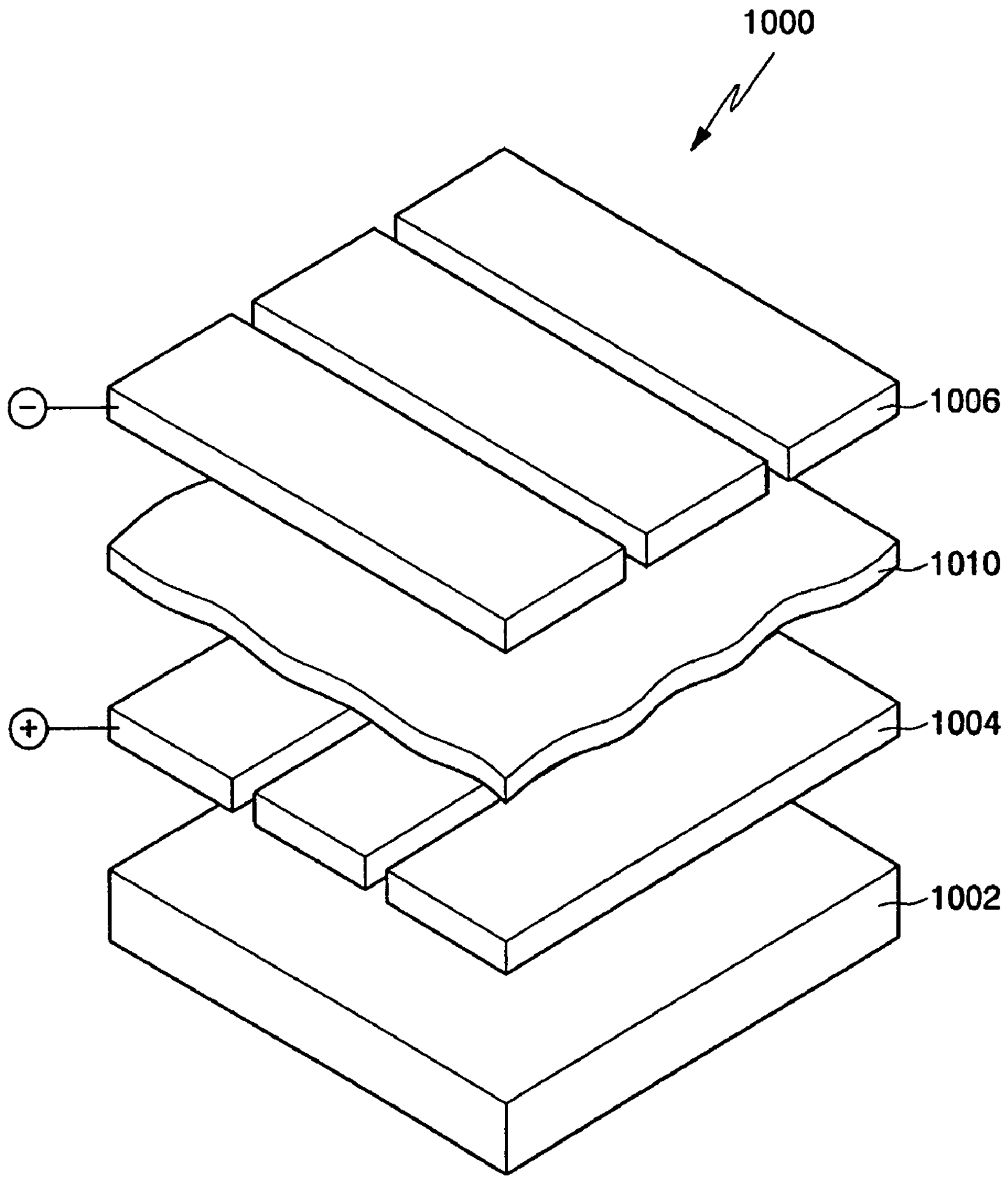


FIG. 6B

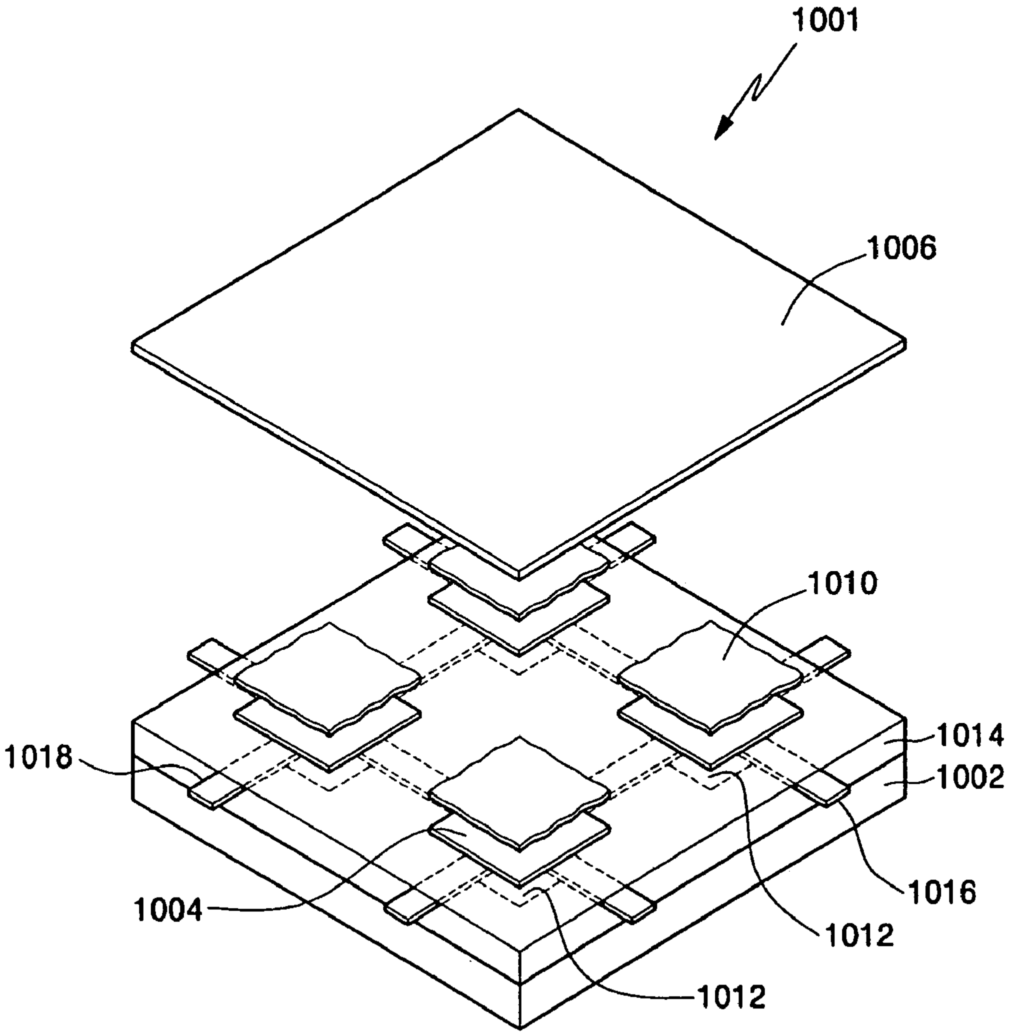


FIG. 6C

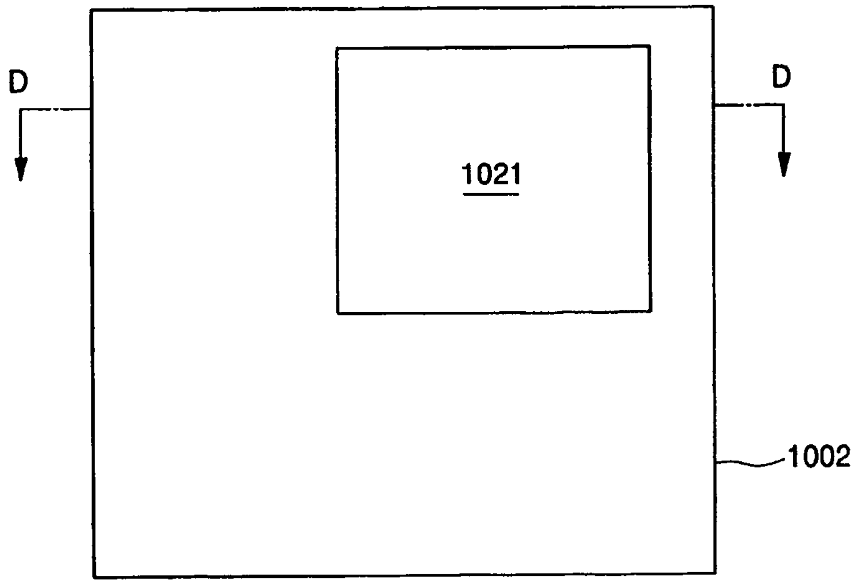


FIG. 6D

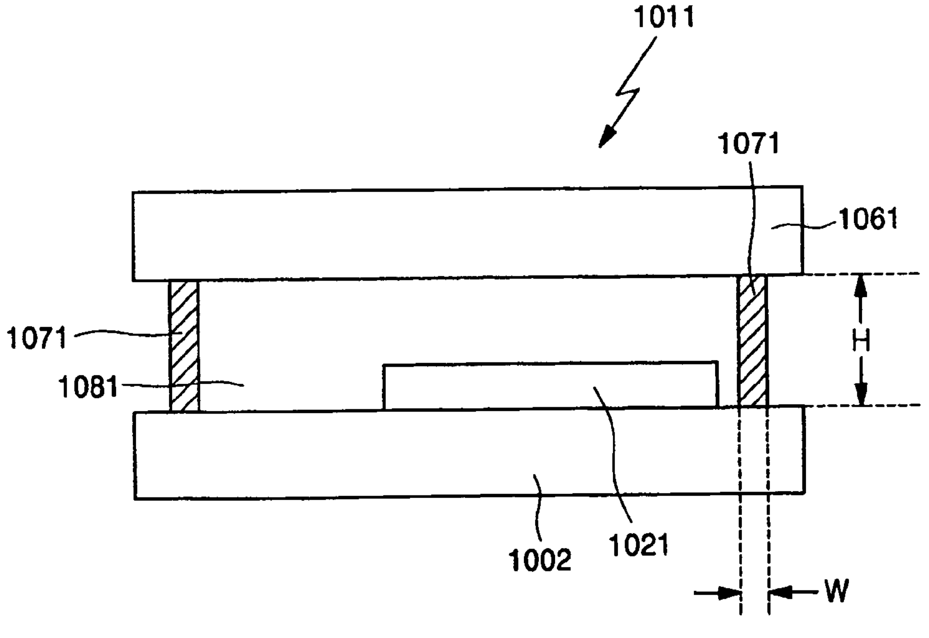
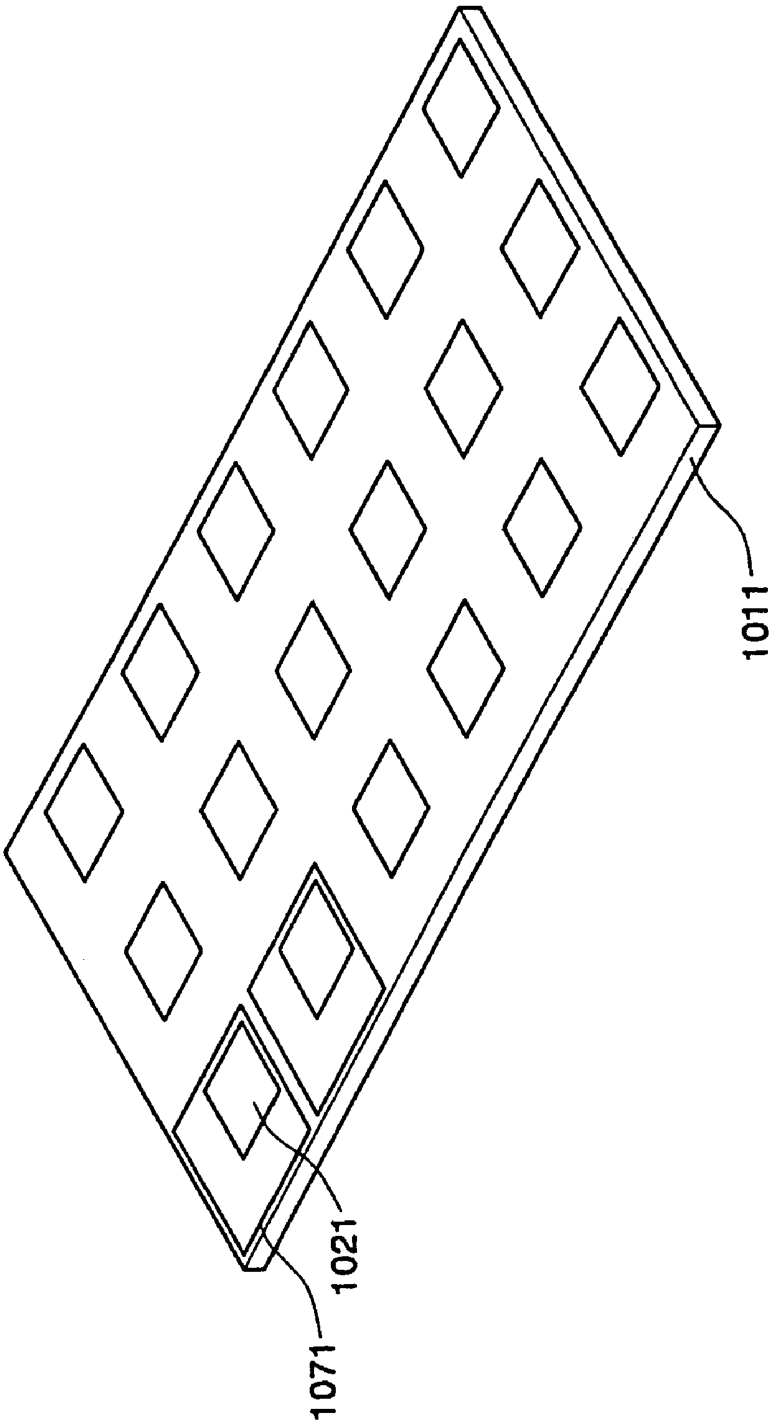


FIG. 6E



ORGANIC LIGHT EMITTING DISPLAY AND METHOD OF FABRICATING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to and the benefit of Korean Patent Application No. 10-2006-0007025, filed on Jan. 23, 2006, the disclosure of which is incorporated herein by reference in its entirety.

This application is related to and incorporates herein by reference the entire contents of the following concurrently filed applications:

Title	Atty. Docket No.	Filing Date	Application No.
ORGANIC LIGHT-EMITTING DISPLAY DEVICE AND METHOD OF FABRICATING THE SAME	SDISHN.043AUS		
ORGANIC LIGHT-EMITTING DISPLAY DEVICE AND METHOD OF MANUFACTURING THE SAME	SDISHN.045AUS		
ORGANIC LIGHT EMITTING DISPLAY DEVICE	SDISHN.048AUS		
ORGANIC LIGHT-EMITTING DISPLAY DEVICE WITH FRIT SEAL AND REINFORCING STRUCTURE	SDISHN.051AUS		
ORGANIC LIGHT EMITTING DISPLAY DEVICE METHOD OF FABRICATING THE SAME	SDISHN.052AUS		
ORGANIC LIGHT EMITTING DISPLAY AND METHOD OF FABRICATING THE SAME	SDISHN.053AUS		
ORGANIC LIGHT-EMITTING DISPLAY DEVICE WITH FRIT SEAL AND REINFORCING STRUCTURE BONDED TO FRAME	SDISHN.054AUS		
METHOD FOR PACKAGING ORGANIC LIGHT EMITTING DISPLAY WITH FRIT SEAL AND REINFORCING STURUTURE	SDISHN.055AUS		
METHOD FOR PACKAGING ORGANIC LIGHT EMITTING DISPLAY WITH FRIT SEAL AND REINFORCING STURUTURE	SDISHN.056AUS		
ORGANIC LIGHT-EMITTING DISPLAY DEVICE AND THE PREPARATION METHOD OF THE SAME	SDISHN.060AUS		
ORGANIC LIGHT EMITTING DISPLAY AND FABRICATING METHOD OF THE SAME	SDISHN.061AUS		
ORGANIC LIGHT-EMITTING DISPLAY AND METHOD OF MAKING THE SAME	SDISHN.062AUS		
ORGANIC LIGHT EMITTING DISPLAY AND FABRICATING METHOD OF THE SAME	SDISHN.063AUS		
ORGANIC LIGHT EMITTING DISPLAY DEVICE AND MANUFACTURING METHOD THEREOF	SDISHN.064AUS		
ORGANIC LIGHT-EMITTING DISPLAY DEVICE AND MANUFACTURING METHOD OF THE SAME	SDISHN.066AUS		
ORGANIC LIGHT EMITTING DISPLAY AND FABRICATING METHOD OF THE SAME	SDISHN.067AUS		
ORGANIC LIGHT EMITTING DISPLAY DEVICE METHOD OF FABRICATING THE SAME	SDISW.018AUS		
ORGANIC LIGHT EMITTING DISPLAY AND METHOD OF FABRICATING THE SAME	SDISW.020AUS		

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an organic light emitting display and a method of fabricating the same, and more particularly, to packaging of an organic light emitting display.

2. Description of the Related Technology

With the goal of improving upon the shortcomings of conventional displays such as cathode ray tubes, attention has recently been focused on flat panel displays such as a liquid crystal display (LCD), an organic light emitting display (OLED), and a plasma display panel (PDP).

Since a liquid crystal display is a passive device rather than an emissive device, it is difficult to make it have high brightness and contrast, a wide viewing angle, and a large-sized screen. On the other hand, a PDP is an emissive device which is self-luminescent. However, a PDP is heavy, consumes much power, and requires a complex manufacturing process, compared to other displays.

An organic light emitting display (OLED) is an emissive device. An OLED has a wide viewing angle, and high contrast. In addition, since it does not require a backlight, it can be made lightweight, compact, and power efficient. Further, an OLED can be driven at a low DC voltage, has a rapid response speed, and is formed entirely of a solid material. As a result, the OLED has the ability to withstand external impact and a wide range of temperatures, and can be fabricated at a low cost.

SUMMARY OF CERTAIN INVENTIVE ASPECTS

One aspect of the invention provides an organic light emitting display (OLED) device. The device comprises: a first substrate comprising a pixel region and a non-pixel region; an array of organic light emitting pixels formed over the pixel region; a conductive line formed over the non-pixel region; a second substrate placed over the first substrate such that the array and the conductive line are interposed between the first and second substrates; and a frit seal interposed between the first and second substrates and surrounding the array, the frit seal interconnecting the first and second substrates, the frit seal comprising a portion overlapping the conductive line, wherein when viewed from the second substrate, the portion of the frit seal substantially eclipses the conductive line.

The conductive line may be electrically connected to the array via another electrical interconnection. The device may further comprise a plurality of thin film transistors interposed between the first substrate and the array, and the conductive line may be connected to the plurality of thin film transistors. The device may further comprise a planarization layer formed at least over the non-pixel region of the first substrate, and the frit seal may contact the planarization layer. The frit seal may contact the conductive line.

The conductive line may extend along a peripheral edge of the first substrate, and the portion of the frit seal may extend along the peripheral edge of the first substrate. The frit seal may further comprise another portion, which does not totally eclipse the conductive line when viewed from the second substrate. The conductive line may comprise a non-eclipsed portion and an eclipsed portion in a cross-section of the conductive line taken along a line where the cross-sectional area of the conductive line is the smallest, and the non-eclipsed portion may be substantially smaller than the eclipsed portion.

The portion of the frit seal may have a width, and the conductive line may have a width where the portion overlaps, and the width of the portion may be substantially greater than the width of the conductive line. The portion of the frit seal may have a width, and the conductive line may have a width where the portion overlaps, and the width of the portion may be from about 95% to about 200% of the width of the conductive line. The conductive line may be made of metal.

Another aspect of the invention provides a method of making an organic light emitting display (OLED) device. The method comprises: providing an unfinished device comprising a first substrate, an array of organic light emitting pixels formed over the first substrate, and a conductive line formed over the substrate and not overlapping the array; further providing a second substrate and a frit; interposing the frit between the first and second substrates such that the array is interposed between the first and second substrates, that the frit surrounds the array and that a portion of the frit overlaps the conductive line, wherein when viewed from the second substrate, the portion of the frit seal substantially eclipses the conductive line, wherein the frit connects to the conductive line with or without a material therebetween, and wherein the frit connects to the second substrate with or without a material therebetween; and melting and resolidifying at least part of the frit so as to interconnect the unfinished device and the second substrate via the frit.

Melting may comprise applying heat to the at least part of the frit. Melting may comprise applying laser or infrared light to the at least part of the frit in a direction from the second substrate to the first substrate, and substantially all the light reaching the conductive line may reach the electrically conductive line after passing through the frit. The conductive line may be made of metal. Interposing the frit may comprise contacting the frit with the conductive line. Interposing the frit may comprise contacting the frit with the second substrate.

The unfinished device may further comprise a planarization layer generally formed over the conductive line with an opening exposing part of the conductive line, and interposing the frit may comprise contacting the frit with the conductive line through the opening. The portion of the frit seal may have a width, and the conductive line has a width where the portion overlaps, and the width of the portion may be from about 95% to about 200% of the width of the conductive line. The frit seal may further comprise another portion, which does not totally eclipse the conductive line when viewed from the second substrate.

Another aspect of the invention provides an organic light emitting display and a method of fabricating the same that are capable of preventing an element from being damaged due to a large amount of heat generated when the laser irradiates a glass frit for sealing a substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features of the invention will be described in reference to certain exemplary embodiments thereof with reference to the attached drawings in which:

FIG. **1** is a cross-sectional view of a conventional organic light emitting display; and

FIG. **2** is a cross-sectional view of an organic light emitting display in accordance with one embodiment.

FIG. **3** is a cross-sectional view of an organic light emitting display in accordance with one embodiment.

FIG. **4** is a cross-sectional view of an organic light emitting display in accordance with one embodiment.

FIG. **5** is a cross-sectional view of an organic light emitting display in accordance with one embodiment.

FIG. **6**A is a schematic exploded view of a passive matrix type organic light emitting display device in accordance with one embodiment.

FIG. **6**B is a schematic exploded view of an active matrix type organic light emitting display device in accordance with one embodiment.

FIG. **6**C is a schematic top plan view of an organic light emitting display in accordance with one embodiment.

FIG. **6**D is a cross-sectional view of the organic light emitting display of FIG. **6**C, taken along the line d-d.

FIG. **6**E is a schematic perspective view illustrating mass production of organic light emitting devices in accordance with one embodiment.

DETAILED DESCRIPTION OF CERTAIN INVENTIVE EMBODIMENTS

Certain embodiments of the invention will now be described more fully hereinafter with reference to the accompanying drawings. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. In the drawings, the thickness of layers and regions may be exaggerated for clarity. Like reference numerals indicate identical or functionally similar elements.

An organic light emitting display (OLED) is a display device comprising an array of organic light emitting diodes. Organic light emitting diodes are solid state devices which include an organic material and are adapted to generate and emit light when appropriate electrical potentials are applied.

OLEDs can be generally grouped into two basic types dependent on the arrangement with which the stimulating electrical current is provided. FIG. **6**A schematically illustrates an exploded view of a simplified structure of a passive matrix type OLED **1000**. FIG. **6**B schematically illustrates a simplified structure of an active matrix type OLED **1001**. In both configurations, the OLED **1000**, **1001** includes OLED pixels built over a substrate **1002**, and the OLED pixels include an anode **1004**, a cathode **1006** and an organic layer **1010**. When an appropriate electrical current is applied to the anode **1004**, electric current flows through the pixels and visible light is emitted from the organic layer.

Referring to FIG. **6**A, the passive matrix OLED (PMOLED) design includes elongate strips of anode **1004** arranged generally perpendicular to elongate strips of cathode **1006** with organic layers interposed therebetween. The intersections of the strips of cathode **1006** and anode **1004** define individual OLED pixels where light is generated and emitted upon appropriate excitation of the corresponding strips of anode **1004** and cathode **1006**. PMOLEDs provide the advantage of relatively simple fabrication.

Referring to FIG. **6**B, the active matrix OLED (AMOLED) includes driving circuits **1012** arranged between the substrate **1002** and an array of OLED pixels. An individual pixel of AMOLEDs is defined between the common cathode **1006** and an anode **1004**, which is electrically isolated from other anodes. Each driving circuit **1012** is coupled with an anode **1004** of the OLED pixels and further coupled with a data line **1016** and a scan line **1018**. In embodiments, the scan lines **1018** supply scan signals that select rows of the driving circuits, and the data lines **1016** supply data signals for particular driving circuits. The data signals and scan signals stimulate the local driving circuits **1012**, which excite the anodes **1004** so as to emit light from their corresponding pixels.

In the illustrated AMOLED, the local driving circuits **1012**, the data lines **1016** and scan lines **1018** are buried in a planarization layer **1014**, which is interposed between the pixel array and the substrate **1002**. The planarization layer **1014** provides a planar top surface on which the organic light emitting pixel array is formed. The planarization layer **1014** may be formed of organic or inorganic materials, and formed of two or more layers although shown as a single layer. The local driving circuits **1012** are typically formed with thin film transistors (TFT) and arranged in a grid or array under the OLED pixel array. The local driving circuits **1012** may be at least partly made of organic materials, including organic TFT. AMOLEDs have the advantage of fast response time improving their desirability for use in displaying data signals. Also, AMOLEDs have the advantages of consuming less power than passive matrix OLEDs.

Referring to common features of the PMOLED and AMOLED designs, the substrate **1002** provides structural support for the OLED pixels and circuits. In various embodiments, the substrate **1002** can comprise rigid or flexible materials as well as opaque or transparent materials, such as plastic, glass, and/or foil. As noted above, each OLED pixel or diode is formed with the anode **1004**, cathode **1006** and organic layer **1010** interposed therebetween. When an appropriate electrical current is applied to the anode **1004**, the cathode **1006** injects electrons and the anode **1004** injects holes. In certain embodiments, the anode **1004** and cathode **1006** are inverted; i.e., the cathode is formed on the substrate **1002** and the anode is opposingly arranged.

Interposed between the cathode **1006** and anode **1004** are one or more organic layers. More specifically, at least one emissive or light emitting layer is interposed between the cathode **1006** and anode **1004**. The light emitting layer may comprise one or more light emitting organic compounds. Typically, the light emitting layer is configured to emit visible light in a single color such as blue, green, red or white. In the illustrated embodiment, one organic layer **1010** is formed between the cathode **1006** and anode **1004** and acts as a light emitting layer. Additional layers, which can be formed between the anode **1004** and cathode **1006**, can include a hole transporting layer, a hole injection layer, an electron transporting layer and an electron injection layer.

Hole transporting and/or injection layers can be interposed between the light emitting layer **1010** and the anode **1004**. Electron transporting and/or injecting layers can be interposed between the cathode **1006** and the light emitting layer **1010**. The electron injection layer facilitates injection of electrons from the cathode **1006** toward the light emitting layer **1010** by reducing the work function for injecting electrons from the cathode **1006**. Similarly, the hole injection layer facilitates injection of holes from the anode **1004** toward the light emitting layer **1010**. The hole and electron transporting layers facilitate movement of the carriers injected from the respective electrodes toward the light emitting layer.

In some embodiments, a single layer may serve both electron injection and transportation functions or both hole injection and transportation functions. In some embodiments, one or more of these layers are lacking. In some embodiments, one or more organic layers are doped with one or more materials that help injection and/or transportation of the carriers. In embodiments where only one organic layer is formed between the cathode and anode, the organic layer may include not only an organic light emitting compound but also certain functional materials that help injection or transportation of carriers within that layer.

There are numerous organic materials that have been developed for use in these layers including the light emitting layer. Also, numerous other organic materials for use in these layers are being developed. In some embodiments, these organic materials may be macromolecules including oligomers and polymers. In some embodiments, the organic materials for these layers may be relatively small molecules. The skilled artisan will be able to select appropriate materials for each of these layers in view of the desired functions of the individual layers and the materials for the neighboring layers in particular designs.

In operation, an electrical circuit provides appropriate potential between the cathode **1006** and anode **1004**. This results in an electrical current flowing from the anode **1004** to the cathode **1006** via the interposed organic layer(s). In one embodiment, the cathode **1006** provides electrons to the adjacent organic layer **1010**. The anode **1004** injects holes to the organic layer **1010**. The holes and electrons recombine in the organic layer **1010** and generate energy particles called "excitons." The excitons transfer their energy to the organic light emitting material in the organic layer **1010**, and the energy is used to emit visible light from the organic light emitting material. The spectral characteristics of light generated and emitted by the OLED **1000**, **1001** depend on the nature and composition of organic molecules in the organic layer(s). The composition of the one or more organic layers can be selected to suit the needs of a particular application by one of ordinary skill in the art.

OLED devices can also be categorized based on the direction of the light emission. In one type referred to as "top emission" type, OLED devices emit light and display images through the cathode or top electrode **1006**. In these embodiments, the cathode **1006** is made of a material transparent or at least partially transparent with respect to visible light. In certain embodiments, to avoid losing any light that can pass through the anode or bottom electrode **1004**, the anode may be made of a material substantially reflective of the visible light. A second type of OLED devices emits light through the anode or bottom electrode **1004** and is called "bottom emission" type. In the bottom emission type OLED devices, the anode **1004** is made of a material which is at least partially transparent with respect to visible light. Often, in bottom emission type OLED devices, the cathode **1006** is made of a material substantially reflective of the visible light. A third type of OLED devices emits light in two directions, e.g. through both anode **1004** and cathode **1006**. Depending upon the direction(s) of the light emission, the substrate may be formed of a material which is transparent, opaque or reflective of visible light.

In many embodiments, an OLED pixel array **1021** comprising a plurality of organic light emitting pixels is arranged over a substrate **1002** as shown in FIG. **6**C. In embodiments, the pixels in the array **1021** are controlled to be turned on and off by a driving circuit (not shown), and the plurality of the pixels as a whole displays information or image on the array **1021**. In certain embodiments, the OLED pixel array **1021** is arranged with respect to other components, such as drive and control electronics to define a display region and a non-display region. In these embodiments, the display region refers to the area of the substrate **1002** where OLED pixel array **1021** is formed. The non-display region refers to the remaining areas of the substrate **1002**. In embodiments, the non-display region can contain logic and/or power supply circuitry. It will be understood that there will be at least portions of control/drive circuit elements arranged within the display region. For example, in PMOLEDs, conductive components will extend into the display region to provide appropriate potential to the anode and cathodes. In AMOLEDs, local driving circuits and data/scan lines coupled with the driving circuits will extend into the display region to drive and control the individual pixels of the AMOLEDs.

One design and fabrication consideration in OLED devices is that certain organic material layers of OLED devices can suffer damage or accelerated deterioration from exposure to water, oxygen or other harmful gases. Accordingly, it is generally understood that OLED devices be sealed or encapsulated to inhibit exposure to moisture and oxygen or other harmful gases found in a manufacturing or operational environment. FIG. **6**D schematically illustrates a cross-section of an encapsulated OLED device **1011** having a layout of FIG. **6**C and taken along the line d-d of FIG. **6**C. In this embodiment, a generally planar top plate or substrate **1061** engages with a seal **1071** which further engages with a bottom plate or substrate **1002** to enclose or encapsulate the OLED pixel array **1021**. In other embodiments, one or more layers are formed on the top plate **1061** or bottom plate **1002**, and the seal **1071** is coupled with the bottom or top substrate **1002**, **1061** via such a layer. In the illustrated embodiment, the seal **1071** extends along the periphery of the OLED pixel array **1021** or the bottom or top plate **1002**, **1061**.

In embodiments, the seal **1071** is made of a frit material as will be further discussed below. In various embodiments, the top and bottom plates **1061**, **1002** comprise materials such as plastics, glass and/or metal foils which can provide a barrier to passage of oxygen and/or water to thereby protect the OLED pixel array **1021** from exposure to these substances. In embodiments, at least one of the top plate **1061** and the bottom plate **1002** are formed of a substantially transparent material.

To lengthen the life time of OLED devices **1011**, it is generally desired that seal **1071** and the top and bottom plates **1061**, **1002** provide a substantially non-permeable seal to oxygen and water vapor and provide a substantially hermetically enclosed space **1081**. In certain applications, it is indicated that the seal **1071** of a frit material in combination with the top and bottom plates **1061**, **1002** provide a barrier to oxygen of less than approximately 10^{-3} cc/m^2-day and to water of less than 10^{-6} g/m^2-day. Given that some oxygen and moisture can permeate into the enclosed space **1081**, in some embodiments, a material that can take up oxygen and/or moisture is formed within the enclosed space **1081**.

The seal **1071** has a width W, which is its thickness in a direction parallel to a surface of the top or bottom substrate **1061**, **1002** as shown in FIG. **6**D. The width varies among embodiments and ranges from about 300 μm to about 3000 μm, optionally from about 500 μm to about 1500 μm. Also, the width may vary at different positions of the seal **1071**. In some embodiments, the width of the seal **1071** may be the largest where the seal **1071** contacts one of the bottom and top substrate **1002**, **1061** or a layer formed thereon. The width may be the smallest where the seal **1071** contacts the other. The width variation in a single cross-section of the seal **1071** relates to the cross-sectional shape of the seal **1071** and other design parameters.

The seal **1071** has a height H, which is its thickness in a direction perpendicular to a surface of the top or bottom substrate **1061**, **1002** as shown in FIG. **6**D. The height varies among embodiments and ranges from about 2 μm to about 30 μm, optionally from about 10 μm to about 15 μm. Generally, the height does not significantly vary at different positions of the seal **1071**. However, in certain embodiments, the height of the seal **1071** may vary at different positions thereof.

In the illustrated embodiment, the seal **1071** has a generally rectangular cross-section. In other embodiments, however, the seal **1071** can have other various cross-sectional shapes such as a generally square cross-section, a generally trapezoidal cross-section, a cross-section with one or more rounded edges, or other configuration as indicated by the needs of a given application. To improve hermeticity, it is generally desired to increase the interfacial area where the seal **1071** directly contacts the bottom or top substrate **1002**, **1061** or a layer formed thereon. In some embodiments, the shape of the seal can be designed such that the interfacial area can be increased.

The seal **1071** can be arranged immediately adjacent the OLED array **1021**, and in other embodiments, the seal **1071** is spaced some distance from the OLED array **1021**. In certain embodiment, the seal **1071** comprises generally linear segments that are connected together to surround the OLED array **1021**. Such linear segments of the seal **1071** can extend, in certain embodiments, generally parallel to respective boundaries of the OLED array **1021**. In other embodiment, one or more of the linear segments of the seal **1071** are arranged in a non-parallel relationship with respective boundaries of the OLED array **1021**. In yet other embodiments, at least part of the seal **1071** extends between the top plate **1061** and bottom plate **1002** in a curvilinear manner.

As noted above, in certain embodiments, the seal **1071** is formed using a frit material or simply “frit” or glass frit,” which includes fine glass particles. The frit particles includes one or more of magnesium oxide (MgO), calcium oxide (CaO), barium oxide (BaO), lithium oxide (Li_2O), sodium oxide (Na_2O), potassium oxide (K_2O), boron oxide (B_2O_3), vanadium oxide (V_2O_5), zinc oxide (ZnO), tellurium oxide (TeO_2), aluminum oxide (Al_2O_3), silicon dioxide (SiO_2), lead oxide (PbO), tin oxide (SnO), phosphorous oxide (P_2O_5), ruthenium oxide (Ru_2O), rubidium oxide (Rb_2O), rhodium oxide (Rh_2O), ferrite oxide (Fe_2O_3), copper oxide (CuO), titanium oxide (TiO_2), tungsten oxide (WO_3), bismuth oxide (Bi_2O_3), antimony oxide (Sb_2O_3), lead-borate glass, tin-phosphate glass, vanadate glass, and borosilicate, etc. In embodiments, these particles range in size from about 2 μm to about 30 μm, optionally about 5 μm to about 10 μm, although not limited only thereto. The particles can be as large as about the distance between the top and bottom substrates **1061**, **1002** or any layers formed on these substrates where the frit seal **1071** contacts.

The frit material used to form the seal **1071** can also include one or more filler or additive materials. The filler or additive materials can be provided to adjust an overall thermal expansion characteristic of the seal **1071** and/or to adjust the absorption characteristics of the seal **1071** for selected frequencies of incident radiant energy. The filler or additive material(s) can also include inversion and/or additive fillers to adjust a coefficient of thermal expansion of the frit. For example, the filler or additive materials can include transition metals, such as chromium (Cr), iron (Fe), manganese (Mn), cobalt (Co), copper (Cu), and/or vanadium. Additional materials for the filler or additives include $ZnSiO_4$, $PbTiO_3$, ZrO_2, eucryptite.

In embodiments, a flit material as a dry composition contains glass particles from about 20 to 90 about wt %, and the remaining includes fillers and/or additives. In some embodiments, the frit paste contains about 10-30 wt % organic materials and about 70-90% inorganic materials. In some embodiments, the frit paste contains about 20 wt % organic materials and about 80 wt % organic materials. In some embodiments, the organic materials may include about 0-30 wt % binder(s) and about 70-100 wt % solvent(s). In some embodiments, about 10 wt % is binder(s) and about 90 wt % is solvent(s) among the organic materials. In some embodiments, the inorganic materials may include about 0-10 wt % additives, about 20-40 wt % fillers and about 50-80 wt % glass powder. In some embodiments, about 0-5 wt % is additive(s), about 25-30 wt % is filler(s) and about 65-75 wt % is the glass powder among the inorganic materials.

In forming a frit seal, a liquid material is added to the dry frit material to form a frit paste. Any organic or inorganic solvent with or without additives can be used as the liquid material. In embodiments, the solvent includes one or more organic compounds. For example, applicable organic compounds are ethyl cellulose, nitro cellulose, hydroxyl propyl cellulose, butyl carbitol acetate, terpineol, butyl cellusolve, acrylate compounds. Then, the thus formed frit paste can be applied to form a shape of the seal **1071** on the top and/or bottom plate **1061**, **1002**.

In one exemplary embodiment, a shape of the seal **1071** is initially formed from the frit paste and interposed between the top plate **1061** and the bottom plate **1002**. The seal **1071** can in certain embodiments be pre-cured or pre-sintered to one of the top plate and bottom plate **1061**, **1002**. Following assembly of the top plate **1061** and the bottom plate **1002** with the seal **1071** interposed therebetween, portions of the seal **1071** are selectively heated such that the frit material forming the seal **1071** at least partially melts. The seal **1071** is then allowed to resolidify to form a secure joint between the top plate **1061** and the bottom plate **1002** to thereby inhibit exposure of the enclosed OLED pixel array **1021** to oxygen or water.

In embodiments, the selective heating of the frit seal is carried out by irradiation of light, such as a laser or directed infrared lamp. As previously noted, the frit material forming the seal **1071** can be combined with one or more additives or filler such as species selected for improved absorption of the irradiated light to facilitate heating and melting of the frit material to form the seal **1071**.

In some embodiments, OLED devices **1011** are mass produced. In an embodiment illustrated in FIG. **6**E, a plurality of separate OLED arrays **1021** is formed on a common bottom substrate **1101**. In the illustrated embodiment, each OLED array **1021** is surrounded by a shaped frit to form the seal **1071**. In embodiments, common top substrate (not shown) is placed over the common bottom substrate **1101** and the structures formed thereon such that the OLED arrays **1021** and the shaped frit paste are interposed between the common bottom substrate **1101** and the common top substrate. The OLED arrays **1021** are encapsulated and sealed, such as via the previously described enclosure process for a single OLED display device. The resulting product includes a plurality of OLED devices kept together by the common bottom and top substrates. Then, the resulting product is cut into a plurality of pieces, each of which constitutes an OLED device **1011** of FIG. **6**D. In certain embodiments, the individual OLED devices **1011** then further undergo additional packaging operations to further improve the sealing formed by the frit seal **1071** and the top and bottom substrates **1061**, **1002**.

FIG. **1** is a cross-sectional view of a conventional organic light emitting display. Referring to FIG. **1**, the organic light emitting display includes a substrate **100**, a semiconductor layer **110**, a gate insulating layer **120**, a gate electrode **130***a*, a scan driver **130***b*, an interlayer insulating layer **140**, and source and drain electrodes **150**. The substrate **100** has a pixel region I and a non-pixel region II. In addition, the organic light emitting display further includes a common power supply line **150***b* which is electrically connected to the source and drain electrodes **150**. The organic light emitting display also includes a second electrode power supply line **150***a*.

A planarization layer **160** is disposed over the substantially entire surface of the substrate **100**. The planarization layer **160** may include an organic material such as acryl-based resin or polyimide-based resin.

The planarization layer **160** has via-holes for exposing the common power supply line **150***b*, the second electrode power supply line **150***a*, and the source and drain electrodes **150**. The common power supply line **150***b* is exposed to enhance adhesive strength when the substrate is sealed using a glass frit.

A first electrode **171** including a reflective layer **170** is disposed over portions of the planarization layer **160** in the pixel region I. A pixel defining layer **180** is disposed over the substantially entire surface of the substrate **100**.

An organic layer **190** including at least one emission layer is disposed over the first electrode **171**. A second electrode **200** is disposed over the organic layer **190**. An encapsulation substrate **210** is disposed opposite to the substrate **100**. The substrate **100** and the encapsulation substrate **210** are sealed with a glass frit **220**.

The illustrated organic light emitting display includes the common power supply line disposed under the glass frit **220** for sealing the substrate. The common power supply line has a width wider than the glass frit. Therefore, when a laser beam is radiated to the glass frit, the laser beam may be also radiated to a portion of the common power supply line. The common power supply line may transfer a heat generated by the laser to the second power supply line, thereby transferring the heat into an element along the second electrode. This problem may damage the organic layer, degrading the reliability of the organic light emitting display.

FIGS. **2** to **5** are cross-sectional views of an organic light emitting display in accordance with embodiments. Referring to FIG. **2**, a substrate **300** includes a pixel region I and a non-pixel region II. The substrate **300** may be an insulating glass substrate, a plastic substrate, or a conductive substrate.

In the illustrated embodiment, a buffer layer **310** is formed over the substantially entire surface of the substrate **300**. The buffer layer **310** may be a silicon oxide layer, a silicon nitride layer, or a composite layer of silicon oxide and silicon nitride. In addition, the buffer layer **310** may functions as a passivation layer for preventing impurities from out-diffusing from the substrate **300**.

Next, a semiconductor layer **320** is formed on a portion of the buffer layer **310** in the pixel region I. The semiconductor layer **320** may include amorphous silicon or polysilicon. Then, a gate insulating layer **330** is formed over the substantially entire surface of the substrate **300**. The gate insulating layer **330** may be a silicon oxide layer, a silicon nitride layer, or a composite layer of silicon oxide and silicon nitride.

Then, a gate electrode **340***a* is formed over the gate insulating layer **330**. The gate electrode **340***a* overlaps with a portion of the semiconductor layer **320**. The gate electrode **340***a* may be formed of Al, Cu, or Cr.

Next, an interlayer insulating layer **350** is formed over the substantially entire surface of the substrate **300**. The interlayer insulating layer **350** may be a silicon oxide layer, a silicon nitride layer, or a composite layer of silicon oxide and silicon nitride. The interlayer insulating layer **350** and the gate insulating layer **330** in the pixel region I are etched to form contact holes **351** and **352** for exposing portions of the semiconductor layer **320**.

Then, source and drain electrodes **360***a* and **360***b* are formed on the interlayer insulating layer **350** in the pixel region I. The source and drain electrodes **360***a* and **360***b* may be formed of one selected from the group consisting of Mo, Cr, Al, Ti, Au, Pd and Ag. In addition, the source and drain electrodes **360***a* and **360***b* are electrically connected to the semiconductor layer **320** through the contact holes **351** and **352**.

Further, when forming the source and drain electrodes **360***a* and **360***b*, a conductive line **360***d* may be formed in the non-pixel region II. The conductive line **360***d* may act as a common power supply line. In addition, a second electrode power supply line **360***c* may also be formed at the same time. Furthermore, when the gate electrode **340***a* is formed, a scan driver **340***b* may be formed in the non-pixel region II.

In one embodiment, the conductive line **360***d* in the non-pixel region II is narrower than a glass frit **430** (FIG. **5**) which will be formed over the conductive line **360***d*. The glass frit **430** may have a portion overlapping the conductive line **360***d*. When viewed from above, the portion of the glass frit substantially eclipses the conductive line **360***d*. In one embodiment, the glass frit may have a width W**1** between about 0.6 mm and about 0.7 mm. The width W**1** of the glass frit, however, may vary depending on the design of an OLED device. The width W**2** of the conductive line **360***d* may be adapted to that of the glass frit. In one embodiment, the width W**2** of the conductive line **360***d* is about 10%, about 20%, about 30%, about 40%, about 50%, about 60%, about 65%, about 70%, about 75%, about 80%, about 85%, about 90%, about 95%, about 96%, about 97%, about 98%, about 99%, about 100%, about 102%, about 104%, about 106%, about 108%, or about 110% of the maximum width W**2** of the glass frit **430**.

The glass frit serves as a sealant for the OLED device, as will be described later in more detail. The glass frit is attached to at least a portion of the top surface of the conductive line **360***d* by a laser process. During the laser process, a laser beam is irradiated onto the glass frit from above. In one embodiment, the diameter of the laser beam may be equal to or larger than the width of the glass frit. At least a portion of the laser beam may be irradiated on edge portions of the glass frit. In certain embodiments, the diameter of the laser beam may be smaller than the width of the glass frit. In such embodiments, the laser beam may be irradiated onto the edge portions of the glass frit by moving the laser beam over the edge portions. These configurations facilitate curing edge portions of the glass frit.

If the conductive line is wider than the glass frit, as in the conventional organic light emitting display of FIG. **1**, the conductive line may be exposed to the laser beam during the laser process. The conductive line may transfer a heat generated by the laser beam to the second electrode power supply line. The heat may be transferred through the second electrode to another element. This problem causes damages to an organic layer in the pixel region I. The illustrated conductive line **360***d* has a narrower width than that of the glass frit sealant. In addition, the substantially entire portion of the conductive line **360***d* is covered by the glass frit. This configuration prevents the conductive line **360***d* from being exposed to the laser beam during the laser process.

In the illustrated embodiment, a top-gate thin film transistor is described. In other embodiments, the conductive line structure may apply to a bottom-gate thin film transistor having a gate electrode disposed under a semiconductor layer. In certain embodiments, the conductive line may be formed simultaneously with forming the gate electrode or a first electrode which will be described later.

Referring to FIG. **3**, a planarization layer **370** is formed over the substantially entire surface of the substrate **300**. The planarization layer **370** may include an organic layer, an inorganic layer, or a composite layer thereof. The inorganic layer may be formed by spin on glass (SOG). The organic layer may include an acryl-based resin, a polyimide-based resin, or benzocyclobutene (BCB).

The planarization layer **370** in the pixel region I is etched to form a via-hole **371***a* for exposing one of the source and drain electrodes. The planarization layer **370** in the non-pixel region II is etched to form openings **371***b* and **371***c* for exposing the conductive line **360***d* and the second electrode power supply line **360***c*. The conductive line **360***d* is exposed to increase adhesive strength with the substrate when the substrate is sealed by the glass frit.

Referring to FIG. **4**, a first electrode **380** including a reflective layer **375** is formed on the planarization **370** in the pixel region I. The first electrode **380** is disposed on a bottom surface of the via-hole **371** to be in contact with one of the exposed source and drain electrodes **360***a* and **360***b*. The first electrode **380** also extends onto portions of the planarization layer **370**. The first electrode **380** may be formed of indium tin oxide (ITO) or indium zinc oxide (IZO).

Then, a pixel defining layer **390** is formed over the substantially entire surface of the substrate **300**. The pixel defining layer **390** also covers the first electrode **380** to a thickness sufficient to fill the via-hole **371***a*, in which the first electrode **380** is disposed. The pixel defining layer **390** may be formed of an organic layer or an inorganic layer. In one embodiment, the pixel defining layer **390** is formed of one selected from the group consisting of BCB, an acryl-based polymer, and polyimide. The pixel defining layer **390** may have high flowability such that the pixel defining layer can be evenly formed over the substantially entire surface of the substrate.

The pixel defining layer **390** is etched to form an opening **395***a* for exposing the first electrode **380** in the pixel region I, and an opening **395***b* for exposing a portion of the second electrode power supply line **360***c* in the non-pixel region II. In addition, the pixel defining layer **390** is also etched to expose a portion of the conductive line **360***d* in the non-pixel region II.

Then, an organic layer **400** is formed on the first electrode **380** exposed through the opening **395***a*. The organic layer **400** includes at least an emission layer. The organic layer **400** may further include at least one of a hole injection layer, a hole transport layer, an electron transport layer, and an electron injection layer.

Next, a second electrode **410** is formed over the substantially entire surface of the substrate **300**. The second electrode **410** is a transmissive electrode. The second electrode may be formed of Mg, Ag, Al, Ca, or an alloy of two or more of the foregoing. The second electrode may be formed of a material which is transparent and has a low work function. The second electrode **410** in the non-pixel region II may be etched to expose the conductive line **360***d* and the planarization layer **370**.

Referring to FIG. **5**, an encapsulation substrate **420** is placed opposite to the substrate **300**. The encapsulation substrate **420** may be formed of an etched insulating glass or a non-etched insulating glass.

Then, a glass frit **430** is applied to edges of the encapsulation substrate **420**. The glass frit **430** may be formed of one or more materials selected from the group consisting of magnesium oxide (MgO), calcium oxide (CaO), barium oxide (BaO), lithium oxide (Li_2O), sodium oxide (Na_2O), potassium oxide (K_2O), boron oxide (B_2O_3), vanadium oxide (V_2O_5), zinc oxide (ZnO), tellurium oxide (TeO_2), aluminum oxide (Al_2O_3), silicon dioxide (SiO_2), lead oxide (PbO), tin oxide (SnO), phosphorous oxide (P_2O_5), ruthenium oxide (Ru_2O), rubidium oxide (Rb_2O), rhodium oxide (Rh_2O), ferrite oxide (Fe_2O_3), copper oxide (CuO), titanium oxide (TiO_2), tungsten oxide (WO_3), bismuth oxide (Bi_2O_3), antimony oxide (Sb_2O_3), lead-borate glass, tin-phosphate glass, vanadate glass, and borosilicate. The glass frit **430** may be applied by a dispensing method or a screen printing method.

In the illustrated embodiment, the glass frit **430** is first applied to the encapsulation substrate **420** and then the encapsulation substrate **420** with the glass frit **430** is placed over the substrate **300**. In other embodiments, the glass frit **430** may be first applied to the substrate **300**, and then the encapsulation substrate **420** is placed over the substrate **300**.

Then, the encapsulation substrate **420** is aligned with the substrate **300**. The glass frit **430** is in contact with the conductive line **360***d* and the planarization layer **370** formed over the substrate **300**.

Next, when the glass frit **430** is irradiated with a laser beam, the glass frit **430** is melted and solidified to adhere to the substrate and the encapsulation substrate, thereby sealing the organic light emitting display.

As described above, the illustrated conductive line has a width narrower than that of the glass frit, thereby reducing heat transfer to elements in the pixel region during the laser process. Thus, the reliability of the resulting OLED can be improved.

As can be seen from the foregoing, in an organic light emitting display and a method of fabricating the same in accordance with the embodiments, it is possible to prevent an element from being damaged due to a large amount of heat generated when the laser beam is radiated to a glass frit for sealing a substrate.

Although the invention has been described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the art that a variety of modifications and variations may be made to the invention without departing from the spirit or scope of the invention defined in the appended claims, and their equivalents.

What is claimed is:

1. An organic light emitting display (OLED) device comprising:

a first substrate comprising a pixel region and a non-pixel region;

an array of organic light emitting pixels formed over the pixel region;

a conductive line formed over a surface of the non-pixel region, wherein the conductive line is substantially flat throughout the surface;

a second substrate placed over the first substrate such that the array and the conductive line are interposed between the first and second substrates;

a planarization layer formed over at least part of the non-pixel region of the first substrate, wherein the planarization layer comprises an opening; and

a frit seal interposed between the first and second substrates and surrounding the array, the frit seal interconnecting the first and second substrates, the frit seal comprising a portion contacting the conductive line through the opening in the planarization layer and overlapping the conductive line in a segment of the device where the frit seal is formed, wherein the portion of the frit seal substantially eclipses the conductive line in the segment when viewed from the second substrate, wherein the frit seal contacts the planarization layer, and wherein the planarization layer covers a portion of the conductive line.

2. The device of claim **1**, wherein the conductive line is electrically connected to the array via another electrical interconnection.

3. The device of claim **1**, further comprising a plurality of thin film transistors interposed between the first substrate and the array, wherein the conductive line is connected to the plurality of thin film transistors.

4. The device of claim **1**, wherein the conductive line extends along a peripheral edge of the first substrate, and wherein the portion of the fit seal extends along the peripheral edge of the first substrate.

5. The device of claim **1**, wherein the portion extends at least the length of one side of the array.

6. The device of claim **1**, wherein the frit seal further comprises a non- eclipsing portion in another segment of the device, wherein the non-eclipsing portion of the fit seal does not eclipse the conductive line when viewed from the second substrate.

7. An organic light emitting display (OLED) device comprising:

a first substrate comprising a pixel region and a non-pixel region;

an array of organic light emitting pixels formed over the pixel region;

a conductive line formed over a surface of the non-pixel region, wherein the conductive line is substantially flat throughout the surface;

a second substrate placed over the first substrate such that the array and the conductive line are interposed between the first and second substrates; and

a planarization layer formed over at least part of the non-pixel region of the first substrate, wherein the planarization layer comprises an opening; and

a frit seal interposed between the first and second substrates and surrounding the array, the frit seal interconnecting the first and second substrates, the frit seal comprising a portion contacting the conductive line through the opening in the planarization layer and overlapping the conductive line in a segment of the device where the frit seal is formed, wherein the portion of the frit seal substantially eclipses the conductive line in the segment when viewed from the second substrate;

wherein the fit seal further comprises a non-eclipsing portion in another segment of the device, wherein the non-eclipsing portion of the frit seal does not eclipse the conductive line when viewed from the second substrate, wherein the conductive line comprises a non-eclipsed portion and an eclipsed portion in a cross-section of the conductive line taken along a line where the cross-sectional area of the conductive line is the smallest, and wherein the non-eclipsed portion is substantially smaller than the eclipsed portion.

8. The device of claim **1**, wherein the portion of the frit seal has a width, and the conductive line has a width where the portion overlaps, and wherein the width of the portion is substantially greater than the width of the conductive line.

9. The device of claim **1**, wherein the portion of the frit seal has a width, and the conductive line has a width where the portion overlaps, and wherein the width of the portion is from about 95% to about 200% of the width of the conductive line.

10. The device of claim **1**, wherein the conductive line is made of metal.

11. The device of claim **1**, wherein the frit seal comprises one or more materials selected from the group consisting of magnesium oxide (MgO), calcium oxide (CaO), barium oxide (BaO), lithium oxide (Li_2O), sodium oxide (Na_2O), potassium oxide (K_2O), boron oxide (B_2O_3), vanadium oxide (V_2O_5), zinc oxide (ZnO), tellurium oxide (TeO_2), aluminum oxide (Al_2O_3), silicon dioxide (SiO_2), lead oxide (PbO), tin oxide (SnO), phosphorous oxide (P_2O_5), ruthenium oxide (Ru_2O), rubidium oxide (Rb_2O), rhodium oxide (Rh_2O), ferrite oxide (Fe_2O_3), copper oxide (CuO), titanium oxide (TiO_2), tungsten oxide (WO_3), bismuth oxide (Bi_2O_3), antimony oxide (Sb_2O_3), lead-borate glass, tin-phosphate glass, vanadate glass, and borosilicate.

12. A method of making the organic light emitting display (OLED) device of claim **1**, the method comprising:

providing an unfinished device comprising the first substrate, the array of organic light emitting pixels formed over the first substrate, and the conductive line formed over the substrate and not overlapping the array;

further providing the second substrate;

interposing a frit to form the frit seal between the first and second substrates such that the array is interposed between the first and second substrates, that the fit surrounds the array and that a portion of the frit overlaps the conductive line, whereby the portion of the fit seal substantially eclipses the conductive line when viewed from the second substrate; and

melting and resolidifying at least part of the fit so as to interconnect the unfinished device and the second substrate via the frit, wherein the frit connects to the conductive line without a material therebetween, and wherein the frit connects to the second substrate with or without a material therebetween.

13. The method of claim **12**, wherein melting comprises applying heat to the at least part of the frit.

14. The method of claim **12**, wherein melting comprises applying laser or infrared light to the at least part of the frit in a direction from the second substrate to the first substrate, and wherein substantially all the light reaching the conductive line reaches the electrically conductive line after passing through the fit.

15. The method of claim **12**, wherein the conductive line is made of metal.

16. The method of claim **12**, wherein interposing the frit comprises contacting the frit with the conductive line.

17. The method of claim **12**, wherein interposing the frit comprises contacting the frit with the second substrate.

18. The method of claim **12**, wherein the unfinished device further comprises a planarization layer generally formed over the conductive line with an opening exposing part of the conductive line, and wherein interposing the fit comprises contacting the frit with the conductive line through the opening.

19. The method of claim **12**, wherein the portion of the frit seal has a width, and the conductive line has a width where the portion overlaps, and wherein the width of the portion is from about 95% to about 200% of the width of the conductive line.

20. The method of claim **12**, wherein the fit seal further comprises another portion, which does not totally eclipse the conductive line when viewed from the second substrate.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,120,249 B2
APPLICATION NO. : 11/529916
DATED : February 21, 2012
INVENTOR(S) : Dong-Soo Choi et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page 1 (Item 57), Abstract, line 17, please delete “flit”, and insert --frit--, therefor.

Title page 3 (Item 56), column 2, line 2, under foreign patent documents, please delete “1227094”, and insert --I227094--, therefor.

Title page 3 (Item 56), column 2, line 3, under foreign patent documents, please delete “1228686”, and insert --I228686--, therefor.

Title page 3 (Item 56), column 2, line 5, under foreign patent documents, please delete “1237218”, and insert --I237218--, therefor.

Title page 3 (Item 56), column 2, line 25, under other publication, please delete “hte”, and insert --the--, therefor.

At column 2, line 34 (Approx), please delete “STURUTURE”, and insert --STRUCTURE--, therefor.

At column 2, line 38 (Approx), please delete “STURUTURE”, and insert --STRUCTURE--, therefor.

At column 9, line 54, please delete “flit”, and insert --frit--, therefor.

At column 10, line 9, please delete “cellusolve”, and insert --cellosolve--, therefor.

At column 15, line 3, in claim 4, please delete “fit”, and insert --frit--, therefor.

At column 15, line 8 (Approx), in claim 6, please delete “non- eclipsing”, and insert --non-eclipsing--, therefor.

Signed and Sealed this
Twenty-eighth Day of August, 2012

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

At column 15, line 9 (Approx), in claim 6, please delete “fit”, and insert --frit--, therefor.

At column 15, line 23 (Approx), in claim 7 after “substrates”, please delete “and”.

At column 15, line 37 (Approx), in claim 7, please delete “fit”, and insert --frit--, therefor.

At column 16, line 20, in claim 12, please delete “fit”, and insert --frit--, therefor.

At column 16, line 22, in claim 12, please delete “fit”, and insert --frit--, therefor.

At column 16, line 25, in claim 12, please delete “fit”, and insert --frit--, therefor.

At column 16, line 38, in claim 14, please delete “fit”, and insert --frit--, therefor.

At column 16, line 48, in claim 18, please delete “fit”, and insert --frit--, therefor.

At column 16, line 55, in claim 20, please delete “fit”, and insert --frit--, therefor.

专利名称(译)	有机发光显示器及其制造方法		
公开(公告)号	US8120249	公开(公告)日	2012-02-21
申请号	US11/529916	申请日	2006-09-29
[标]申请(专利权)人(译)	崔东SOO 朴镇宇		
申请(专利权)人(译)	崔东SOO 朴镇宇		
当前申请(专利权)人(译)	三星移动显示器有限公司.		
[标]发明人	CHOI DONG SOO PARK JIN WOO		
发明人	CHOI, DONG-SOO PARK, JIN-WOO		
IPC分类号	H01L51/52 H01L51/50 H01L51/56 H05B33/00		
CPC分类号	H01L51/5237 H01L27/3276 H01L51/5246 A61M5/3221 A61M5/3232 A61M5/5066 A61M2005/3206 A61M2005/3231 A61M2005/5073		
优先权	1020060007025 2006-01-23 KR		
其他公开文献	US20070170850A1		
外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种有机发光显示器及其制造方法，其能够防止元件在激光照射用于密封基板的玻璃料时产生的大量热量而被损坏。有机发光显示器包括：第一基板，包括像素区域和非像素区域;在像素区域上形成的有机发光像素阵列;形成在非像素区域上的导线;第二基板放置在第一基板上，使得阵列和导线插入第一和第二基板之间;以及插入在第一和第二基板之间并围绕阵列的玻璃料密封件，玻璃料密封件将第一和第二基板互连，玻璃料密封件包括与导电线重叠的部分，其中当从第二基板观察时，该部分的过滤器密封基本上遮盖了导线。