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Yee

(54) ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAY

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(57) **ABSTRACT**

An organic light emitting diode (OLED) display is disclosed. In one embodiment, the display includes 1) a display panel including i) a display area configured to display an image and ii) a pad area adjacent to the display area and configured not to display an image, 2) a bezel configured to receive the display panel and 3) a reinforcing member positioned between the pad area of the display panel and the bezel. According to at least one embodiment, the deformation of the portion corresponding to the pad area of the display panel among the bezel may be prevented during an external impact, and thereby the twisting strength and the bending strength may be improved.

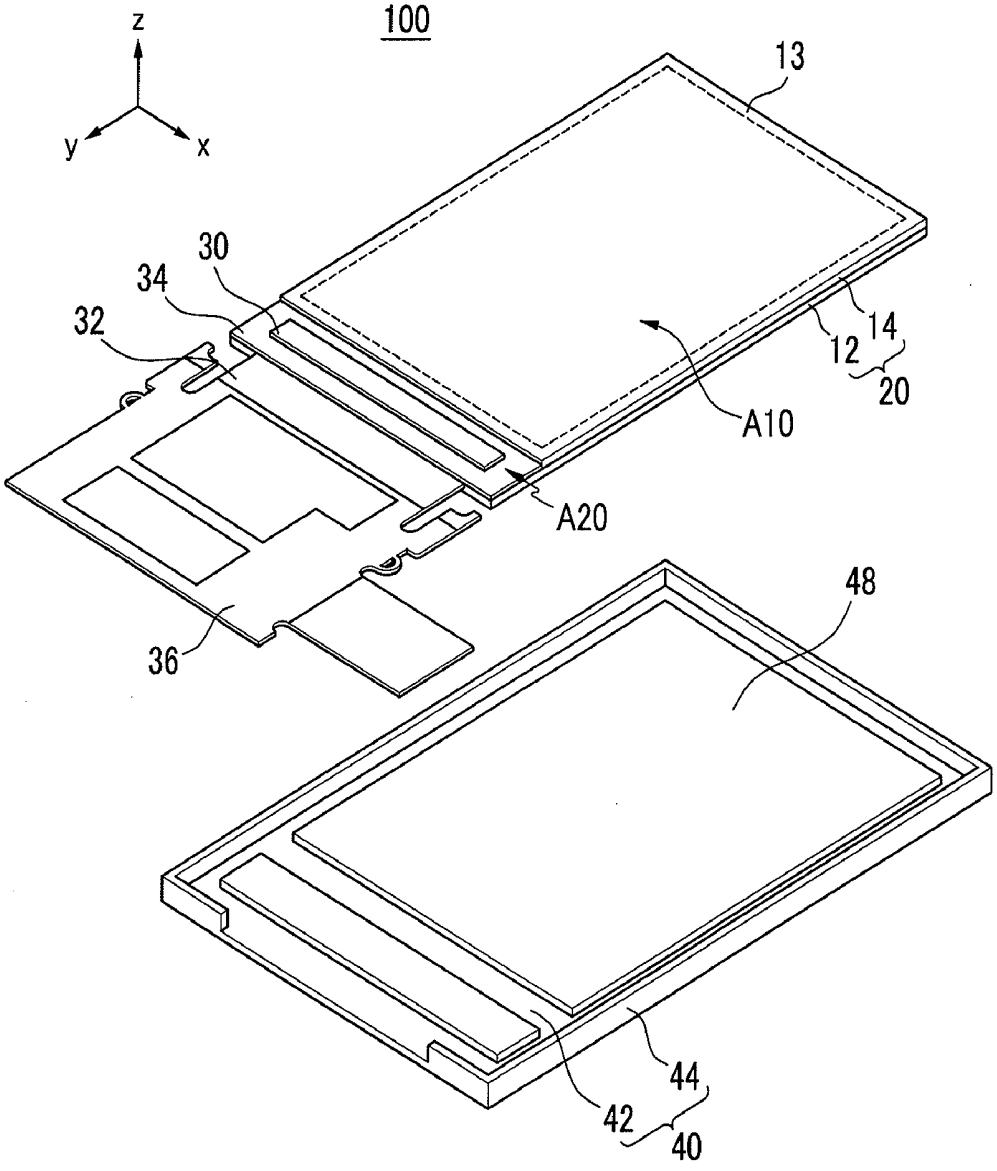


FIG.1

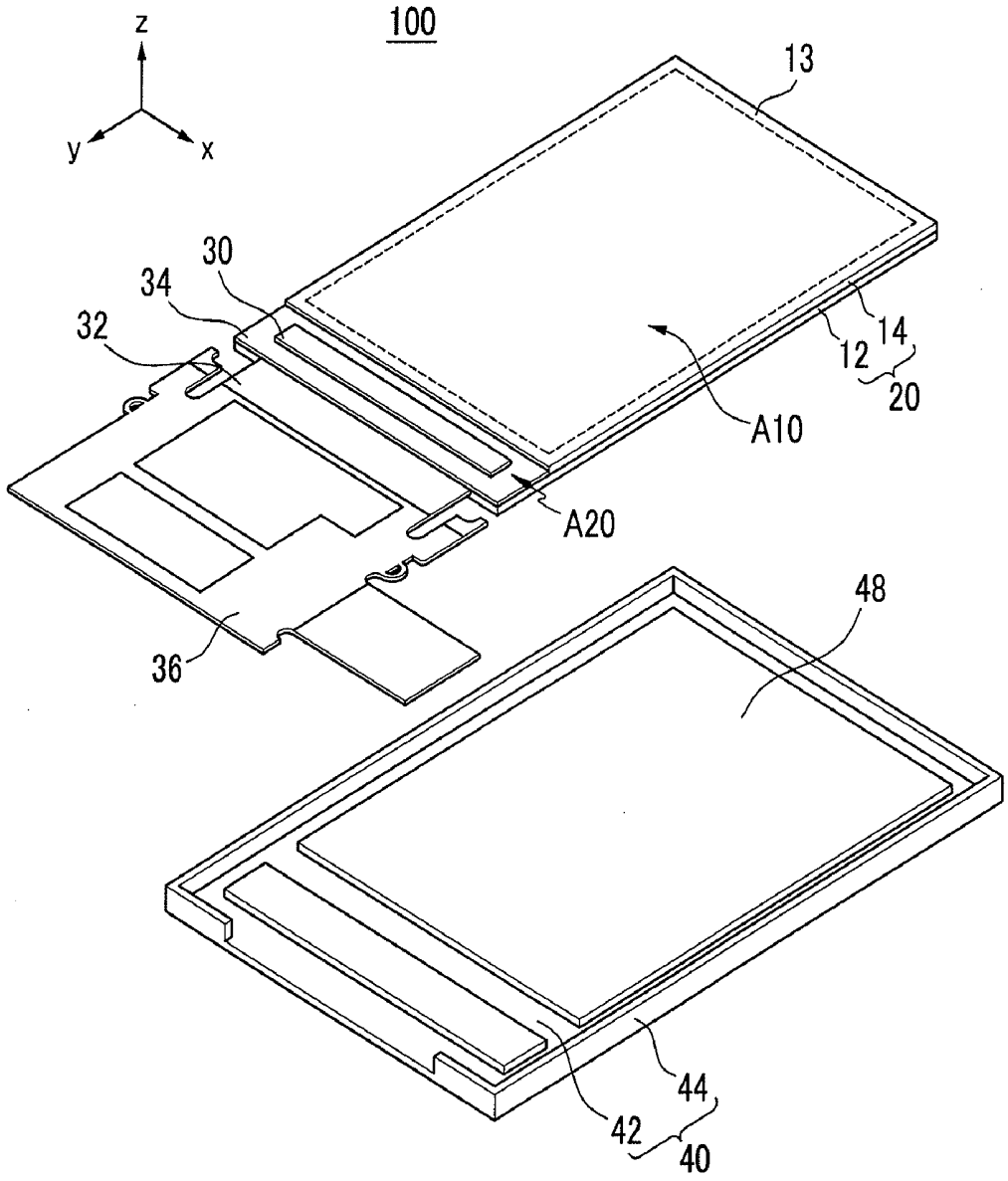


FIG.2

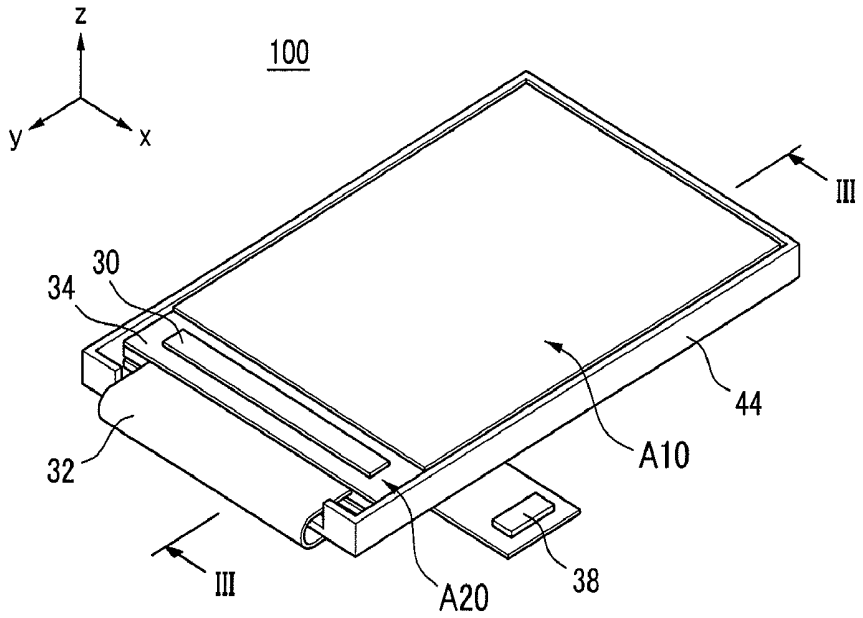
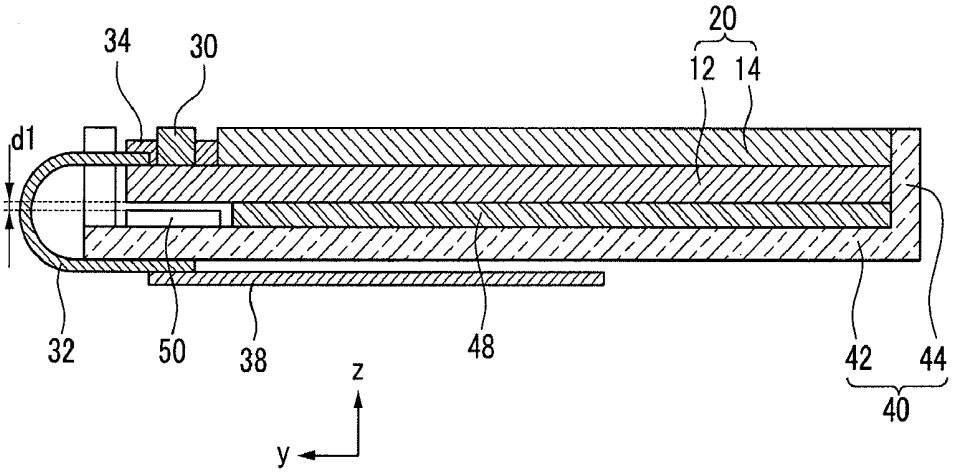

z
y
x
100
III
30
34
44
A10
32
III
A20
38

FIG.3


20
34
30
12
14
d1
32
50
38
48
42
44
40
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y

ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAY

RELATED APPLICATION

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-2010-0103546 filed in the Korean Intellectual Property Office on Oct. 22, 2010, the entire contents of which are incorporated herein by reference.

BACKGROUND

[0002] 1. Field

[0003] The described technology generally relates to an organic light emitting diode (OLED) display.

[0004] 2. Description of the Related Technology

[0005] An organic light emitting device includes two electrodes and an organic light emitting layer interposed between the two electrodes. One of the two electrodes injects holes and the other injects electrons into the light emitting member. The injected electrons and holes are combined to form excitons and the excitons emit light as discharge energy.

SUMMARY

[0006] One inventive aspect is an organic light emitting diode (OLED) display that is impact-resistant.

[0007] Another aspect is an organic light emitting diode (OLED) display which includes a display panel including a display area and a pad area, a bezel receiving the display panel, and a reinforcing member positioned between the pad area of the display panel and the bezel.

[0008] The lower surface of the pad area of the display panel and the upper surface of the reinforcing member may be separated from each other by a predetermined interval.

[0009] A cushioning tape positioned between the display area of the display panel and the bezel may be further included.

[0010] The bezel may include a bottom portion and a side wall portion protruded from the edge of the bottom portion, and the reinforcing member may be in contact with the bottom portion.

[0011] The reinforcing member may be enclosed by the cushioning tape and the side wall portion of the bezel.

[0012] The reinforcing member may include a material selected from a group of stainless steel, steel plate cold commercial, aluminum, an aluminum alloy, and a nickel alloy.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. **1** is an exploded perspective view of an organic light emitting diode (OLED) display according to an embodiment.

[0014] FIG. **2** is a perspective view showing a state in which a display panel is received at a bezel in FIG. **1**.

[0015] FIG. **3** is a cross-sectional view taken along the line of FIG. **2**.

DETAILED DESCRIPTION

[0016] An organic light emitting diode (OLED) display generally includes i) two substrates that are fixed by a sealant, ii) a display panel having a display area and a pad area, iii) a bezel combined to the display panel, and iv) a flexible printed circuit (FPC) electrically connected to the display panel through a flexible printed circuit board (FPCB).

[0017] Unlike an LCD in which a structure such as a backlight unit is positioned between the display panel and the bezel, in the OLED, because no structure exists between the display panel and the bezel, an impact is directly transmitted to the display panel in a sudden situation such as the device being dropped, whereby the display panel may be easily damaged.

[0018] Particularly, the lateral wall of the bezel is omitted at the portion where the flexible circuit board is contacted such that twisting strength and bending strength at the portion corresponding to the pad area of the display panel among the bezel is reduced.

[0019] Accordingly, if a user drops the organic light emitting diode (OLED) display during usage, a large twist load and a large bend load instantaneously act at the portion corresponding to the pad area of the display panel among the bezel such that the bezel is deformed. As a result, the twist load and the bend load are transmitted to the display panel combined to the bezel as it is such that the display panel may be easily damaged.

[0020] Embodiments will be described more fully hereinafter with reference to the accompanying drawings. As those skilled in the art would realize, the described embodiments may be modified in various different ways.

[0021] Further, like reference numerals designate like elements throughout the specification.

[0022] The size and thickness of each of elements that are displayed in the drawings are described for better understanding and ease of description, and the present invention is not limited by the described size and thickness.

[0023] Next, a display device according to an embodiment will be described with reference to FIG. **1** to FIG. **3**.

[0024] FIG. **1** is an exploded perspective view of an organic light emitting diode (OLED) **100** display according to an embodiment, FIG. **2** is a perspective view showing a state in which a display panel is received at a bezel in FIG. **1**, and FIG. **3** is a cross-sectional view taken along the line III-III of FIG. **2**.

[0025] As shown in FIG. **1** to FIG. **3**, an organic light emitting diode (OLED) display according to an embodiment includes a display area A**10** and a pad area A**20**, and has a display panel **20** displaying a predetermined image at the display area A**10**, a bezel **40** combined to the display panel **20** at the rear of the display panel **20**, and a flexible printed circuit (FPC) **36** electrically connected to the display panel **20** through a flexible circuit board **32**.

[0026] The display panel **20** has a first substrate **12** and a second substrate **14** with a smaller size than the first substrate **12** and fixed to the first substrate **12** by a sealant **13** at an edge thereof. The display area A**10** substantially overlapping with the first substrate **12** and the second substrate **14** and actually displaying the image is positioned inside the sealant **13**, and the pad area A**20** on the first substrate **12** is positioned outside the sealant **13**.

[0027] Subpixels may be disposed in a matrix format in the display area A**10** of the first substrate **12**, and a scan driver (not shown) and a data driver (not shown) to drive the subpixels are positioned between the display area A**10** and the sealant **13** or outside the sealant **13**. Pad electrodes to transmit an electrical signal to the scan driver and the data driver are positioned at the pad area A**10** of the first substrate **12**.

[0028] The second substrate **14** is combined to the first substrate **12** by the sealant **13** with a predetermined interval therebetween such that driving circuits formed in the first

substrate **12** and the organic light emitting elements are sealed from the outside for protection. The second substrate **14** may be an upper substrate of the display panel **20**, and an absorption agent (not shown) may be attached to the inner surface of the second substrate **14**.

[0029] In one embodiment, an integrated circuit chip **30** is mounted as a chip-on-glass (COG) type, and the flexible circuit board **32** is mounted as a chip-on-film (COF) type at the pad area A**20** of the display panel **20**. A protective layer **34** is formed near the integrated circuit chip **30** and the flexible circuit board **32**, thereby covering and protecting the pad electrodes formed at the pad area A**20**.

[0030] In the flexible printed circuit (FPC) **36**, electronic elements (not shown) to process driving signals are mounted, and a connector **38** to transmit external signals to the flexible printed circuit (FPC) **36** is installed. The flexible circuit board **32** fixed to the pad area A**20** is folded into the back side of the bezel **40** such that the flexible printed circuit (FPC) **36** is positioned at the rear surface of the bezel **40**.

[0031] In the present embodiment, the bezel **40** includes a bottom portion **42** mounted with the display panel **20** and a side wall portion **44** extending from the edge of the bottom portion **42** except for the portion with which the flexible circuit board **32** is contacted toward the display panel **20**. The side wall portion **44** is in contact with the side surface of the display panel **20**.

[0032] The bezel **40** may be formed of a material having excellent strength, for example, stainless use steel (SUS), steel plate cold commercial (SPCC), aluminum, an aluminum alloy, a nickel alloy, and the like, and may be completed through a process in which the side wall portion **44** is bent from the bottom portion **42** at about a 90 degree angle. Also, a cushioning tape **48** is positioned between the bottom portion **42** of the bezel **40** and the display area A**10** of the display panel **20** such that the display panel **20** may be fixed to the bezel **40**.

[0033] A reinforcing member **50** is positioned between the pad area A**20** of the display panel **20** and the bottom portion **42** of the bezel **40**. In one embodiment, the reinforcing member **50** contacts the bottom portion **42**, and the lower surface of the pad area A**20** of the display panel **20** and the upper surface of the reinforcing member **50** are separated from each other by a predetermined interval d**1**. This is to prevent the external impact from being directly transmitted to the pad area A**20** of the display panel **20**. The reinforcing member **50** may be attached to the bottom portion **42** through welding.

[0034] The reinforcing member **50** is enclosed by the cushioning tape **48** and the side wall portion **44** of the bezel **40**. In one embodiment, the reinforcing member **50** includes a metallic material such as stainless use steel (SUS), steel plate cold commercial (SPCC), aluminum, an aluminum alloy, and a nickel alloy.

[0035] The bezel **40** is combined to the lower surface of the display panel **20** through the cushioning tape **48** thereby having a function of fixing and supporting the display panel **20**. In the present embodiment, the reinforcing member **50** is formed at a portion that is mechanically weak because the side wall **44** is not provided, that is, at the bottom portion of the bezel **40** corresponding to the portion with which the flexible circuit board **32** is contacted, in order to increase twisting strength and bending strength of the bezel **40**.

[0036] Accordingly, in the organic light emitting diode (OLED) display according to the present embodiment, the reinforcing member **50** is formed at the bottom portion **42** of the bezel **40** to provide uniform strength to the whole bezel **40** such that the deformation amount of the bezel **40** may be decreased during the dropping impact. As a result, the twisting and bending applied from the bezel **40** to the display panel **20** is decreased such that the damage to the display panel **20** may be reduced.

[0037] Table 1 below shows measurements of damage to an organic light emitting diode (OLED) display after a comparative organic light emitting diode (OLED) display is mounted on a drop jig and the drop jig is released, and Table 2 shows measurements of damage to an organic light emitting diode (OLED) display after an organic light emitting diode (OLED) display according to an embodiment is mounted on a drop jig and the drop jig is released.

TABLE 1

Division		#1	#2	#3	#4	#5	#6	#7	#8
1 time	rear side	○	○	○	○	○	○	○	○
1 time	front side	○	x	○	○	○	○	○	○
2 times	rear side	○		○	○	○	○	○	○
2 times	front side	○		○	○	○	○	○	○
3 times	rear side	○		○	○	○	x	x	○
3 times	front side	○		○	x	x			○
4 times	rear side	x		○					○
4 times	front side			○					○
5 times	rear side			x					○
5 times	front side								○
6 times	rear side								○
6 times	front side								○
7 times	rear side								○
7 times	front side								○
8 times	rear side								○
8 times	front side								○
9 times	rear side								○
9 times	front side								○
10 times	rear side								○
10 times	front side								○
Percent OK	result	30	5	40	25	25	20	20	100
Percent OK	average				33.13				

TABLE 2

Division		#1	#2	#3	#4	#5	#6	#7	#8
1 time	rear side	○	○	○	○	○	○	○	○
1 time	front side	○	○	○	○	○	○	○	○
2 times	rear side	○	○	○	○	○	○	○	○
2 times	front side	○	○	○	○	○	○	○	○
3 times	rear side	○	○	○	○	○	○	○	○
3 times	front side	○	○	○	○	○	○	○	○
4 times	rear side	○	○	○	○	○	○	○	○
4 times	front side	○	○	○	○	○	○	○	x
5 times	rear side	○	○	○	○	x	x	○	
5 times	front side	○	○	○	x			○	
6 times	rear side	○	x	x				○	
6 times	front side	○						○	
7 times	rear side	x						○	
7 times	front side							○	
8 times	rear side							○	
8 times	front side							○	
9 times	rear side							x	
9 times	front side								
10 times	rear side								
10 times	front side								
Percent OK	result	60	45	50	45	40	40	80	35
Percent OK	average				49.38				

[0038] The drop height of a drop jig is 1.1 m, the front side faces downward and a drop is performed in "front side", and the rear side faces downward and a drop is performed in "rear

side". Eight (#**1** to #**8**) organic light emitting diode (OLED) displays are dropped up to a total of ten times on each of the front side and rear side to determine damage to the organic light emitting diode (OLED) displays.

[0039] As shown in Table 1, the comparative organic light emitting diode (OLED) display is damaged when the number of drops is an average of 33.13 percent of the total, however, as shown in Table 2, the organic light emitting diode (OLED) display according to an embodiment is damaged when the number of drops is an average of 49.38 percent of the total. Accordingly, the organic light emitting diode (OLED) display according to the present embodiment that includes the reinforcing member **50** at the bottom portion **42** of the bezel **40** provides uniform strength to the whole bezel **40** such that the deformation amount of the bezel **40** may be minimized during the drop impact, and as a result, the twisting load and the bending load that are applied from the bezel **40** to the display panel **20** are decreased such that damage to the display panel **20** may be reduced.

[0040] According to at least one of the disclosed embodiments, the reinforcing member is formed between the pad area of the display panel and the bezel such that the deformation of the portion corresponding to the pad area of the display panel among the bezel may be prevented during an external impact, and thereby the twisting strength and the bending strength may be improved.

[0041] While the disclosed embodiments have been described with reference to the accompanying drawings, it is to be understood that the disclosed embodiments are not considered limiting. Further, various modifications and equivalent arrangements are included within the spirit and scope of the appended claims.

What is claimed is:

1. An organic light emitting diode (OLED) display comprising:
- a display panel including i) a display area configured to display an image and ii) a pad area adjacent to the display area and configured not to display an image;
- a bezel configured to receive the display panel; and
- a reinforcing member positioned between the pad area of the display panel and the bezel.

2. The organic light emitting diode (OLED) display of claim **1**, wherein a lower surface of the pad area of the display panel and an upper surface of the reinforcing member are separated from each other by a predetermined interval.

3. The organic light emitting diode (OLED) display of claim **1**, further comprising:
- a cushioning tape positioned between the display area of the display panel and the bezel.

4. The organic light emitting diode (OLED) display of claim **1**, wherein the bezel includes:
- a bottom portion; and
- a side wall portion protruded from the edge of the bottom portion, and
- wherein the reinforcing member contacts the bottom portion.

5. The organic light emitting diode (OLED) display of claim **4**, wherein the reinforcing member is enclosed by the cushioning tape and the side wall portion of the bezel.

6. The organic light emitting diode (OLED) display of claim **1**, wherein the reinforcing member includes a material selected from the group consisting of stainless steel, steel plate cold commercial, aluminum, an aluminum alloy, and a nickel alloy.

* * * * *

专利名称(译)	有机发光二极管（OLED）显示器		
公开(公告)号	US20120098736A1	公开(公告)日	2012-04-26
申请号	US13/047639	申请日	2011-03-14
[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DISPLAY CO.，LTD.		
[标]发明人	YEE DONG SU		
发明人	YEE, DONG-SU		
IPC分类号	G09G3/30		
CPC分类号	G06F1/1626 H01L51/5237 G09F9/33 G06F1/169		
优先权	1020100103546 2010-10-22 KR		
其他公开文献	US8829790		
外部链接	Espacenet USPTO		

摘要(译)

公开了一种有机发光二极管（OLED）显示器。在一个实施例中，显示器包括1）显示面板，包括：i）显示区域，被配置为显示图像; ii）垫区域，与显示区域相邻并被配置为不显示图像; 2）边框，被配置为接收图像。显示面板和3）位于显示面板的焊盘区域和边框之间的加强构件。根据至少一个实施例，可以在外部冲击期间防止边框中与显示面板的焊盘区域对应的部分的变形，从而可以提高扭曲强度和弯曲强度。