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(54) **PIXEL STRUCTURE AND MASK FOR MANUFACTURING THE SAME**

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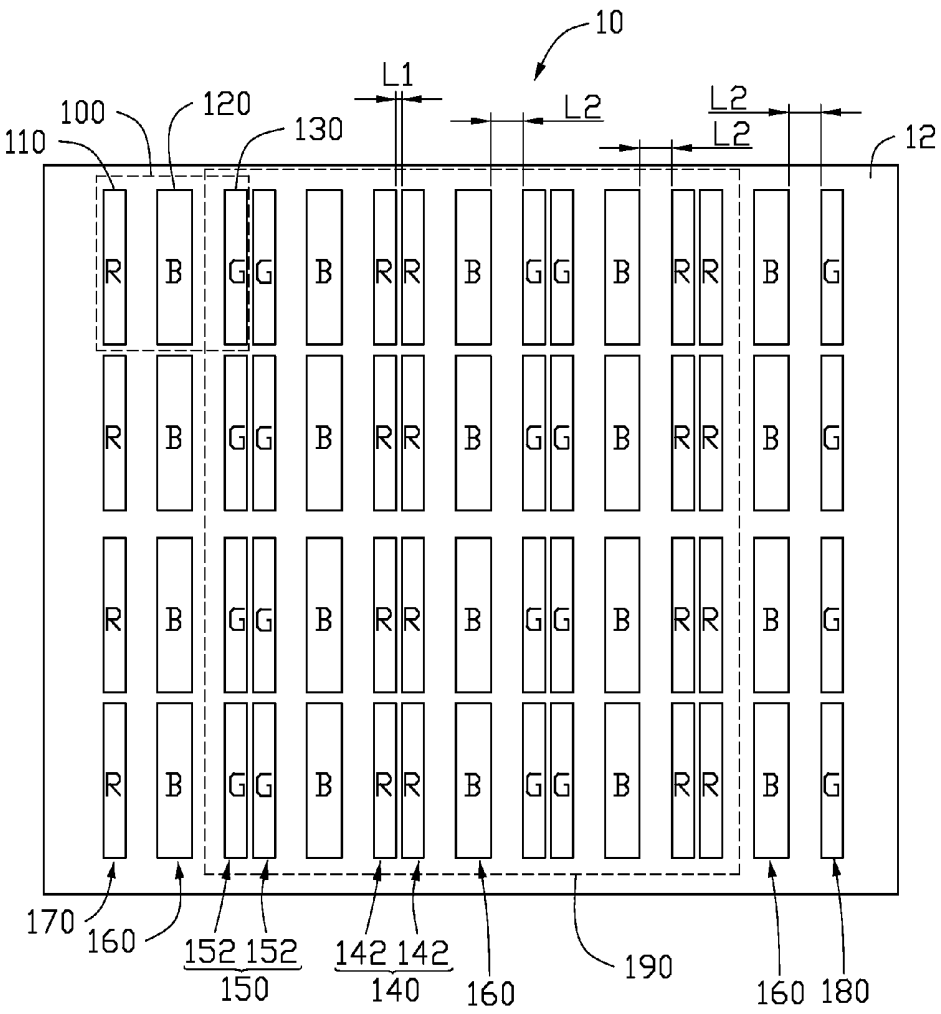
USPC **257/40**; 118/504

(57) **ABSTRACT**

A pixel structure of an organic light emitting diode display includes a number of pixels arranged as a matrix and formed on a substrate. Each of the pixels includes a first sub-pixel of one color, and second and third sub-pixels each of different colors. The pixel structure at least includes a first sub-pixel column pair having two adjacent first sub-pixel columns with a first interval defined therebetween, a third sub-pixel column pair having two adjacent second sub-pixel columns with the first interval defined therebetween, and a second sub-pixel column between the first sub-pixel column pair and the third sub-pixel column pair. The pixel structure defines a second interval between the first sub-pixel column pair and the second sub-pixel column, and between the third sub-pixel column pair and the second sub-pixel column.



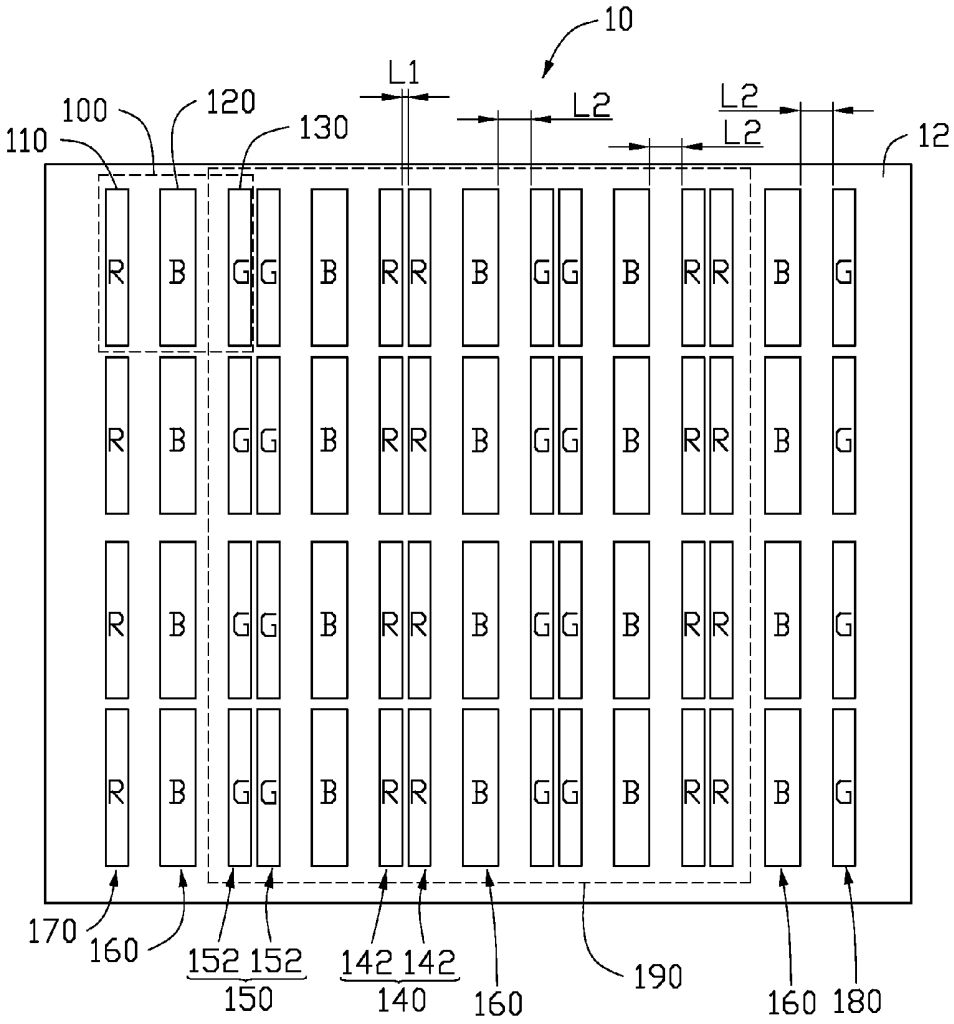

10
L1
L2
L2
L2
100
110
120
130
12
R
B
G
170
160
152 152
150
142 142
140
160
190
160
180

FIG. 1

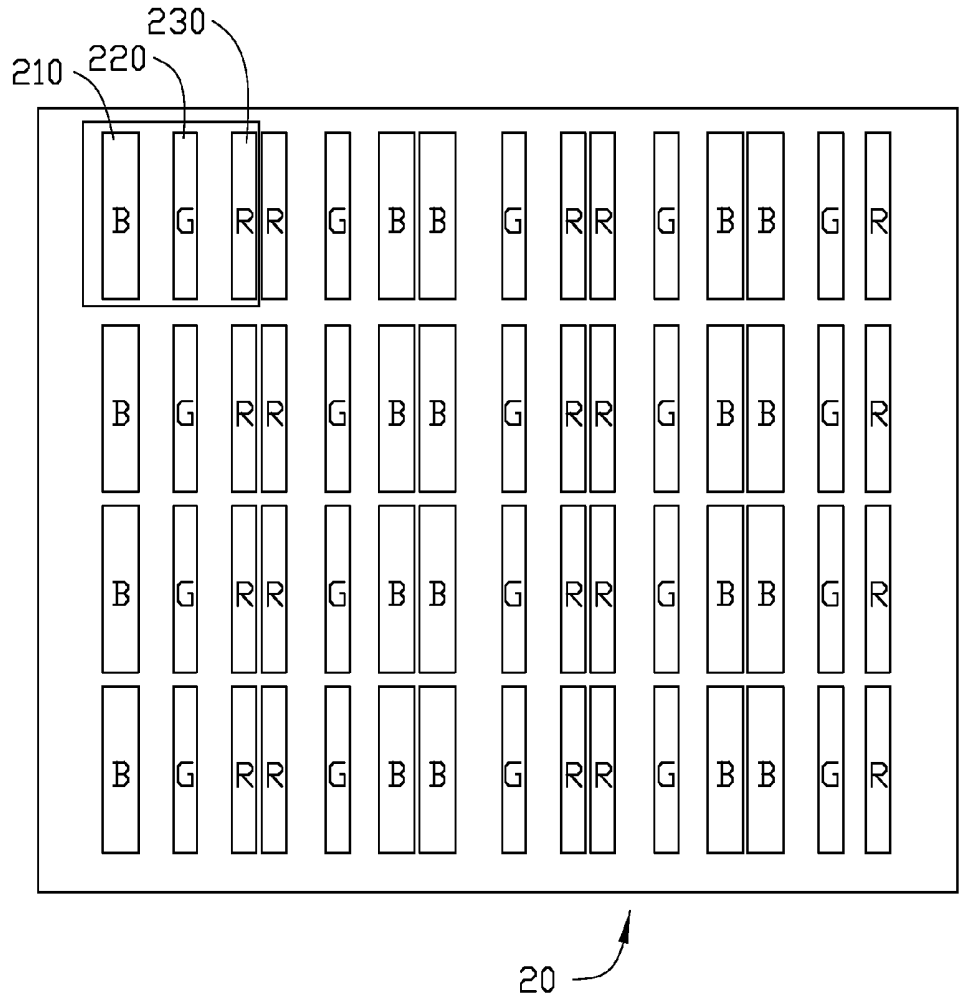

230
220
210
B G R R G B B G R R G B B G R
B G R R G B B G R R G B B G R
B G R R G B B G R R G B B G R
B G R R G B B G R R G B B G R
20

FIG. 2

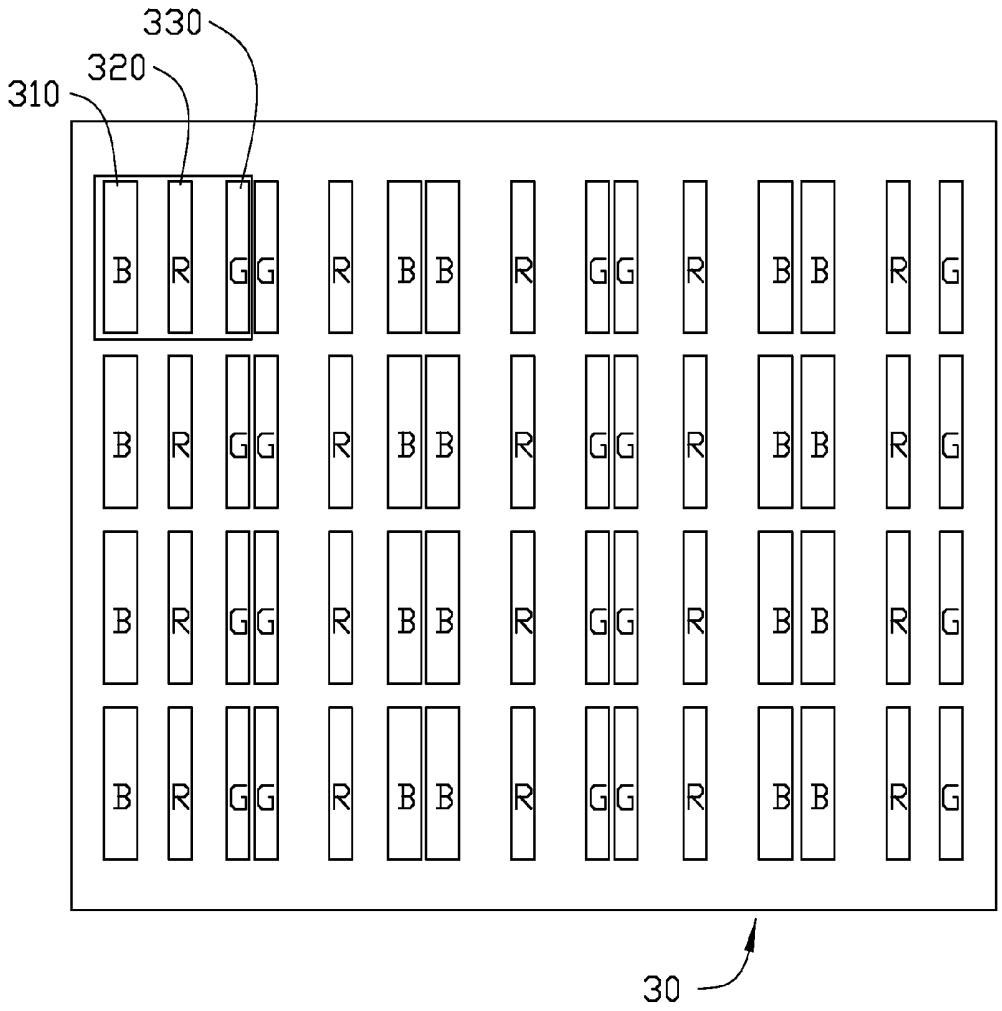


FIG. 3

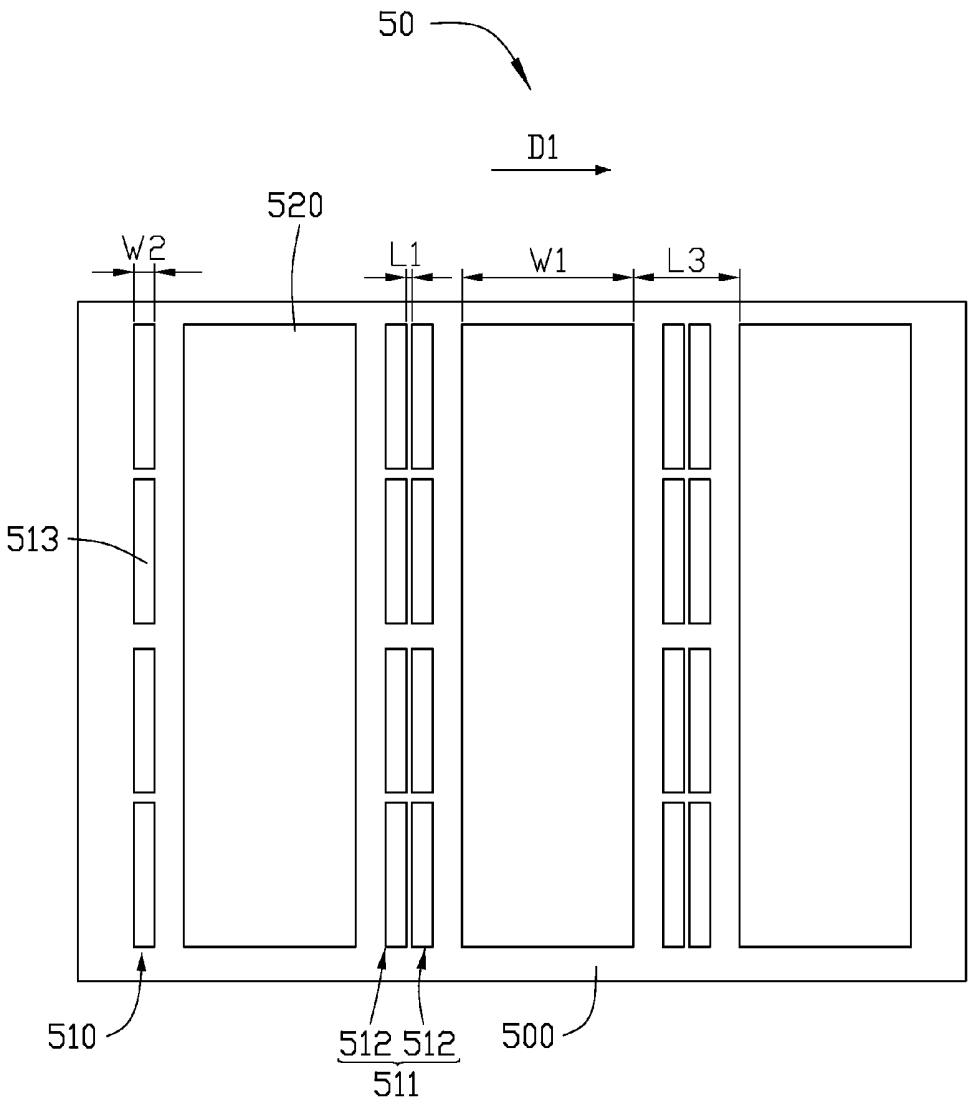


FIG. 4

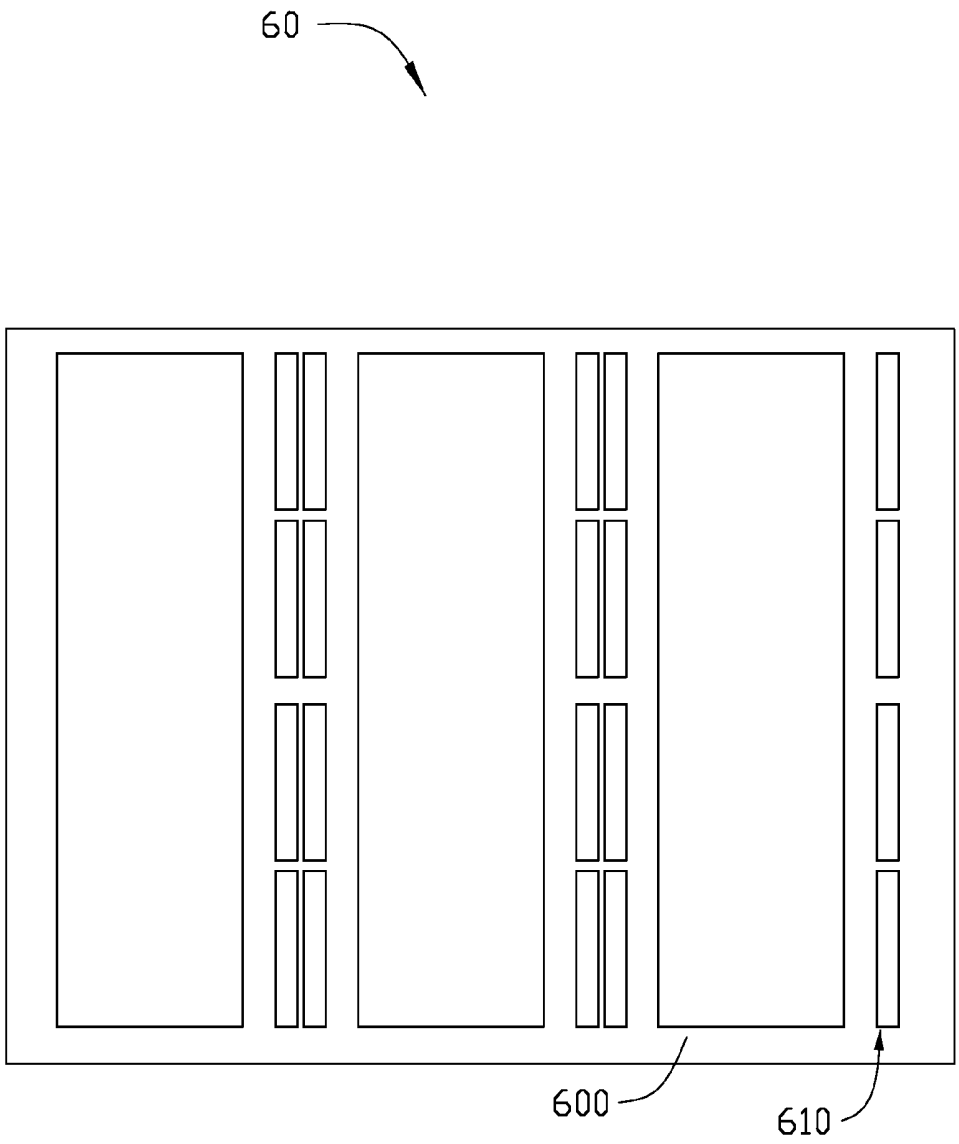


FIG. 5

PIXEL STRUCTURE AND MASK FOR MANUFACTURING THE SAME

FIELD

[0001] The disclosure generally relates to organic light emitting diode (OLED) display manufacturing technologies.

BACKGROUND

[0002] An OLED display panel includes a number of pixels formed on a substrate. Each of the pixels includes at least one red sub-pixel, one green sub-pixel, and one blue sub-pixel. The sub-pixels with different colors are made of different OLED material. In order to achive a high pixel density, an interval between two adjacent sub-pixels of different colors needs to be smaller. OLED materials of different colors mix and lose identity in two adjacent sub-pixels which are very close together.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Many aspects of the disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the views.

[0004] FIG. **1** is a diagrammatic view of a pixel structure of a first embodiment.

[0005] FIG. **2** is a diagrammatic view of a pixel structure of a second embodiment.

[0006] FIG. **3** is a diagrammatic view of a pixel structure of a third embodiment.

[0007] FIG. **4** is a diagrammatic view of a mask for manufacturing a first sub-pixel of the pixel structure of FIG. **1**.

[0008] FIG. **5** is a diagrammatic view of a mask for manufacturing a third sub-pixel of the pixel structure of FIG. **1**.

DETAILED DESCRIPTION

[0009] The disclosure is illustrated by way of example and not by way of limitation in the figures of the accompanying drawings in which like references indicate similar elements. It should be noted that references to "an" or "one" embodiment in this disclosure are not necessarily to the same embodiment, and such references can mean "at least one."

[0010] FIG. **1** illustrates a pixel structure **10** of an OLED display panel of a first embodiment. The pixel structure **10** of the first embodiment includes a number of pixels **100** arranged as a matrix and formed on a substrate **12**. Each of the pixels **100** includes a first sub-pixel **110**, a second sub-pixel **120**, and a third sub-pixel **130**. Colors of the first sub-pixel **110**, the second sub-pixel **120**, and the third sub-pixel **130** are different from each other. In this embodiment, the first sub-pixel **110** is a red sub-pixel, the second sub-pixel **120** is a blue sub-pixel, and the third sub-pixel **130** is a green sub-pixel.

[0011] The pixel structure **10** can include a first sub-pixel column pair **140**, a third sub-pixel column pair **150**, and a second sub-pixel column **160** which is between the first sub-pixel column pair **140** and the third sub-pixel column pair **150**. The first sub-pixel column pair **140** includes two adjacent first sub-pixel columns **142** and defines a first interval L**1** between these two adjacent first sub-pixel columns **142**. The third sub-pixel column pair **150** includes two adjacent third sub-pixel columns **152** and the first interval L**1** is also defined between these two adjacent third sub-pixel columns **152**. The pixel structure **10** defines a second interval L**2** between the first sub-pixel column pair **140** and the second sub-pixel column **160**, and between the third sub-pixel column pair **150** and the second sub-pixel column **160**.

[0012] In detail, the sub-pixels **110**, **120**, and **130** are divided into a first column of sub-pixels **170**, a final column of sub-pixels **180**, and a middle sub-pixel area **190** located between the first column of sub-pixels **170** and the final column of sub-pixels **180**. One second sub-pixel column **160** is located between the first column of sub-pixels **170** and the middle sub-pixel area **190** and the other second sub-pixel column **160** is located between the middle sub-pixel area **190** and the final column of sub-pixels **180**. The second interval L**2** is also defined between the second sub-pixel column **160** and the first column of sub-pixels **170**, and between the second sub-pixel column and the final column of sub-pixels **180**. The middle sub-pixel area **190** includes a number of first sub-pixel column pairs **140**, a number of third sub-pixel column pairs **150**, and a number of second sub-pixel columns **160**. The first sub-pixel column pairs **140** and the third sub-pixel column pairs **150** are alternately arranged. The second sub-pixel column **160** is located between the first sub-pixel column pair **140** and the third sub-pixel column pair **150**. In this embodiment, the first column of sub-pixels **170** contains the first sub-pixels **110** and the final column of sub-pixels **180** contains the third sub-pixels **130**. An outermost sub-pixel column pair in the middle sub-pixel area **190** which corresponding to the first column of sub-pixels **170** is the third sub-pixel column pair **150**. An outermost sub-pixel column pair of the sub-pixels in the middle sub-pixel area **190** which corresponds to the final column of the sub-pixels is the first sub-pixel column pair **140**.

[0013] In the pixel structure **10**, the first interval L**1** is greater than the second interval L**2**. For example, when a pixel density of the OLED display panel is 300 pixels per inch (PPI), a width of the first sub-pixel **110** is 6 micrometers, the first interval L**1** is 3 micrometer and the second interval L**2** is 26 micrometers. Because the pixel structure **10** has a number of the greater second interval L**2** between the adjacent sub-pixels **110**, **120**, and **130** of different colors, OLED materials of different colors are not mixed up. The pixel structure **10** has a number of the lesser first interval L**1** between the adjacent sub-pixels **110**, **120**, and **130**, which are all of same color, thus the pixel density of the OLED display panel can be increased.

[0014] The sub-pixels **110**, **120**, and **130** can be, but are not limited to being, in a rectangular configuration. An area of the red sub-pixel **110** is the same as an area of the green sub-pixel **120**. An area of the blue sub-pixel **130** is greater than the individual areas of each of the red and green sub-pixels, **110** and **120**.

[0015] FIG. **2** illustrates a pixel structure **20** of an OLED display panel of a second embodiment. The pixel structure **20** of the second embodiment is similar to the pixel structure **10** of the first embodiment except that the first sub-pixel **210** is a blue sub-pixel, the second sub-pixel **220** is a green sub-pixel, and the third sub-pixel **230** is a red sub-pixel.

[0016] FIG. **3** illustrates a pixel structure **30** of an OLED display panel of a third embodiment. The pixel structure **30** of the third embodiment is similar to the pixel structure **10** of the first embodiment except that the first sub-pixel **310** is a blue sub-pixel, the second sub-pixel **320** is a red sub-pixel, and the third sub-pixel **330** is a green sub-pixel.

[0017] FIG. **4** illustrates a mask **50** for manufacturing the first sub-pixels **110** of the OLED display panel. The mask **50** can include a base board **500** and defines a stacked column of openings **510** near one of two opposite peripheries of the base board **500** arranged along a horizontal direction D**1** of the base board **500**, a number of openings column pairs **511** parallel to the column of openings **510** and a shielding part **520** located after the column of openings **510** and then between every two adjacent column pair openings **511**. The column of openings **510**, the opening column pairs **511** and the shielding part **520** are orderly aligned with each other along and across the horizontal direction D**1** of the base board **500**. Each of the opening column pair **511** includes two closely adjacent columns of openings **512** and the first interval L**1** is defined between each two closely adjacent columns of openings **512**. A number of openings **513** of the mask **50** restricts OLED material of the first sub-pixels **110** from being deposited on certain predetermined positions on the substrate **12**, to form a pattern of the first sub-pixel **110**. In this embodiment, the column of openings **510** is defined near a left periphery of the base board **500**

[0018] A size and configuration of each opening **513** corresponds to the size and configuration of the first sub-pixel **110**. To form the OLED display panel of 300 PPI, a width W**2** of each opening **513** is 6 micrometers, the first interval L**1** of the opening column pair **511** is 3 micrometers, a width W**1** of the shielding part **520** is 93 micrometers and a third interval L**3** between two adjacent shielding parts is 43 micrometers.

[0019] FIG. **5** illustrates a mask **60** for manufacturing the third sub-pixels **130** of the OLED display panel. The structure of the mask **60** is similar to the structure of the mask **50** for manufacturing the first sub-pixels **110** of the OLED display panel except that the column of openings **610** is defined near a right periphery of the base board **600**.

[0020] It is believed that the present embodiments and their advantages will be understood from the foregoing description, and it will be apparent that various changes may be made thereto without departing from the spirit and scope of the disclosure or sacrificing all of its material advantages, the examples hereinbefore described merely being preferred or exemplary embodiments.

What is claimed is:

1. A pixel structure of an organic light emitting diode display comprising:

a plurality of pixels arranged as a matrix and formed on a substrate, each of the pixels comprising a first sub-pixel, a second sub-pixel and a third sub-pixel;

the first sub-pixel having a first color;

the second sub-pixel having a second color;

the third sub-pixel having a third color, wherein the first color, the second color and the third color are different from one another;

a first sub-pixel column pair comprising two adjacent first sub-pixel columns with a first interval defined therebetween;

a second sub-pixel column pair; and

a third sub-pixel column pair comprising two adjacent third sub-pixel columns with a first interval defined therebetween, wherein the second sub-pixel column pair is located between the first sub-pixel column pair and the third sub-pixel column pair;

wherein a second interval is defined between the first sub-pixel column pair and the second sub-pixel column and between the third sub-pixel column pair and the second sub-pixel column.

2. The pixel structure of claim **1**, wherein the pixel structure comprises a first column of sub-pixels, a final column of sub-pixels, a middle sub-pixels area located between the first column of sub-pixels and the final column of sub-pixels, one second sub-pixel column located between the first column of sub-pixels and the middle sub-pixel area and the other one second sub-pixel column located between the middle sub-pixel area and the final column of sub-pixels.

3. The pixel structure of claim **2**, wherein the middle sub-pixel area comprises a plurality of first sub-pixel column pairs, a plurality of third sub-pixel column pairs and a plurality of second sub-pixel columns, the first sub-pixel column pairs and the third sub-pixel column pairs are alternately arranged, and the second sub-pixel columns are correspondingly located between the first sub-pixel column pair and the third sub-pixel column pair.

4. The pixel structure of claim **3**, wherein the first column of sub-pixels are the first sub-pixels, the final column of sub-pixels are the third sub-pixels, an outermost sub-pixel column pair in the middle sub-pixel area corresponding to the first column of sub-pixels is the third sub-pixel column pair, and an outermost sub-pixel column pair in the middle sub-pixel area corresponding to the final column of the sub-pixels is the first sub-pixel column pair.

5. The pixel structure of claim **2**, wherein the second interval is also correspondingly defined between the second sub-pixel column and the first column of sub-pixels and between the secong sub-pixel column and the final column of sub-pixels.

6. The pixel structure of claim **5**, wherein the first interval is greater than the second interval.

7. The pixel structure of claim **1**, wherein the first sub-pixel is a red sub-pixel, the second sub-pixel is a blue sub-pixel, and the third sub-pixel is a green sub-pixel.

8. The pixel structure of claim **1**, wherein the first sub-pixel is a blue sub-pixel, the second sub-pixel is a green sub-pixel, and the third sub-pixel is a red sub-pixel.

9. The pixel structure of claim **1**, wherein the first sub-pixel is a red sub-pixel, the second sub-pixel is a blue sub-pixel and the third sub-pixel is a green sub-pixel.

10. A mask for manufacturing sub-pixels of an organic light emitting diode display panel comprising:

a base board;

a column of openings defined near one of two opposite peripheries of the base board along a horizontal direction of the base board;

a plurality of opening column pairs defined in the base board; and

a shielding part located after the column of openings and then between every two adjacent opening column pairs;

wherein the column of openings, the opening column pairs and the shielding part are aligned with each other along and across the horizontal direction of the base board, and each of the opening column pair comprises two closely adjacent columns of openings and a first interval is defined between each two closely adjacent columns of openings.

11. The mask of claim **10**, wherein the column of opening is defined near a right periphery of the base board.

12. The mask of claim **10**, wherein the column of opening is defined near a left periphery of the base board.

* * * * *

专利名称(译)	像素结构和制造相同的掩模		
公开(公告)号	US20150001512A1	公开(公告)日	2015-01-01
申请号	US14/320756	申请日	2014-07-01
[标]申请(专利权)人(译)	业鑫科技顾问股份有限公司		
申请(专利权)人(译)	叶欣科技咨询有限公司.		
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[标]发明人	HUANG CHUN CHIEH WANG WEI LI		
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IPC分类号	H01L27/32 B05C21/00		
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优先权	102123544 2013-07-01 TW		
外部链接	Espacenet USPTO		

摘要(译)

有机发光二极管显示器的像素结构包括布置为矩阵并形成在基板上的多个像素。每个像素包括一种颜色的第一子像素，以及每种不同颜色的第二和第三子像素。所述像素结构至少包括第一子像素列对，所述第一子像素列对具有两个相邻的第一子像素列，所述第一子像素列之间具有第一间隔，第三子像素列对具有两个相邻的第二子像素列，所述第二子像素列之间限定有所述第一间隔，第一子像素列对和第三子像素列对之间的第二子像素列。像素结构限定第一子像素列对与第二子像素列之间以及第三子像素列对与第二子像素列之间的第二间隔。