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(54) ORGANIC LIGHT-EMITTING DISPLAY PANEL AND DISPLAY DEVICE

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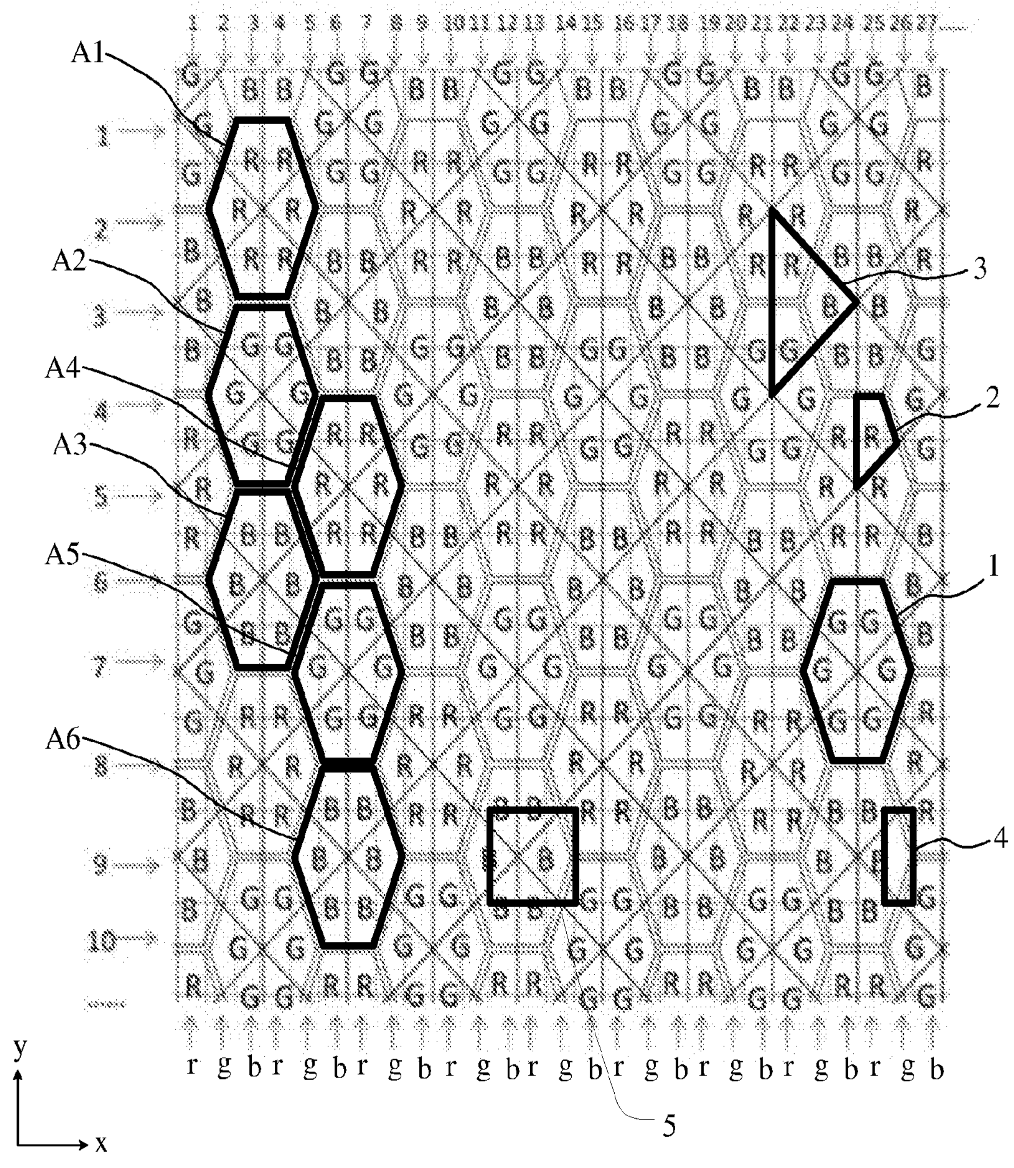
(57) **ABSTRACT**

An organic light-emitting display panel includes a plurality of pixel defining aperture regions each having a same shape and size. Each pixel defining aperture region is partitioned into six sub-pixel regions, the six sub-pixels has a same area defined by six boundary lines, each boundary line is a connection line running from a center point to an edge of the pixel defining aperture region. The plurality of the pixel defining aperture regions is characterized with three different colors. The six sub-pixels of any one of the pixel defining aperture regions is characterized with a same color. Two adjacent pixel defining aperture regions are characterized with different colors. Three connection lines between the center points of three adjacent pixel defining aperture regions have different colors constitute an isosceles right triangle, and three sub-pixel regions defined by the isosceles right triangle constitute one pixel unit.



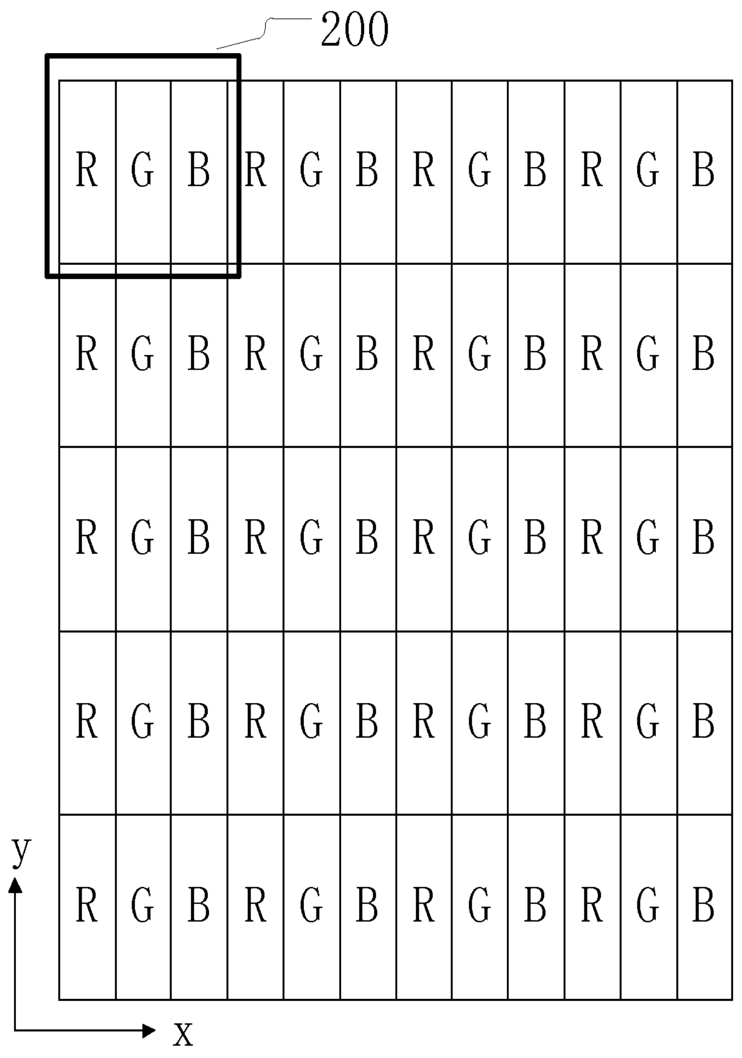

200
R G B R G B R G B R G B
R G B R G B R G B R G B
R G B R G B R G B R G B
R G B R G B R G B R G B
R G B R G B R G B R G B
y
x

FIG. 1a

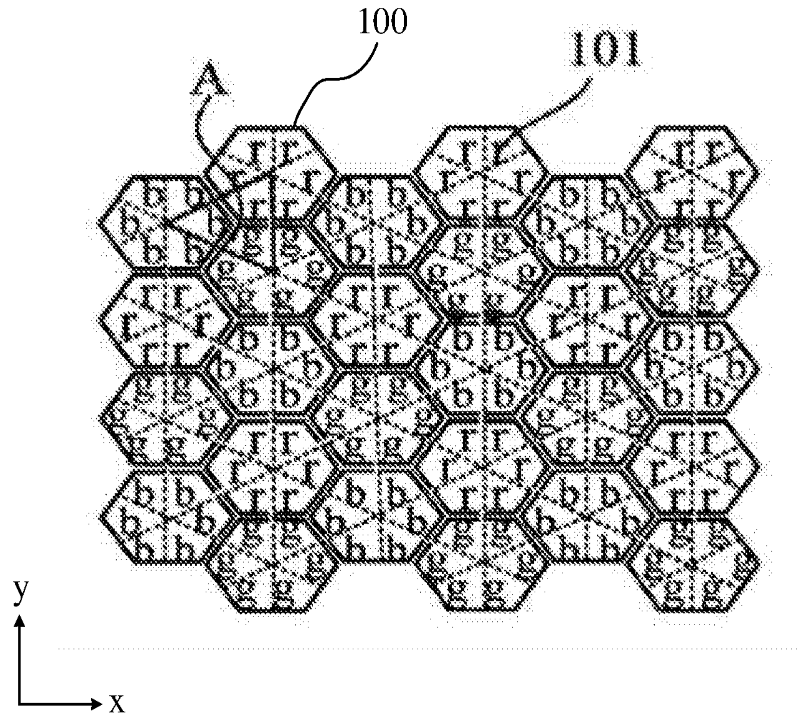


FIG. 1b

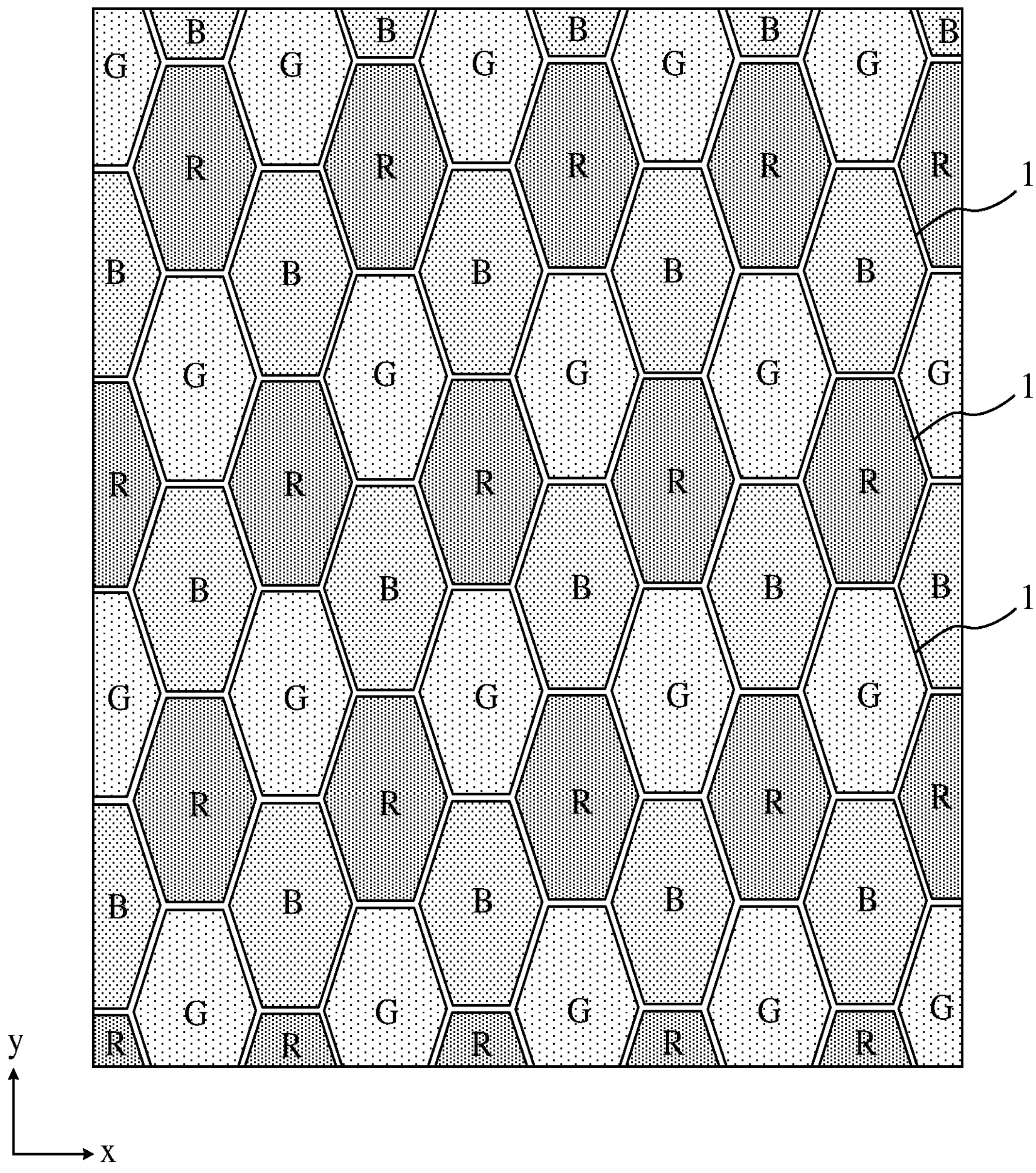


FIG. 2

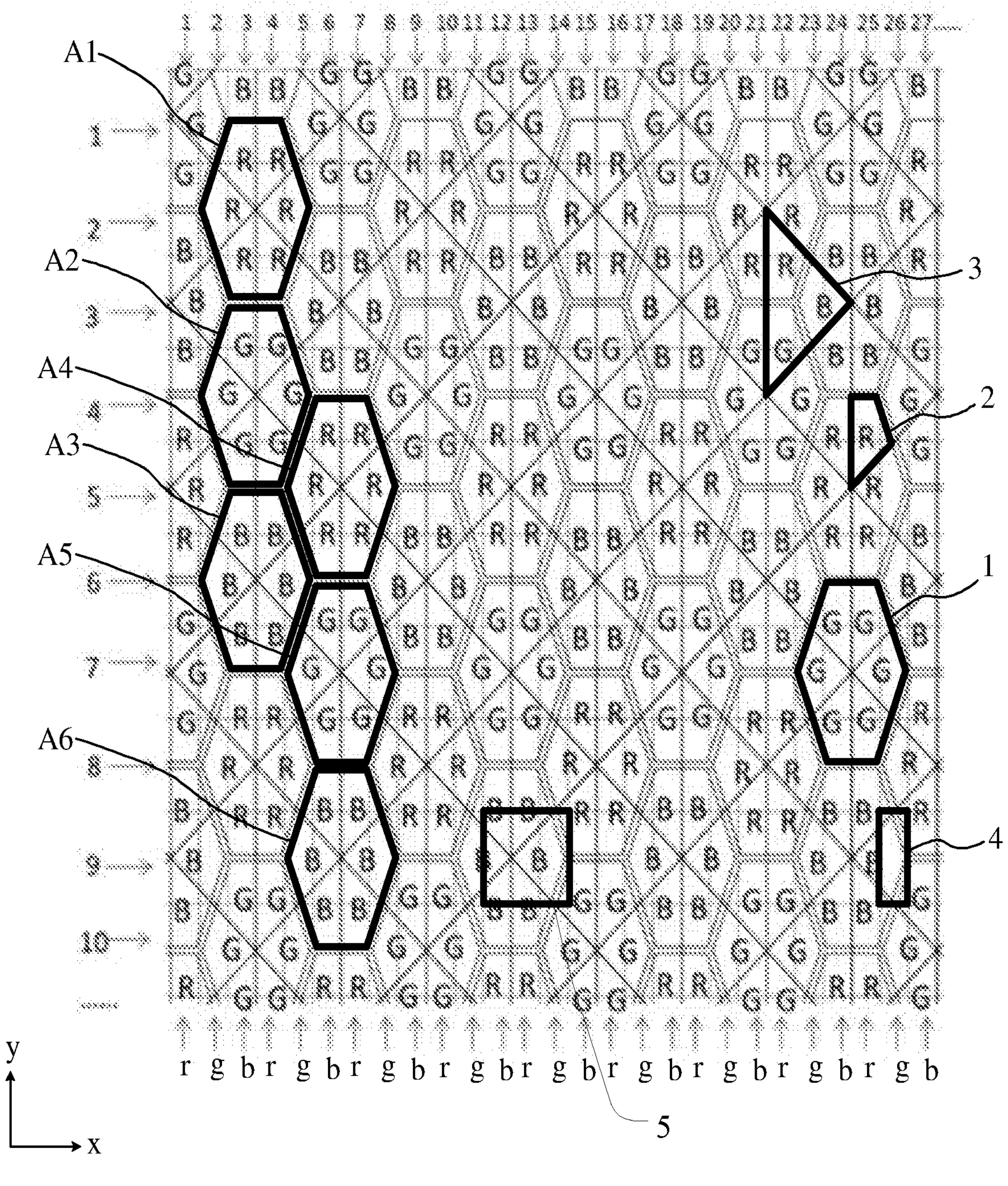


FIG. 3

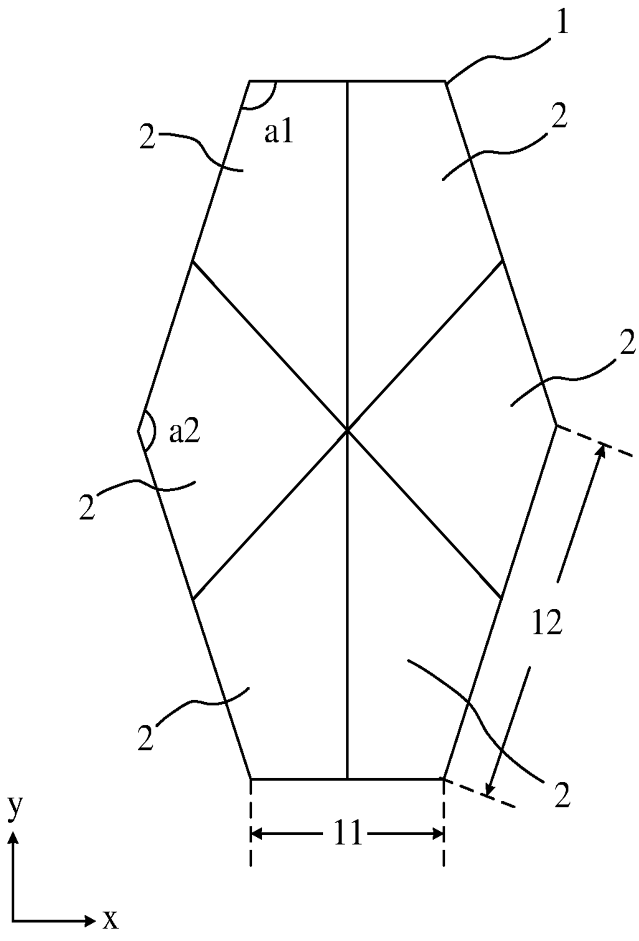


FIG. 4

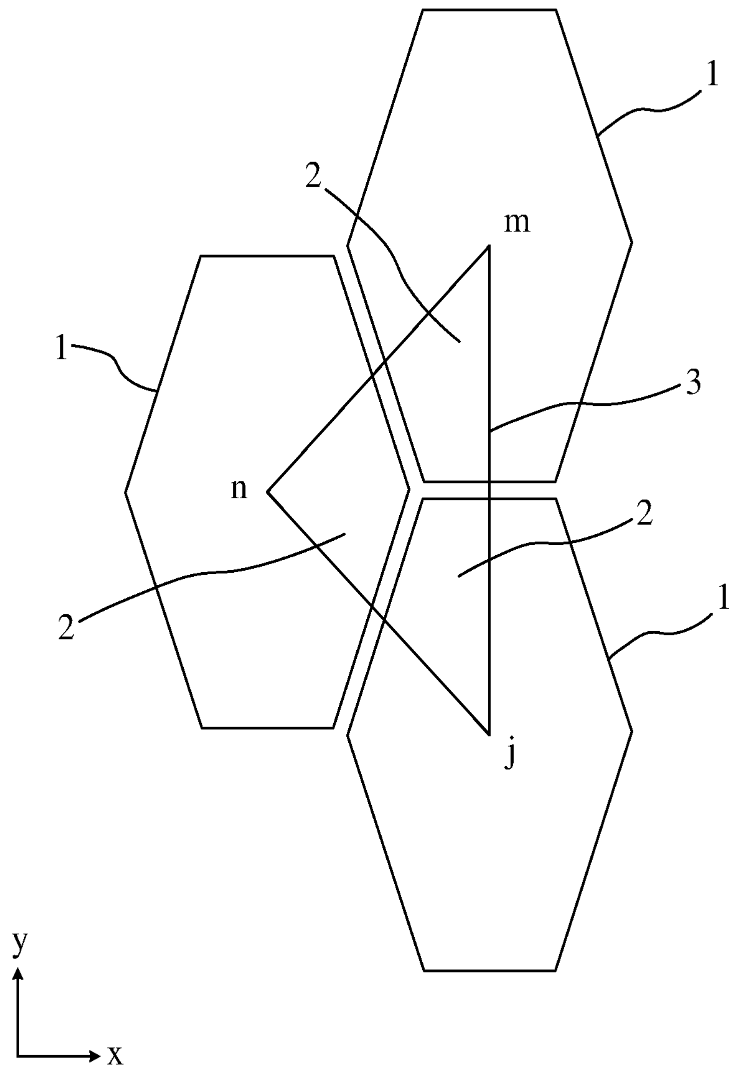


FIG. 5

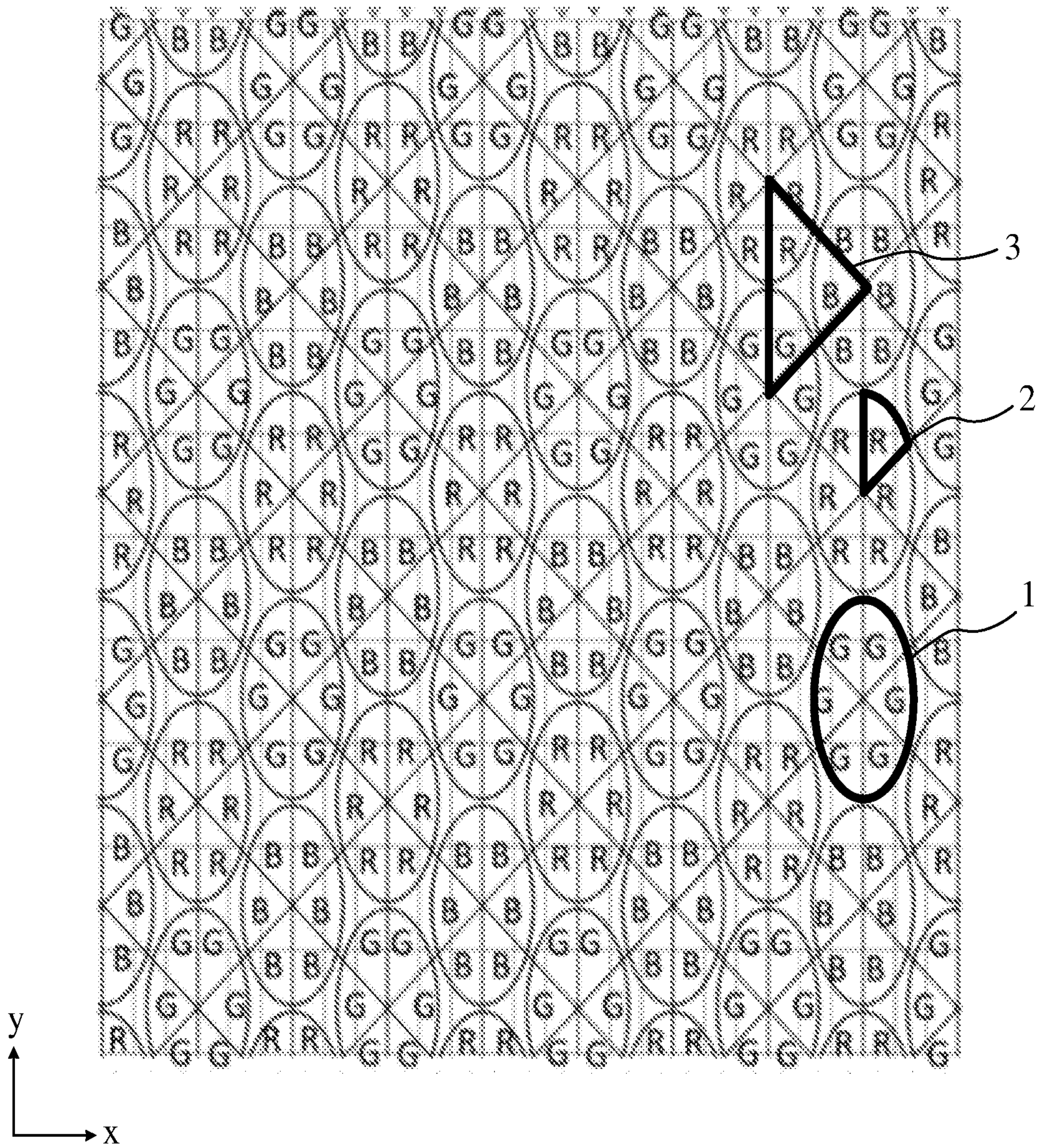


FIG. 6

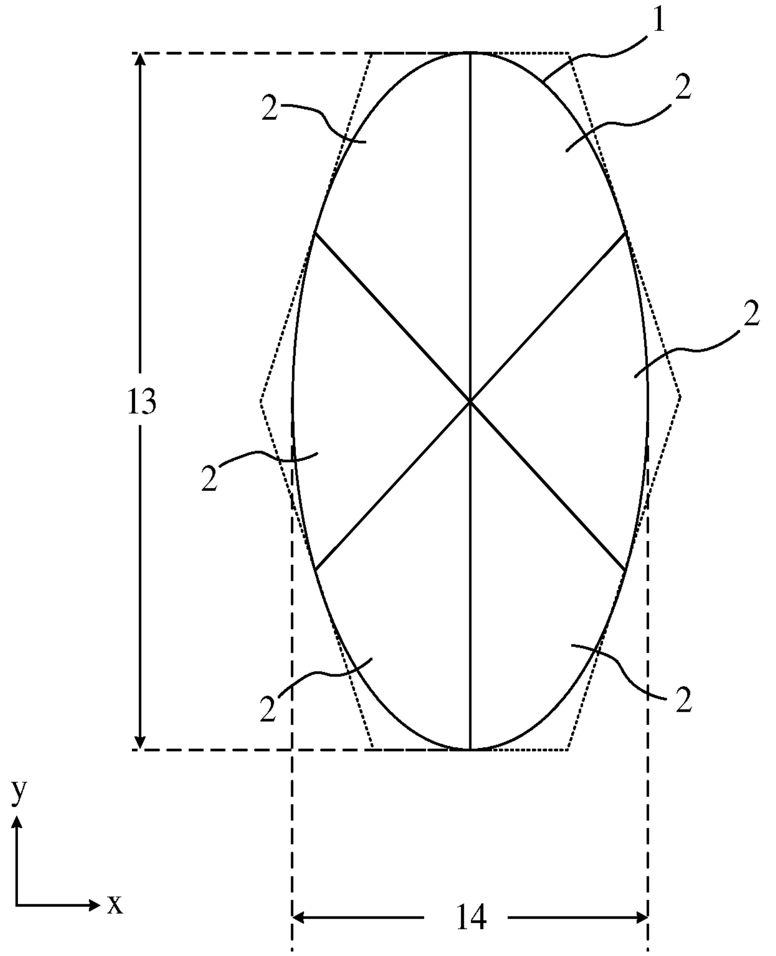


FIG. 7

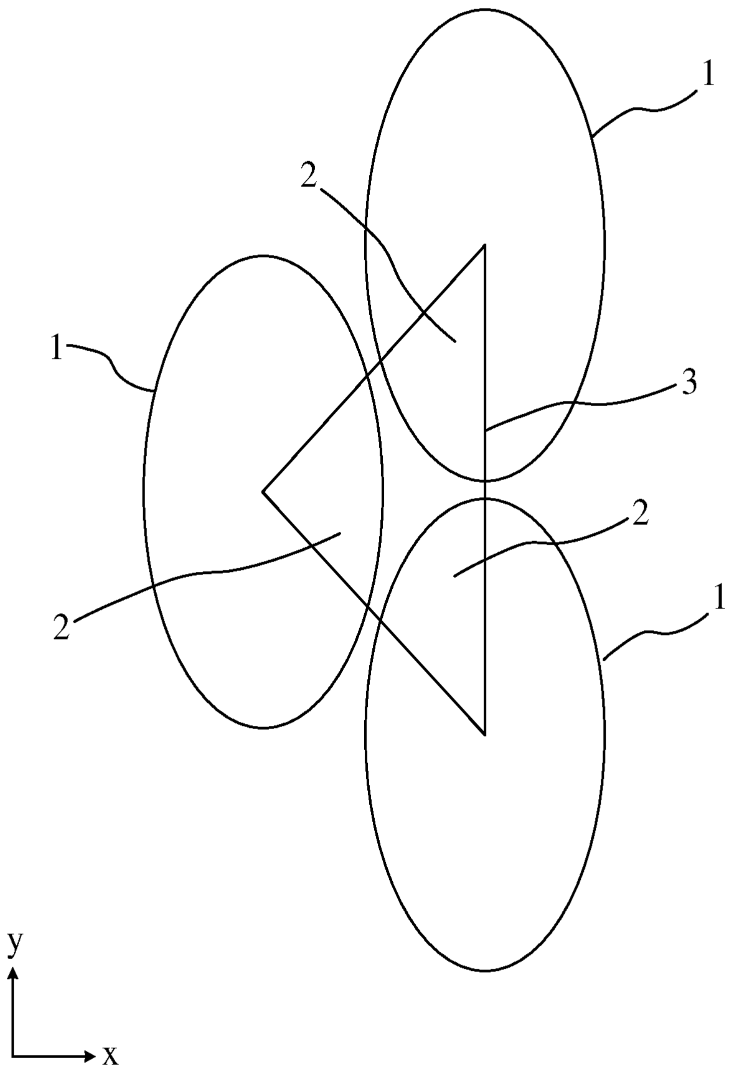


FIG. 8

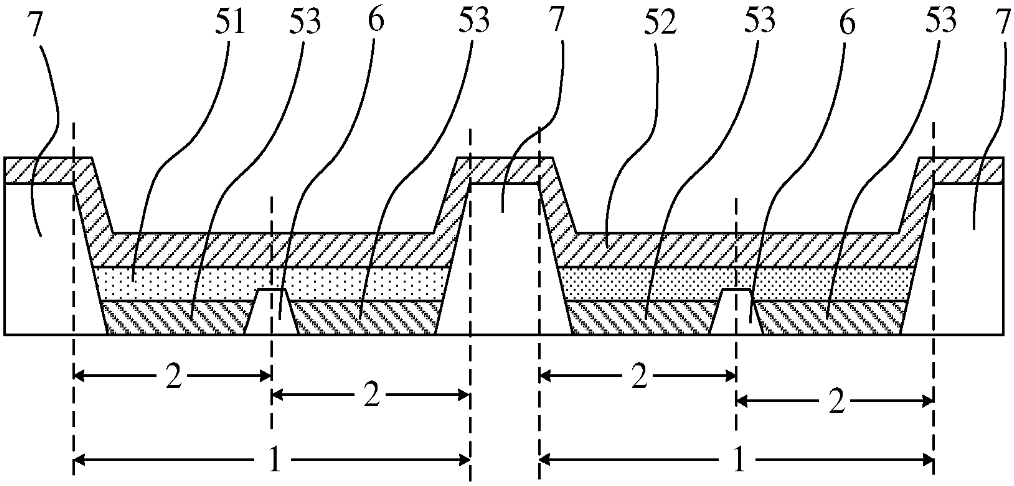


FIG. 9

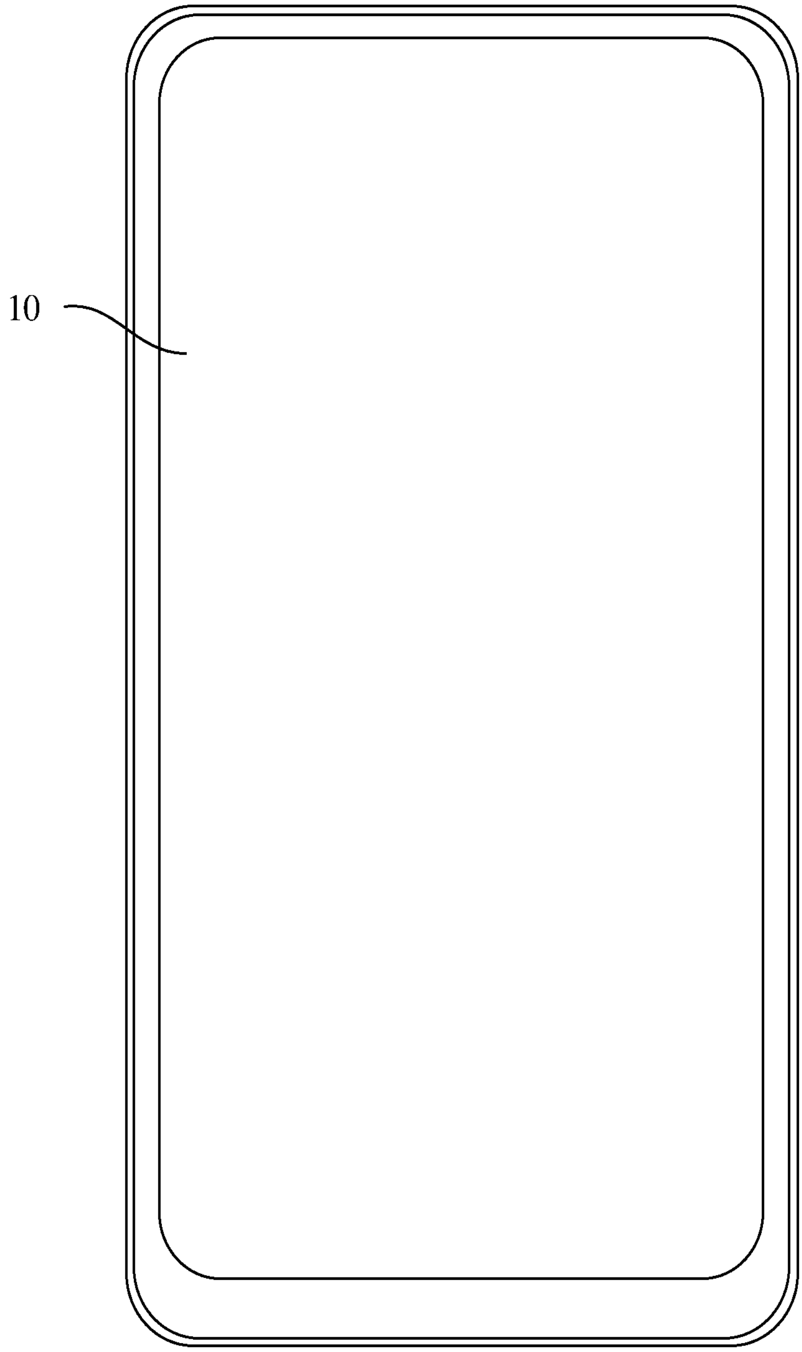


FIG. 10

ORGANIC LIGHT-EMITTING DISPLAY PANEL AND DISPLAY DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present disclosure claims priority to Chinese Patent Application No. CN 201811634124.X, filed on Dec. 29, 2018, the content of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of display technologies and, particularly, relates to an organic light-emitting display panel and a display device.

BACKGROUND

[0003] Among display technologies, an organic light-emitting display (OLED) panel has more and more applications from its excellent characteristics such as self-luminous, high brightness, wide viewing angle and fast response. Light-emitting devices in the organic light-emitting display panel include an anode, a cathode and an organic light-emitting layer. The organic light-emitting layer is located between the anode and the cathode. Electrons and holes are combined in the organic light-emitting layer to realize light emission under the voltage of the anode and the cathode.

[0004] However, in the current pixel design, each sub-pixel corresponds to a separate organic light-emitting layer pattern, which requires high patterning precision for the organic light-emitting layer. Therefore, it is difficult to manufacture an organic light-emitting layer pattern having a small region, resulting in a low resolution of the organic light-emitting display panel.

SUMMARY

[0005] The present disclosure provides an organic light-emitting display panel and a display device, which can improve a resolution of the organic light-emitting display panel.

[0006] In a first aspect, the present provides an organic light-emitting display panel, and the organic light-emitting display panel includes: a plurality of pixel defining aperture regions each having a same shape and a same size as others. For each pixel defining aperture region of the plurality of pixel defining aperture regions, the pixel defining aperture region is partitioned into six sub-pixel regions. Each of the six sub-pixel regions has a same area defined by six boundary lines. Each of the six boundary lines is a connection line running from a center point to an edge of the pixel defining aperture region. The plurality of the pixel defining aperture regions is characterized with three different colors. The six sub-pixel regions of any one of the pixel defining aperture regions is characterized with a same color. Two adjacent pixel defining aperture regions of the plurality of pixel defining aperture regions are characterized with different colors. Three connection lines between the center points of three adjacent pixel defining aperture regions having different colors constitute an isosceles right triangle. Three sub-pixel regions defined by the isosceles right triangle constitute one pixel unit.

[0007] In a second aspect, the present disclosure provides a display device, and the display device includes the display panel provided in any embodiment of the present disclosure.

BRIEF DESCRIPTION OF DRAWINGS

[0008] In order to better explain the embodiments of the present disclosure or the technical solution in the related art, the drawings to be used in the description of the embodiments or the related art will be briefly described below. The drawings in the following description are some embodiments of the present disclosure. For those skilled in the art, other drawings may also be obtained based on these drawings without paying any creative effort.

[0009] FIG. **1***a* is a schematic diagram showing a pixel arrangement of an organic light-emitting display panel in the related art;

[0010] FIG. **1***b* is a schematic diagram showing another pixel arrangement of an organic light-emitting display panel in the related art;

[0011] FIG. **2** is a schematic diagram showing an arrangement of a portion of pixel aperture regions in an organic light-emitting display panel according to an embodiment of the present disclosure;

[0012] FIG. **3** is a schematic diagram showing the arrangement of a portion of sub-pixel region in the organic light-emitting display panel in FIG. **2**;

[0013] FIG. **4** is an enlarged schematic diagram showing one pixel defining aperture region in FIG. **2**;

[0014] FIG. **5** is an enlarged schematic diagram showing three pixel defining aperture regions adjacent to each other and having different colors;

[0015] FIG. **6** is a schematic diagram showing an arrangement of a portion of pixel aperture regions in an organic light-emitting display panel according to another embodiment of the present disclosure;

[0016] FIG. **7** is an enlarged schematic diagram showing one pixel defining aperture region in FIG. **6**;

[0017] FIG. **8** is an enlarged schematic diagram showing three pixel defining aperture regions adjacent to each other and having different colors in FIG. **6**;

[0018] FIG. **9** is a cross-sectional structural schematic diagram showing a partial region of an organic light-emitting display panel according to an embodiment of the present disclosure; and

[0019] FIG. **10** is a structural schematic diagram showing a display device according to an embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0020] In order to make the objectives, technical solutions, and advantages of the present disclosure more apparent, the technical solutions of the present disclosure will be further described by embodiments with reference to the accompanying drawings. The described embodiments are some embodiments of the present disclosure, but not all of the embodiments. Other embodiments obtained by those persons skilled in the art based on the embodiments of the present disclosure without creative efforts shall fall within the protection scope of the present disclosure.

[0021] The terms used in the embodiments of the present disclosure are merely for the purpose of describing specific embodiment, rather than limiting the present disclosure. The terms "a", "an", "the" and "said" in a singular form in the embodiments of the present disclosure and the attached claims are also intended to include plural forms thereof, unless noted otherwise.

[0022] In order to further illustrate the beneficial effects of the embodiments of the present disclosure, a process of discovering the problems of the related art by the inventor is first described before the embodiments of the present disclosure are described in detail.

[0023] Referring to FIG. **1***a,* FIG. **1***a* is a schematic diagram showing a pixel arrangement of an organic light-emitting display panel in the related art. The pixel arrangement includes a plurality of sub-pixel units **200** arranged in a matrix along a row direction x and a column direction y. Each of the plurality of sub-pixel units **200** includes three sub-pixel elements having different colors. The three sub-pixel elements are arranged in the row direction. With the display panel thus designed, each pixel has a same shape and orientation, and can be designed with a same pixel circuit. Signal lines such as a scan line, a data line, a light-emitting control line, a high-voltage line, a low-voltage line, and the like are arranged in a row or column direction due to a regular arrangement of the respective sub-pixels, thereby achieving a simple design. However, in such an organic light-emitting display panel, since each sub-pixel is required to be separately vapor-deposited with an organic light-emitting material, it is unable to keep up with the increasingly high resolution requirements due to evaporation precision and equipment.

[0024] As the display resolution is increased, a pixel arrangement manner occurs due to the limitation of the patterning process difficulty of the organic light-emitting layer. As shown in FIG. **1***b,* FIG. **1***b* is a schematic diagram showing a pixel arrangement of an organic light-emitting display panel in the related art. The pixel arrangement includes a plurality of sub-pixel units **100** each having the same shape and size. Each of the plurality of sub-pixel units **100** is composed of six sub-pixel elements **101** having a same color. The sub-pixel unit **100** has three different colors. Connection lines between the centers of adjacent three sub-pixel units constitutes an equilateral triangle. The above three sub-pixel elements defined by the equilateral triangle constitute one pixel unit A in which r represents red, g represents green, and b represents blue. Since the sub-pixel unit **100** includes six sub-pixel elements **101** having a same color which are adjacent to each other, the organic light-emitting layer can be patterned with the sub-pixel unit **100** as the smallest patterned region, that is, the resolution of the organic light-emitting display panel can be improved. However, since the six sub-pixels are a quadrangle including an acute angle, and the sub-pixel unit **100** is in a shape of an equilateral hexagon, which is closely arranged in the entire display panel. Since the six sub-pixels having a same color need to separately emit light, each sub-pixel element **101** is required to be correspondingly provided with a corresponding pixel driving circuit. Compared with a full-array display panel in the related art, the sub-pixels are arranged in a matrix of rows and columns. In the display panel shown in FIG. **1***a,* the sub-pixel elements **101** are not arranged in rows and columns, so that the layout of the pixel circuit is very complex, and the layout of scan lines, data lines, light-emitting control lines, high-voltage lines, low-voltage lines, etc. are also difficult to arrange. The pixel unit for display composed of three adjacent sub-pixel elements of different colors in FIG. **1***b* is an equilateral triangle. The space occupied by three pixel driving circuits corresponding to one pixel unit is in a shape of square. The regular hexagon composed by six sub-pixels cannot be compatible with the design principle of the conventional pixel driving circuit.

[0025] As shown in FIGS. **2-5**, FIG. **2** is a schematic diagram showing an arrangement of a portion of pixel aperture regions in an organic light-emitting display panel according to an embodiment of the present disclosure; FIG. **3** is a schematic diagram showing the arrangement of a portion of sub-pixel region in the organic light-emitting display panel in FIG. **2**; FIG. **4** is an enlarged schematic diagram showing one pixel defining aperture region in FIG. **2**; and FIG. **5** is an enlarged schematic diagram showing three pixel defining aperture regions adjacent to each other and having different colors in FIG. **2**. The present disclosure provides an organic light-emitting display panel. The organic light-emitting display panel includes: a plurality of pixel defining aperture regions **1** having a same shape and a same size. In each of the plurality of pixel defining aperture regions **1**, a connection line from a center point to an edge of the pixel defining aperture region is regarded as a boundary line. The pixel defining aperture region **1** is partitioned into six sub-pixel regions having a same area. The same one pixel defining aperture region **1** includes six sub-pixel regions **2** having a same color. The pixel defining aperture region **1** has three different colors. Any two adjacent pixel defining aperture regions **1** have different colors. Connection lines between the center points of any three pixel defining aperture regions **1** adjacent to each other and having different color constitute an isosceles right triangle. Three sub-pixel regions **2** defined by the isosceles right triangle constitute one pixel unit **3**.

[0026] The pixel defining aperture region **1** is configured to define a pattern of the organic light-emitting layer of the light-emitting device in the organic light-emitting display panel. The sub-pixel region **2** is a smallest possible separately controllable light-emitting region. Three sub-pixel regions **2** having different colors constitute a pixel unit **3**. One color pixel is realized by superposition of three colors of red, green, and blue. The pixel defining aperture region **1** includes six sub-pixel regions **2** having a same color. Therefore, the minimum pattern of the organic light-emitting layer has an area of six sub-pixels, while in the related art, the minimum pattern of the organic light-emitting layer has an area of one sub-pixel. Therefore, in the embodiments of the disclosure, the requirement for the patterning precision of the organic light-emitting layer is relatively low, so that the resolution of the organic light-emitting display panel can be improved. In addition, in the embodiments of the present disclosure, the pixel unit **3** corresponds to an isosceles right triangle, and can be compatible with a design principle of the conventional pixel driving circuit.

[0027] Taking the pixel arrangement manner shown in FIGS. **2-3** as an example, the organic light-emitting display panel in the embodiments of the present disclosure can be compatible with the design principle of the conventional pixel driving circuit. In FIG. **3**, the arrangement of the pixel driving circuit is also illustrated. FIG. **3** shows the arrangement of the pixel driving circuit of the sub-pixels corresponding to 10*9 display pixels (that is, 10 rows and 9 columns of display pixels). Here, the display pixel refers to the minimum pixel unit of the image to be displayed. The display pixels each have a color to be displayed. Since the red, green and blue primary colors after mixing can display various colors, the pixels to be displayed generally include gray-scale information of three channels of red, green and blue. That is, one display pixel can be divided into three display sub-pixels. The gray-scale information of the display sub-pixels is in one-to-one correspondence with the sub-pixels. The brightness is displayed by each sub-pixel, that is, the final display is completed. Therefore, when 10 rows and 9 columns of display pixels are required to display, 10 rows and 27 columns of sub-pixels are required, that is, a pixel driving circuit of 10 rows and 27 columns is required. Referring to FIG. **3**, a plurality of pixel driving units **5** are included in the pixel driving circuit. Each of the plurality of pixel driving units **5** includes three pixel driving circuits **4** arranged in the row direction x. The pixel driving circuit **4** has a space occupied by the pixel driving circuit **4** corresponding to one sub-pixel. Each of the three smallest rectangular pixel driving circuits **4** constitute a square pixel driving unit **5** corresponding to the pixel unit **3** of an isosceles right triangle. Each of the pixel driving circuits **4** is configured to drive one sub-pixel region **2**. Three pixel driving circuits **4** are configured to drive one pixel unit **3**. In this embodiment, the pixel driving circuit **4** has a rectangular shape. The plurality of pixel driving circuits are arranged in the row direction and the column direction. A square pixel driving unit **5** is configured to drive the pixel unit **3** of an isosceles right triangle. By using the driving circuit with such a structure, the pixel driving circuit arranged in the rectangular matrix of the related art can be directly used. The signal lines such as the scanning line, the data line, the light-emitting control line, the high-voltage line, and the low-voltage line can be arranged in the row direction or in the column direction, so that the design is simple. Moreover, because the pixel defining aperture region **1** includes six adjacent sub-pixel elements **2** having a same color, the organic light-emitting layer can be patterned by using the pixel defining aperture region **1** as the smallest patterned region, that is, the resolution of the organic light-emitting display panel can be improved.

[0028] Hereinafter, the feasibility of the pixel unit **3** of the isosceles right triangle corresponding to the square pixel driving unit **5** will be described with reference to the drawings. Referring to FIGS. **3** and **4**, it is assumed that a length of the short side of each of the smallest rectangle is a, and the adjacent three rectangles form a square, that is, a length of the long side of the rectangle is **3***a*. An area occupied by the pixel driving circuit **4** corresponding to one pixel unit **3** is an area of three rectangles, that is, an area of $9a^2$. The length of the oblique side of the isosceles right triangle corresponding to one pixel unit **3** is the length of two long sides of the rectangle, that is, a length of 6a. The length of the height on the oblique side of the isosceles right triangle is 3a. The area of the isosceles right triangle is $9a^2$, that is, it can be ensured that the area occupied by one pixel unit **3** is equal to the area occupied by the pixel driving circuit **4** corresponding to one pixel unit **3**. Further, a distance between the centers of two pixel defining aperture regions **1** adjacent to each other along the long side of the pixel defining aperture region **1** in the row direction x is 3a, and a distance between the centers of two pixel defining aperture regions **1** adjacent to each other along the long side of the pixel defining aperture region **1** in the column direction y is also 3a. A pitch of the pixel unit **3** for display in a shape of an isosceles right triangle is 3a in the row direction. A pitch of the pixel unit **3** for display in a shape of an isosceles right triangle is also 3a in the column direction. In the arrangement of the driving circuits, a pitch of the square pixel driving unit **510** in the row direction is 3a, and a pitch of the square pixel driving unit **510** in the column direction is also 3a. That is, the finally formed display panel can achieve that the pixel unit and the pixel driving unit **5** have the same pitch in both the row direction and the column direction, so that the organic light-emitting display panel in the embodiments can be compatible with the design principle of the conventional pixel driving circuit. That is, a driving circuit is designed with a matrix, and a specially designed organic light-emitting film layer is used. The organic light-emitting film layer includes a plurality of specially designed quadrilateral anodes. Each of the plurality of anodes is correspondingly connected to an output terminal of a driving transistor included in one rectangular pixel driving circuit **4**. Therefore, it is possible to drive a specially designed organic light-emitting film layer by using a conventional driving circuit.

[0029] In FIG. **2**, R indicates that the corresponding sub-pixel region **2** is configured to display in red color, G indicates that the corresponding sub-pixel region **2** is configured to display in green color, B indicates that the corresponding sub-pixel region **2** is configured to display in blue color, the x-axis direction is a row direction, and the y-axis direction is a column direction. In FIG. **3**, the Arabic numerals from 1 to 27 arranged in the x-axis direction indicate the serial numbers of the columns corresponding to the pixel driving circuit **4**, the Arabic numerals from 1 to 10 arranged in the y-axis direction indicate the serial numbers of the rows corresponding to the pixel driving circuit **4**, r indicates that the corresponding column of the pixel driving circuit **4** is configured to drive the sub-pixel regions **2** displaying in red color, g indicates that the corresponding column of the pixel driving circuit **4** is configured to drive the sub-pixel regions **2** displaying in green color, and b indicates that the corresponding column of the pixel driving circuit **4** is configured to drive the sub-pixel regions **2** displaying in blue color. For example, the six sub-pixel regions **2** in the pixel defining aperture region A**1** are all configured to display in red color, so that the six sub-pixel regions **2** can correspond to six pixel driving circuits **4** in the first row and the first column, the second row and the first column, the third row and the first column, the first row and the fourth column, the second row and the fourth column, the third row and the fourth column, respectively. Six sub-pixel regions **2** in the pixel defining aperture region A**2** are all configured to display in green color, so that the six sub-pixel regions **2** can correspond to six pixel driving circuits **4** in the third row and the second column, the fourth row and the second column, the fifth row and the second column, the third row and the fifth column, the fourth row and the fifth column, the fifth row and the fifth column, respectively. Six sub-pixel regions **2** in the pixel defining aperture region A**3** are all configured to display in blue color, so that the six sub-pixel regions **2** can correspond to six pixel driving circuits **4** in the fifth row and the third column, the sixth row and the third row, the seventh row and the third column, the fifth row and the sixth column, the sixth row and the sixth column, the seventh row and the sixth column, respectively. Six sub-pixel regions **2** in the pixel defining aperture region A**4** are all configured to display in red color, so that the six sub-pixel regions **2** can correspond to six pixel driving circuits **4** at the fourth row and the fourth column, the fifth row and the fourth column, the sixth row and the fourth column, the fourth row and the seventh column, the fifth row and the seventh column, the sixth row and the seventh column, respectively. Six sub-pixel regions **2** in the pixel defining aperture region A**5** are all configured to display in green color, so that the six sub-pixel regions **2** can correspond to six pixel driving circuits **4** at the sixth row and the fifth column, the seventh row and the fifth column, the eighth row and the fifth column, the sixth row and the eighth column, the seventh row and the eighth column, the eighth row and the eighth column, respectively. Six sub-pixel regions **2** in the pixel defining aperture region A**6** are all configured to display in blue color, so that the six sub-pixel regions **2** can correspond to six pixel driving circuits **4** at the eighth row and the sixth column, the ninth row and the sixth column, the tenth row and the sixth column, the eighth row and the ninth column, the ninth row and the ninth column, the tenth row and the ninth column, respectively, etc. It is possible that each of the pixel driving circuits **4** can exactly correspond to one sub-pixel region **2**. It should be noted that the corresponding manner in FIG. **2** is only an example, and the correspondence relationship between the specific pixel driving circuit **4** and the sub-pixel region **2** in the embodiments of the present disclosure is not limited thereto. It can be seen that the pixel arrangement manner in the embodiments of the present disclosure can make the pixel driving circuit **4** and the sub-pixel region **2** exactly in one-to-one correspondence when it is matched with a conventional design in which the space occupied by three adjacent pixel driving circuits **4** is a square. 270 pixel driving circuits **4** in FIG. **2** can be in one-to-one correspondence with 270 sub-pixel regions **2** occupied by the same space.

[0030] In the organic light-emitting display panels of the embodiments of the present disclosure, the pixel defining aperture region includes six sub-pixels having a same color. Therefore, the minimum pattern of the organic light-emitting layer has an area of six sub-pixels. Compared with the related art, the requirement for the patterning precision of the organic light-emitting layer is lower, so that the resolution of the organic light-emitting display panel can be improved. In the embodiments of the present disclosure, one pixel unit corresponds to an isosceles right triangle, which can be compatible with the design principle of the conventional pixel driving circuit.

[0031] In the embodiments of the present disclosure, as shown in FIGS. **2-5**, each of the plurality of pixel defining aperture region **1** has a shape of hexagon.

[0032] In the embodiments of the present disclosure, the hexagon described above includes two equal short sides **11** and four equal long sides **12**, the two short sides **11** are opposite and parallel to each other, and a ratio of the short side **11** to the long side **12** is e**1**,

$$(2/\sqrt{10})\times(1-90\%)<e1<(2/\sqrt{10})\times(1+90\%).$$

[0033] Theoretically, as shown in FIGS. **3** and **4**, the pixel unit **3** corresponds to an isosceles right triangle. n, m, and j are respectively three vertices of an isosceles right triangle. An angle between a line segment nm and a line segment nj is a right angle. The sub-pixel regions **2** each has an equal area, which can be obtained by a geometric relationship. Each side of the isosceles right triangle passes through the midpoint of the side of the corresponding hexagon. The apex angle a**1** of the hexagon is equal to 108.44°, the apex angle a**2** of the hexagon is equal to 143.13°, and a ratio of the short side **11** to the long side **12** of each side of the hexagon is $2/\sqrt{10}$, which can be obtained by a geometric relationship. However, the ratio of the short side **11** to the long side **12** of the hexagon are defined to be $(2/\sqrt{10})\times(1-90\%)<e1<(2/\sqrt{10})\times(1+90\%)$ in consideration of the processing error.

[0034] In the embodiments of the present disclosure, e**1**=$2/\sqrt{10}$.

[0035] In the embodiments of the present disclosure, as shown in FIGS. **3** and **4**, in each of the plurality of pixel defining aperture regions **1**, a connection line from a center point to a midpoint of each side of the hexagon is regarded as a boundary line. The pixel defining aperture region **1** is partitioned into six sub-pixel regions **2** having a same area.

[0036] In the embodiments of the present disclosure, as shown in FIGS. **6-8**, FIG. **6** is a schematic diagram showing an arrangement of a portion of pixel aperture regions in an organic light-emitting display panel according to another embodiment of the present disclosure; FIG. **7** is an enlarged schematic diagram showing one pixel defining aperture region in FIG. **6**; and FIG. **8** is an enlarged schematic diagram showing three pixel defining aperture regions adjacent to each other and having different colors in FIG. **6**. Each of the plurality of pixel defining aperture regions **1** has a shape of ellipse.

[0037] Due to limitations of the process and the like, in an actual organic light-emitting display panel, it is difficult to manufacture a hexagonal pattern. Therefore, based on the pixel defining aperture region **1** of the hexagon, the pixel defining aperture region **1** can be designed with a shape of an ellipse. The ellipse is inscribed in the six sides of the hexagon described in the above embodiments. The specific principle and the relationship between the ellipse and the sub-pixel region **2** or the pixel unit **3** are same as those described in the above embodiments, which are not elaborated here.

[0038] In the embodiments of the present disclosure, the ellipse has a ratio e**2** of a major axis **13** to a minor axis **14**,

$$(29/16)\times(1-90\%)<e2<(29/16)\times(1+90\%)$$

[0039] In the embodiments of the present disclosure, e**2**=29/16. The relationship between the major axis **13** and the minor axis **14** of the ellipse can be obtained from the geometric relationship of the ellipse. When considering the processing error, the ratio of the major axis **13** to the minor axis **14** of the ellipse is defined to be $(29/16)\times(1-90\%)<e2<(29/16)\times(1+90\%)$. Without considering the processing error, the ratio of the major axis **13** to the minor axis **14** of the ellipse is 29/16.

[0040] In the embodiments of the present disclosure, the pixel defining aperture region **1** described above includes a red pixel defining aperture region, a blue pixel defining aperture region, and a green pixel defining aperture region.

[0041] As shown in FIG. **9**, FIG. **9** is a cross-sectional structural schematic diagram showing a partial region of an organic light-emitting display panel according to an embodiment of the present disclosure. For example, the pixel defining aperture region **1** may be a region defined by an aperture formed by the pixel definition layer **7**. A plurality of organic light-emitting layers **51** having a same color is arranged in each of the pixel defining aperture region **1**. The color of the pixel defining aperture region **1** refers to the color of the light emitted corresponding to the organic light-emitting layer **51**. R represents red, G represents green, and B represents blue. In a same one pixel defining aperture region **1**, the organic light-emitting layers **51** have a same color. The sub-pixel region **2** is configured to define a light-emitting region corresponding to one sub-pixel. One sub-pixel region **2** corresponds to one light-emitting device, which can be individually controlled. The light-emitting device includes an organic light-emitting layer **51**, a cathode **52** and an anode **53**. The anodes **53** of each of the light-emitting devices are independent from each other. The anodes **53** in the different pixel defining aperture regions **1** are separated by the pixel definition layer **7**. In the same one pixel defining aperture regions **1**, the anodes **53** in the different sub-pixel regions **2** may be separated by a barrier wall **6**. The organic light-emitting layers **51** in the different pixel defining aperture regions **1** are independent from each other. The organic light-emitting layers **51** in the same one pixel defining aperture region **1** is a continuous whole-layer structure in order to be patterned. The cathode **52** may be attached in a whole layer to the light-emitting region of the organic light-emitting display panel, that is, continuously covering all pixel defining aperture regions **1**. The anode **53** of each of the sub-pixel regions **2** is electrically connected to a corresponding pixel driving circuit, and is driven and controlled by a pixel driving circuit. After a voltage is applied to the anode **53** and the cathode **52** of the light-emitting device, holes and electrons are respectively injected from the anode **53** and the cathode **52** into the organic light-emitting layer **51**. The holes and electrons are combined in the organic light-emitting layer **51** to release energy in order to emit light. The organic light-emitting display panel realizes the image display by the light emission of the light-emitting devices in each of the sub-pixel regions **2**.

[0042] As shown in FIG. **10**, FIG. **10** is a structural schematic diagram showing a display device according to an embodiment of the present disclosure. The embodiments of the present disclosure further provide a display device including the organic light-emitting display panel **10** described above.

[0043] The specific structure of the organic light-emitting display panel **10** is same as that of the above embodiments, which is not elaborated here. The display device may be any electronic device having a display function such as a mobile phone, a tablet computer, a laptop computer, an electronic paper book, or a television.

[0044] In the display devices of the embodiments of the present disclosure, the pixel defining aperture region includes six sub-pixels having a same color. Therefore, the minimum pattern of the organic light-emitting layer has an area of six sub-pixels. Compared with the related art, the requirement for the patterning precision of the organic light-emitting layer is lower, so that the resolution of the organic light-emitting display panel can be improved. In the embodiments of the present disclosure, one pixel unit corresponds to an isosceles right triangle, which can be compatible with the design principle of the conventional pixel driving circuit.

[0045] Finally, it should be noted that the technical solutions of the present disclosure are illustrated by the above embodiments, but not intended to limit thereto. Although the present disclosure has been described in detail with reference to the foregoing embodiments, those skilled in the art can understand that the present disclosure is not limited to the specific embodiments described herein, and can make various obvious modifications, readjustments, and substitutions without departing from the scope of the present disclosure.

What is claimed is:

1. An organic light-emitting display panel, comprising:

a plurality of pixel defining aperture regions each having a same shape and a same size as others;

wherein each pixel defining aperture region of the plurality of pixel defining aperture regions is partitioned into six sub-pixel regions, wherein each of the six sub-pixel regions has a same area defined by six boundary lines, wherein each of the six boundary lines is a connection line running from a center point to an edge of the pixel defining aperture region;

wherein the plurality of the pixel defining aperture regions is characterized with three different colors;

wherein the six sub-pixel regions of any one of the pixel defining aperture regions is characterized with a same color;

wherein two adjacent pixel defining aperture regions of the plurality of pixel defining aperture regions are characterized with different colors; and

wherein three connection lines between the center points of three adjacent pixel defining aperture regions having different colors constitute an isosceles right triangle, and wherein three sub-pixel regions defined by the isosceles right triangle constitute one pixel unit.

2. The organic light-emitting display panel according to claim **1**, wherein

each of the plurality of pixel defining aperture region has a shape of hexagon.

3. The organic light-emitting display panel according to claim **2**, wherein

the hexagon comprises two short sides having a same length and four long sides having a same length, the two short sides are opposite and parallel to each other, and a ratio of one of the two short sides to one of the four long sides is e**1**,

where $(2/\sqrt{10})\times(1-90\%)<e1<(2/\sqrt{10})\times(1+90\%)$

4. The organic light-emitting display panel according to claim **3**, wherein

$e1=2/\sqrt{10}$.

5. The organic light-emitting display panel according to claim **2**, wherein

the connection line is from the center point to a midpoint of one side of the hexagon.

6. The organic light-emitting display panel according to claim **1**, wherein

the plurality of pixel defining aperture regions each has a shape of ellipse.

7. The organic light-emitting display panel according to claim **6**, wherein

the ellipse has a major axis and a minor axis, a ratio of the major axis to the minor axis is e**2**, where

$$(29/16)\times(1-90\%)<e2<(29/16)\times(1+90\%).$$

8. The organic light-emitting display panel according to claim **7**, wherein

$e2=29/16$.

9. The organic light-emitting display panel according to claim **1**, wherein

the plurality of pixel defining aperture regions at least comprises a red pixel defining aperture region, a blue pixel defining aperture region, and a green pixel defining aperture region.

10. A display device, comprising an organic light-emitting display panel, wherein the organic light-emitting display panel comprises:

a plurality of pixel defining aperture regions each having a same shape and a same size as others, wherein each pixel defining aperture region of the plurality of pixel defining aperture regions is partitioned into six sub-pixel regions, wherein each of the six sub-pixel regions has a same area defined by six boundary lines, wherein each of the six boundary lines is a connection line running from a center point to an edge of the pixel defining aperture region;

wherein the plurality of the pixel defining aperture regions is characterized with three different colors;

wherein the six sub-pixel regions of any one of the pixel defining aperture regions is characterized with a same color;

wherein two adjacent pixel defining aperture regions of the plurality of pixel defining aperture regions are characterized with different colors; and

wherein three connection lines between the center points of three adjacent pixel defining aperture regions having different colors constitute an isosceles right triangle, and wherein three sub-pixel regions defined by the isosceles right triangle constitute one pixel unit.

* * * * *

专利名称(译)	有机发光显示面板和显示装置		
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摘要(译)

有机发光显示面板包括多个像素,每个像素限定具有相同形状和尺寸的开口区域。 每个限定开口区域的像素被划分为六个子像素区域,六个子像素具有由六个边界线限定的相同面积,每个边界线是从像素限定开口区域的中心点到边缘的连接线。 。 限定开口区域的多个像素具有三种不同的颜色。 限定开口区域的任何一个像素的六个子像素都具有相同的颜色。 限定孔区域的两个相邻像素具有不同的颜色。 三个相邻的限定开口区域的像素的中心点之间的三个连接线具有不同的颜色,构成等腰直角三角形,由等腰直角三角形限定的三个子像素区域构成一个像素单元。