



US 20110186869A1

(19) **United States**(12) **Patent Application Publication**
HONG(10) **Pub. No.: US 2011/0186869 A1**(43) **Pub. Date: Aug. 4, 2011**(54) **ORGANIC LIGHT EMITTING DIODE
DISPLAY AND METHOD OF
MANUFACTURING THE SAME**(52) **U.S. CL. 257/88; 438/28; 257/E51.018**(57) **ABSTRACT**(75) Inventor: **Sang-Min HONG**, Yongin-City
(KR)(73) Assignee: **SAMSUNG MOBILE DISPLAY
CO., LTD.**, Yongin-City (KR)(21) Appl. No.: **12/906,755**(22) Filed: **Oct. 18, 2010**(30) **Foreign Application Priority Data**

Feb. 2, 2010 (KR) 10-2010-0009587

Publication Classification(51) **Int. Cl.**
H01L 51/52 (2006.01)
H01L 51/56 (2006.01)

An organic light emitting diode (OLED) display comprises a first substrate and a second substrate configured to comprise a pixel area and a non-pixel area other than the pixel area, a sealing member configured to adhere the first substrate and the second substrate together, reinforcing materials filled into the non-pixel area of the first substrate and the second substrate, and an accommodation unit configured to accommodate some of the reinforcing materials within at least one of the first substrate and the second substrate corresponding to the non-pixel area. A method of manufacturing the OLED display comprises: preparing a mother substrate, including a plurality of display panels and cutting lines between two adjacent display panels; cutting the mother substrate into separated unit display panels; forming grooves on a side of each unit display panels; and filling reinforcing materials in a non-pixel area of the unit display panels, some of the reinforcing materials flowing into the grooves.

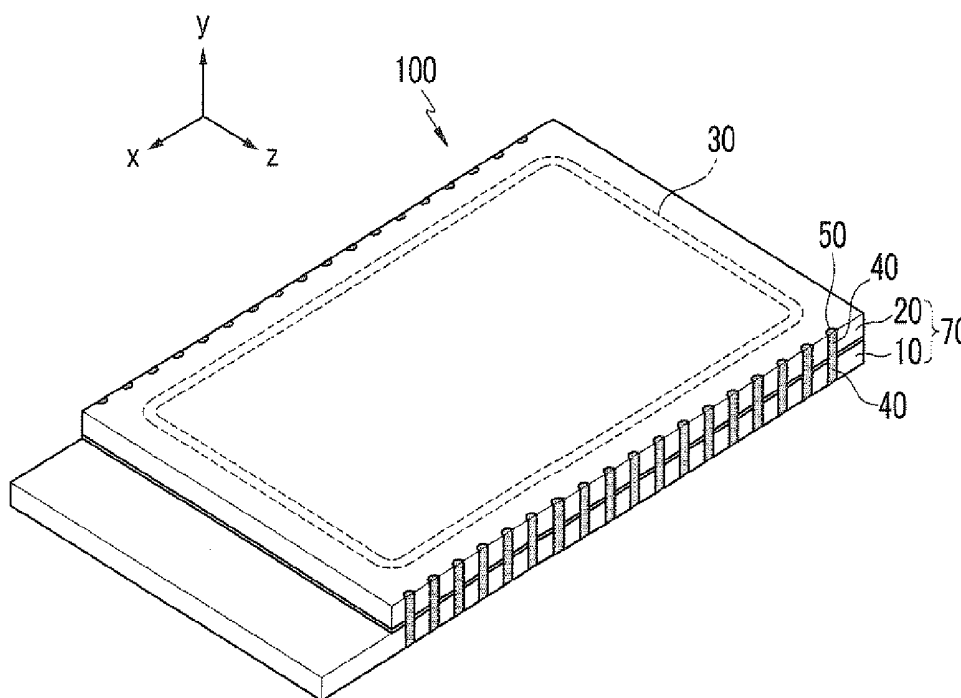


FIG.1

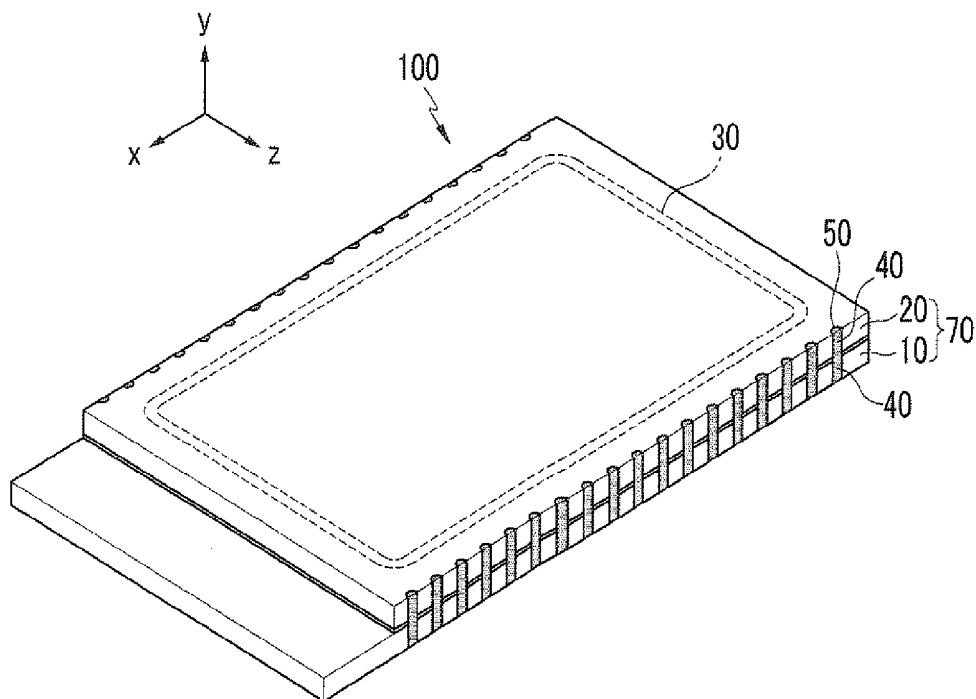


FIG.2

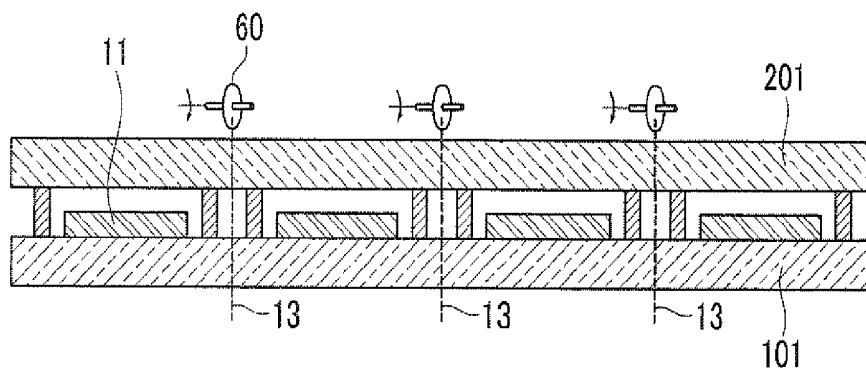


FIG.4

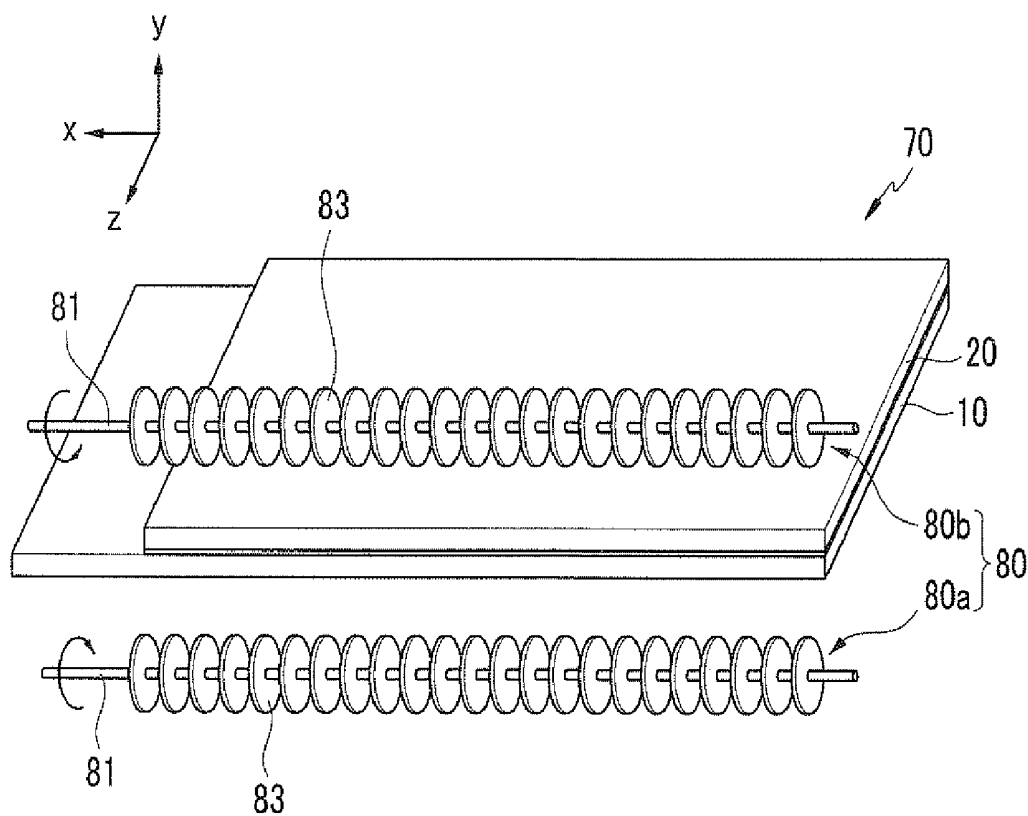
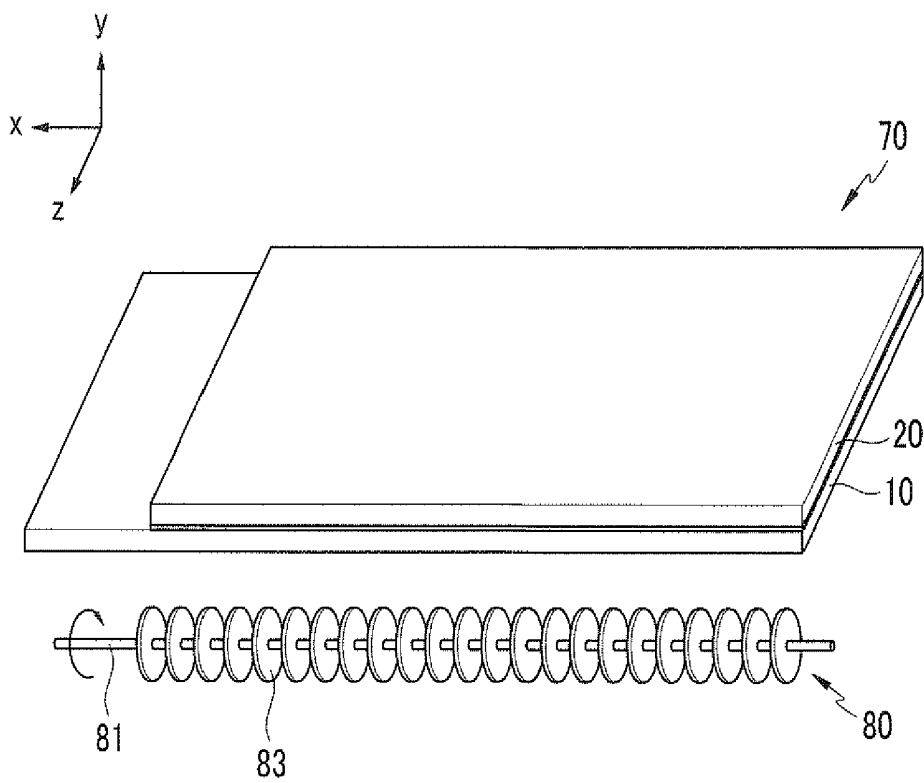


FIG.5



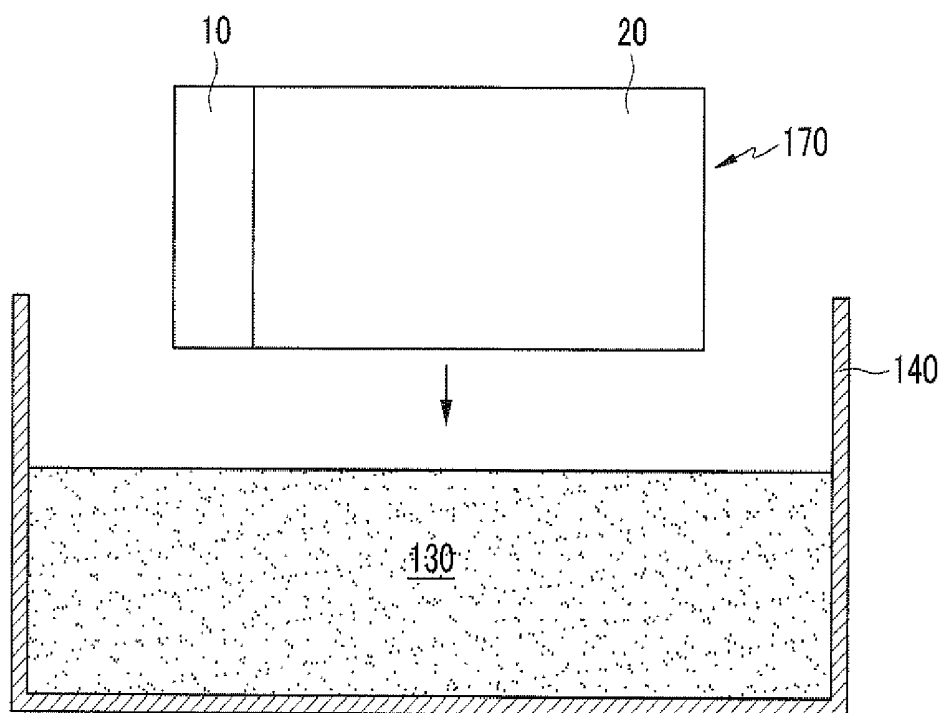
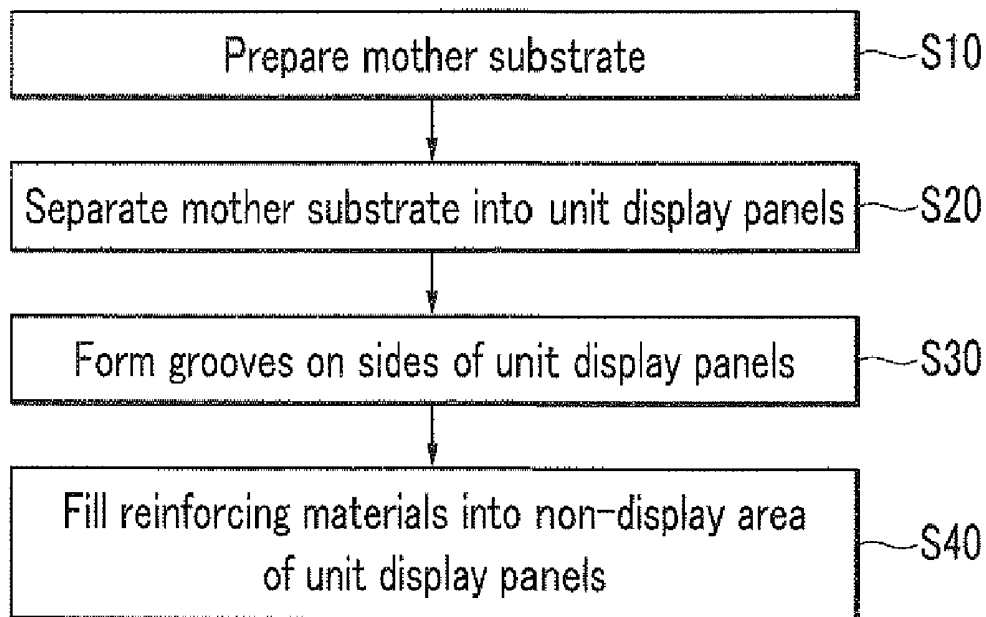


FIG. 8



ORGANIC LIGHT EMITTING DIODE DISPLAY AND METHOD OF MANUFACTURING THE SAME

CLAIM OF PRIORITY

[0001] This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from an application earlier filed in the Korean Intellectual Property Office on Feb. 2, 2010 and there duly assigned Serial No. 10-2010-0009587.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention generally relates to an organic light emitting diode (OLED) display and a method of manufacturing the same. More particularly, the invention relates to an organic light emitting diode (OLED) display in which a display panel is reinforced and a method of manufacturing the same.

[0004] 2. Description of the Related Art

[0005] In general, an organic light emitting diode (OLED) display includes two sheets of different substrates coalesced together, a display panel assembly configured to have organic light emitting elements formed therein, a flexible printed circuit (FPC) electrically connected to the display panel assembly through a flexible circuit board, and a support member (or bezel) configured to support the display panel assembly, the flexible printed circuit (FPC), etc.

[0006] Recently, the organic light emitting diode (OLED) display has been mounted on mobile devices, such as a mobile phone and a PDA, and it has been gradually downsized.

[0007] Accordingly, there is a problem in that the downsized organic light emitting diode (OLED) display is damaged by external impact resulting from dropping, etc. which are caused by a user's mistake while the display is being carried. For this reason, there is a need for a structure for absorbing external impact on the organic light emitting diode (OLED) display.

[0008] The above information disclosed in this Background section is only for the enhancement of an understanding of the background of the described technology, and therefore it may contain information that does not form the prior art which is already known in this country to a person of ordinary skill in the art.

SUMMARY OF THE INVENTION

[0009] The invention has been developed in an effort to provide an organic light emitting diode (OLED) display and a method of manufacturing the same which provide the advantage of easily absorbing external impact by increasing the amount of reinforcing materials filled between the substrates of display panel units of the organic light emitting diode (OLED) display.

[0010] An exemplary embodiment provides an organic light emitting diode (OLED) display comprising a first substrate and a second substrate configured to include a pixel area and a non-pixel area other than the pixel area, a sealing member configured to adhere the first substrate and the second substrate together, reinforcing materials filled into the non-pixel area of the first substrate and the second substrate, and an accommodation unit configured to accommodate

some of the reinforcing materials within at least one of the first substrate and the second substrate corresponding to the non-pixel area.

[0011] The accommodation unit can include a groove formed on the sides of the first substrate and the second substrate.

[0012] A plurality of the grooves can be formed on the sides of the first substrate and the second substrate.

[0013] The grooves can be formed by lateral processing using grinders, each comprising penett wheels.

[0014] The grinder can comprise a first grinder for processing the sides of the first substrate and a second grinder for processing the sides of the second substrate.

[0015] The grooves can be formed by etching. The grooves can be formed in a vertical direction (y-axis) relative to a planar direction (x-axis) of the first and second substrates.

[0016] The sealing member can be formed of a frit.

[0017] The reinforcing materials can be made of epoxy-based materials.

[0018] A method of manufacturing an organic light emitting diode (OLED) display according to an exemplary embodiment comprises: (a) preparing a mother substrate, including a plurality of display panels and cutting lines each between the display panels; (b) cutting the mother substrate into a plurality of unit display panels and forming a plurality of grooves on a side of each of the separated unit display panels; and (c) filling reinforcing materials in a non-pixel area of the unit display panels at the step (b). In this case, when the reinforcing materials are filled, some of the reinforcing materials flow into the grooves.

[0019] The step (b) includes forming the grooves in the unit display panels using grinders, each including penett wheels.

[0020] The grinders can comprise a first grinder and a second grinder mounted on a first substrate and a second substrate, respectively, constituting the unit display panels, and can form a plurality of the grooves on sides of the first substrate and the second substrate.

[0021] The grooves formed in step (b) can be formed by etching.

[0022] Step (b) can comprise: (b-1) adhering a plurality of etching prevention members on sides of the unit display panels; and (b-2) forming the plurality of grooves by etching the sides of the unit display panels at the step (b-1).

[0023] In accordance with the present invention, in the organic light emitting diode (OLED) display, the reinforcing materials are filled into the lateral edges of the display panel, and grooves are formed in the substrates of the display panel so that the filled reinforcing materials can flow into the grooves. Accordingly, external impact can be easily absorbed because the filling cross section of the reinforcing materials is expanded.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings, in which like reference symbols indicate the same or similar components, wherein:

[0025] FIG. 1 is a diagram schematically showing an organic light emitting diode (OLED) display according to a first exemplary embodiment of the invention;

[0026] FIG. 2 is a diagram showing that a first substrate member and a second substrate member of a mother substrate form are separated into a plurality of panel units using penett wheels;

[0027] FIG. 3 is a diagram showing a state in which the first substrate member and the second substrate member shown in FIG. 2 are separated into the plurality of panel units;

[0028] FIG. 4 is a diagram showing the manufacturing of grooves using a pair of grinders;

[0029] FIG. 5 is a diagram showing the manufacturing of grooves using one grinder;

[0030] FIG. 6 is a diagram showing the adhesion of tape members for forming grooves for a display panel according to a second exemplary embodiment of the invention;

[0031] FIG. 7 is a diagram showing the immersion of the display panel, shown in FIG. 3, in an etchant; and

[0032] FIG. 8 is a flowchart schematically illustrating a method of manufacturing the organic light emitting diode (OLED) display according to an exemplary embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0033] Hereinafter, an organic light emitting diode (OLED) display and a method of manufacturing the same according to some exemplary embodiments are described with reference to the accompanying drawings. However, the present invention is not limited to the exemplary embodiments, but may be implemented in various ways. The embodiments are provided to complete the disclosure of the present invention and to allow those having ordinary skill in the art to understand the scope of the present invention.

[0034] Furthermore, the size and thickness of each of the elements shown in the drawings is arbitrarily shown for better understanding and ease of description, but the present invention is not limited thereto. In the drawings, the thickness of layers and areas is exaggerated for clarity.

[0035] FIG. 1 is a diagram schematically showing an organic light emitting diode (OLED) display according to a first exemplary embodiment of the invention; FIG. 2 is a diagram showing that a first substrate member and a second substrate member of a mother substrate form are separated into a plurality of panel units using penett wheels; and FIG. 3 is a diagram showing a state in which the first substrate member and the second substrate member shown in FIG. 2 are separated into the plurality of panel units.

[0036] As shown in FIG. 1, the organic light emitting diode (OLED) display 100 according to the first exemplary embodiment includes a first substrate 10, a second substrate 20 coalesced with the first substrate 10 to form a display panel 70, a sealing member 30 configured to adhere the first substrate 10 and the second substrate 20 together, reinforcing materials 40 filled between the first substrate 10 and the second substrate 20, and an accommodation unit 50 configured to accommodate some of the reinforcing materials 40.

[0037] The first substrate 10 includes a pixel area in which organic light emitting elements 11 (FIG. 2) are formed and a non-pixel area other than the pixel area. The second substrate 20 is adhered to one area, including the pixel area, of the first substrate 10. In this case, the first substrate 10 is a lower substrate, and the second substrate 20 is an upper substrate.

[0038] To adhere the first substrate 10 and the second substrate 20 together, the sealing member 30 is coated along the edge of one face of the first substrate 10. Here, the sealing member 30 is formed of a frit. The frit and the sealing member

are hereinafter assigned the same reference numeral 30. The frit 30 includes a filler (not shown) for controlling a coefficient of thermal expansion and an absorbent (not shown) for absorbing a laser or infrared rays.

[0039] In the state in which the first substrate 10 and the second substrate 20 are coalesced together, a laser or infrared rays are radiated onto the frit 30, thereby melting the frit 30. Accordingly, the first substrate 10 and the second substrate 20 are adhered together. Since the first substrate 10 and the second substrate 20 are sealed by the frit 30, external oxygen and moisture are prevented from flowing into predetermined inclusions (i.e., the organic light emitting elements 11) formed on the first substrate 10. In the state in which the first substrate 10 and the second substrate 20 are coalesced together, the non-pixel area is filled with the reinforcing materials 40.

[0040] As shown in FIG. 3, in the state in which the first substrate 10 and the second substrate 20 are coalesced together, the reinforcing materials 40 are filled into the non-pixel area. The reinforcing materials 40 are made of epoxy-based materials. Since the reinforcing materials 40 are filled, the dropping of or external impact on the organic light emitting diode (OLED) display can be absorbed. Accordingly, internal damage to the organic light emitting diode (OLED) display can be prevented. Part of the coating portions of the reinforcing materials 40 is accommodated by the accommodation unit 50.

[0041] In the state in which the first substrate 10 and the second substrate 20 are coalesced together, the accommodation unit 50 is formed so that some of the reinforcing materials 40 flow into the first and second substrates 10 and 20, respectively. To this end, a groove forming the accommodation unit is formed on the side of the first substrate 10 and the second substrate 20, and so some of the reinforcing materials 40 flow into the groove. The groove and the accommodation unit are hereinafter assigned the same reference numeral 50.

[0042] A plurality of the grooves 50 can be formed on the circumference of the first substrate 10 and the second substrate 20.

[0043] The grooves 50 are formed in the state in which a mother substrate, including a number of display panels, is separated into unit display panels. This is described in more detail below with reference to FIGS. 2 and 3.

[0044] As shown in FIGS. 2 and 3, the first substrate members 101 and the second substrate members 201, which are coalesced together, are separated into a plurality of unit display panels 70 using a cutting apparatus 60.

[0045] FIG. 4 is a diagram showing the manufacturing of grooves using a pair of grinders.

[0046] Next, the grooves 50 are formed on the sides of the separated unit display panels 70 using grinders 80.

[0047] As shown in FIG. 4, a plurality of penett wheels 83 are mounted on each of the grinders 80 in the length direction of a shaft 81. The grinders 80 include a first grinder 80a for processing the side of the first substrate 10 and a second grinder 80b for processing the side of the second substrate 20. Accordingly, when the shafts 81 are rotated, the plurality of grooves 50 are formed in each of the sides of the first substrate 10 and the second substrate 20 of the unit display panel 70 in its inner direction. The grooves 50 are formed in a vertical direction (i.e., a y-axis) relative to the planar direction (i.e., an x-axis) of the first and second substrates 10 and 20, respectively. However, the grooves 50 can also be formed so as to

have an acute angle or an obtuse angle relative to the planar direction (the x-axis) of the first and second substrates **10** and **20**, respectively.

[0048] FIG. **5** is a diagram showing the manufacturing of grooves using one grinder.

[0049] In the first exemplary embodiment of FIG. **4**, the first and second grinders **80a** and **80b** are used to process the grooves **50**. As shown in FIG. **5**, however, the grooves **50** can be formed in the first and second substrates **10** and **20**, respectively, using one grinder **80**.

[0050] Referring back to FIG. **3**, the reinforcing materials **40** flow into the formed grooves **50**, thereby being capable of further increasing the amount of the reinforcing materials **40** filled into the non-pixel area of the first substrate **10** and the second substrate **20**. Accordingly, when external impact is generated, such as by dropping of the organic light emitting diode (OLED) display, an effect of absorbing the amount of impact can be further increased.

[0051] FIG. **6** is a diagram showing the adhesion of tape members for forming the grooves for a display panel according to a second exemplary embodiment of the invention, and FIG. **7** is a diagram showing the immersion of the display panel, shown in FIG. **3**, in an etchant. Reference numerals common to FIGS. **6** and **7** and to FIGS. **1** thru **5** refer to the same constituent elements having the same functions as in FIGS. **1** thru **5**, and a description thereof is omitted.

[0052] As shown in FIGS. **6** and **7**, a plurality of etching prevention members (e.g., tape members) **190** are mounted on the lateral edge of a unit display panel **170** according to the second exemplary embodiment of the invention.

[0053] More particularly, first, a mother substrate (not shown), including a plurality of unit display panels **170**, is prepared.

[0054] Next, the mother substrate is separated into the plurality of unit display panels **170**. A number of the tape members **190** are mounted on the sides of each of the unit display panels **170** at equal intervals in order to prevent etching.

[0055] As shown in FIG. **7**, the unit display panel **170** having the tape members **190** mounted on its sides is immersed in the etchant **130** contained in a liquid tank **140**. The etchant **130** includes fluoric acid, ammonium fluoride, or a mixture thereof. Furthermore, hydrogen peroxide having strong oxidizing power can be added to the mixture of fluoric acid and ammonium fluoride in order to further improve the etching effect. The components and concentration of the etchant **130** can be properly changed according to the glass composition, the type, etc. of a substrate of the display panel **170**. Furthermore, the display panel **170**, etched when etching processing is performed, can be shaken or assigned ultrasonic waves of a weak output.

[0056] In this case, portions of the unit display panel **170** (FIG. **6**) having the tape members **190** not adhered to its sides are etched, thereby forming grooves **150**. Accordingly, the reinforcing materials **40** can flow into the grooves **150** on the sides of the unit display panel **170**, and so the area in which the reinforcing materials **40** are filled can be expanded. Consequently, the unit display panel **170** can be more stably protected from external impact.

[0057] FIG. **8** is a flowchart schematically illustrating a method of manufacturing the organic light emitting diode (OLED) display according to an exemplary embodiment of the invention. Reference numerals common to FIG. **8** and to

FIGS. **1** thru **7** refer to the same constituent elements having the same functions as in FIGS. **1** thru **7**, and a detailed description thereof is omitted.

[0058] First, as shown in FIG. **2**, the mother substrates **101** and **201**, including cutting lines **13**, each between the plurality of unit display panels **70**, are prepared at step **S10**.

[0059] Next, at step **S10** of FIG. **8**, the mother substrates **101** and **201** are cut into the unit display panels **70**, as shown in FIG. **3**. Then, the plurality of grooves **50** are formed on the sides of the separated unit display panels **70** at step **S30**. The grooves **50** can be formed in step **S30** by processing the sides of the unit display panels **70** using the grinders **80** of FIG. **4** or **5**. The grinders **80** include the first grinder **80a** for processing the first substrate **10** constituting the unit display panels **70** and the second grinder **80b** for processing the second substrate **20** as seen in FIG. **4**. Alternatively, one grinder **80** can be used to process the grooves **50** on the sides of the unit display panels **70**, as seen in FIG. **5**.

[0060] Meanwhile, a number of tape members **190** (see FIG. **6**) for preventing etching can be mounted at equal intervals on the sides of the unit display panels **70**, and the unit display panel units **70** can then be immersed in the etchant, thereby being capable of forming the grooves **50**. That is, the grooves **50** are formed because the sides of the unit display panel units **70**, to which the tape members **190** are not adhered, are subject to an etching action.

[0061] Next, the reinforcing materials **40** are filled into the non-pixel area of the unit display panels **70** at step **S40**. Accordingly, since the reinforcing materials **40** flow into the grooves **50**, damage to the unit display panels **70** because of external impact can be prevented.

[0062] The present invention has been described in connection with what is presently considered to be practical exemplary embodiments. It is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims. Accordingly, the true scope of the present invention is defined by the appended claims.

[0063] While this disclosure has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

What is claimed is:

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

- a first substrate and a second substrate configured to form a pixel area and a non-pixel area other than the pixel area;
- a sealing member for adhering the first substrate and the second substrate together;
- reinforcing materials filled into the non-pixel area of the first substrate and the second substrate; and
- an accommodation unit for accommodating some of the reinforcing materials within at least one of the first substrate and the second substrate corresponding to the non-pixel area.

2. The organic light emitting diode (OLED) display of claim 1, wherein the accommodation unit includes a groove formed on sides of the first substrate and the second substrate.

3. The organic light emitting diode (OLED) display of claim 2, wherein a plurality of the grooves is formed on the sides of the first substrate and the second substrate.

4. The organic light emitting diode (OLED) display of claim 2, wherein the groove is formed by lateral processing using grinders, each grinder comprising penett wheels.

5. The organic light emitting diode (OLED) display of claim 4, wherein the grinders comprise:

a first grinder for processing the sides of the first substrate; and

a second grinder for processing the sides of the second substrate.

6. The organic light emitting diode (OLED) display of claim 2, wherein the groove is formed by etching.

7. The organic light emitting diode (OLED) display of claim 6, wherein the groove is formed in a vertical direction (y-axis) relative to a planar direction (x-axis) of the first and second substrates.

8. The organic light emitting diode (OLED) display of claim 5, wherein the groove is formed in a vertical direction (y-axis) relative to a planar direction (x-axis) of the first and second substrates.

9. The organic light emitting diode (OLED) display of claim 4, wherein the groove is formed in a vertical direction (y-axis) relative to a planar direction (x-axis) of the first and second substrates.

10. The organic light emitting diode (OLED) display of claim 3, wherein the groove is formed in a vertical direction (y-axis) relative to a planar direction (x-axis) of the first and second substrates.

11. The organic light emitting diode (OLED) display of claim 2, wherein the groove is formed in a vertical direction (y-axis) relative to a planar direction (x-axis) of the first and second substrates.

12. The organic light emitting diode (OLED) display of claim 1, wherein the sealing member comprises frit.

13. The organic light emitting diode (OLED) display of claim 1, wherein the reinforcing materials comprise epoxy-based materials.

14. A method of manufacturing an organic light emitting diode (OLED) display, the method comprising the steps of:

(a) preparing a mother substrate, including a plurality of display panels and cutting lines, each cutting line being formed between two adjacent display panels;

(b) cutting the mother substrate into a plurality of separated unit display panels and forming a plurality of grooves on a side of each of the separated unit display panels; and

(c) filling reinforcing materials in a non-pixel area of the unit display panels;

wherein, when the reinforcing materials are filled, some of the reinforcing materials flow into the grooves.

15. The method of claim 14, wherein step (b) comprises forming the plurality of grooves in the separated unit display panels using grinders, each including penett wheels.

16. The method of claim 15, wherein the grinders comprise a first grinder mounted on a first substrate and a second grinder mounted on a second substrate constituting the unit display panels and forming the plurality of grooves on sides of the first substrate and the second substrate.

17. The method of claim 14, wherein step (b) comprises forming the plurality of grooves by etching.

18. The method of claim 17, wherein step (b) comprises:

(b-1) adhering a plurality of etching prevention members on sides of the separated unit display panels; and

(b-2) forming the plurality of grooves by etching the sides of the separated unit display panels.

* * * * *

专利名称(译)	有机发光二极管显示器及其制造方法		
公开(公告)号	US20110186869A1	公开(公告)日	2011-08-04
申请号	US12/906755	申请日	2010-10-18
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星移动显示器有限公司.		
当前申请(专利权)人(译)	三星移动显示器有限公司.		
[标]发明人	HONG SANG MIN		
发明人	HONG, SANG-MIN		
IPC分类号	H01L51/52 H01L51/56		
CPC分类号	H01L51/56 H01L51/52 Y02P70/521		
优先权	1020100009587 2010-02-02 KR		
其他公开文献	US8872197		
外部链接	Espacenet USPTO		

摘要(译)

一种有机发光二极管 (OLED) 显示器, 包括: 第一基板; 第二基板, 被配置为包括像素区域和除像素区域之外的非像素区域; 密封构件, 被配置为将第一基板和第二基板粘合在一起, 填充到第一基板和第二基板的非像素区域中的增强材料, 以及容纳单元, 其被配置为在与非像素区域对应的第一基板和第二基板中的至少一个内容纳一些增强材料。一种制造 OLED 显示器的方法, 包括: 制备母基板, 包括多个显示面板和两个相邻显示面板之间的切割线; 将母基板切割成分离的单元显示板; 在每个单元显示板的一侧形成凹槽; 并且, 在单元显示面板的非像素区域中填充增强材料, 一些增强材料流入凹槽中。

