



US 20190043932A1

(19) **United States**

(12) **Patent Application Publication**
SHIH et al.

(10) **Pub. No.: US 2019/0043932 A1**

(43) **Pub. Date: Feb. 7, 2019**

(54) **PIXEL STRUCTURE OF ORGANIC LIGHT
EMITTING DIODE DISPLAY**

Publication Classification

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(51) **Int. Cl.**
H01L 27/32 (2006.01)

(52) **U.S. Cl.**
CPC **H01L 27/3213** (2013.01); **H01L 27/3225**
(2013.01); **H01L 27/323** (2013.01); **H01L**
27/3216 (2013.01); **H01L 27/3227** (2013.01);
H01L 27/3218 (2013.01)

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(57) **ABSTRACT**

A pixel structure of an organic light emitting diode display comprises a substrate and a plurality of pixels arranged on the substrate. The plurality of pixels is closely arranged. Each of the pixels is a light-emitting region. Each of the pixels comprises a plurality of sub-regions arranged in at least one column. Each sub-region of each of the column of the pixels comprises a color sub-pixel, a transparent sub-pixel or a sensing component. At least one of the pluralities of sub-regions of each pixel is the sensing component and the sensing component is arranged in the light-emitting region. The pixel structure of the organic light emitting diode display of the disclosure has a sensing function in addition to the display function, and at the same time the such arrangement enables the display to have a resolution of more than 500 ppi.

(21) Appl. No.: **16/050,009**

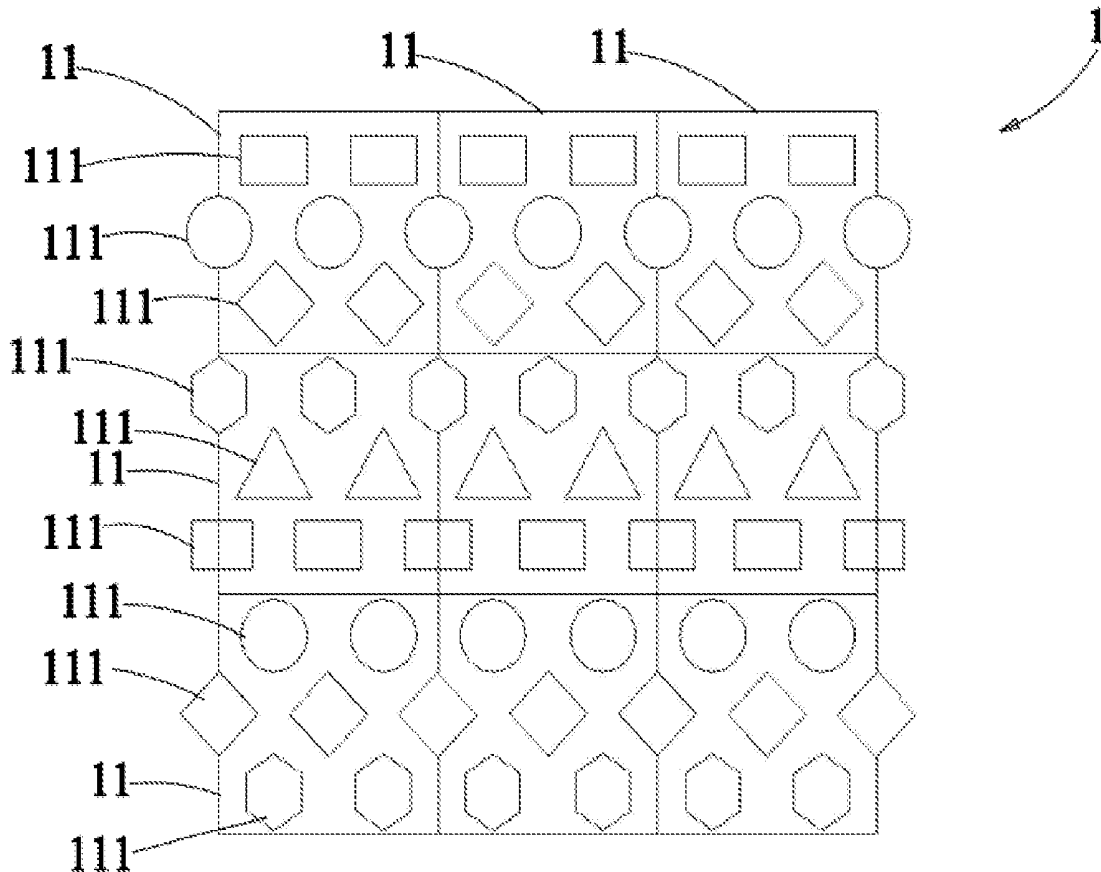
(22) Filed: **Jul. 31, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/540,050, filed on Aug. 1, 2017.

Foreign Application Priority Data

(30) Jun. 21, 2018 (CN) 201810642102.1



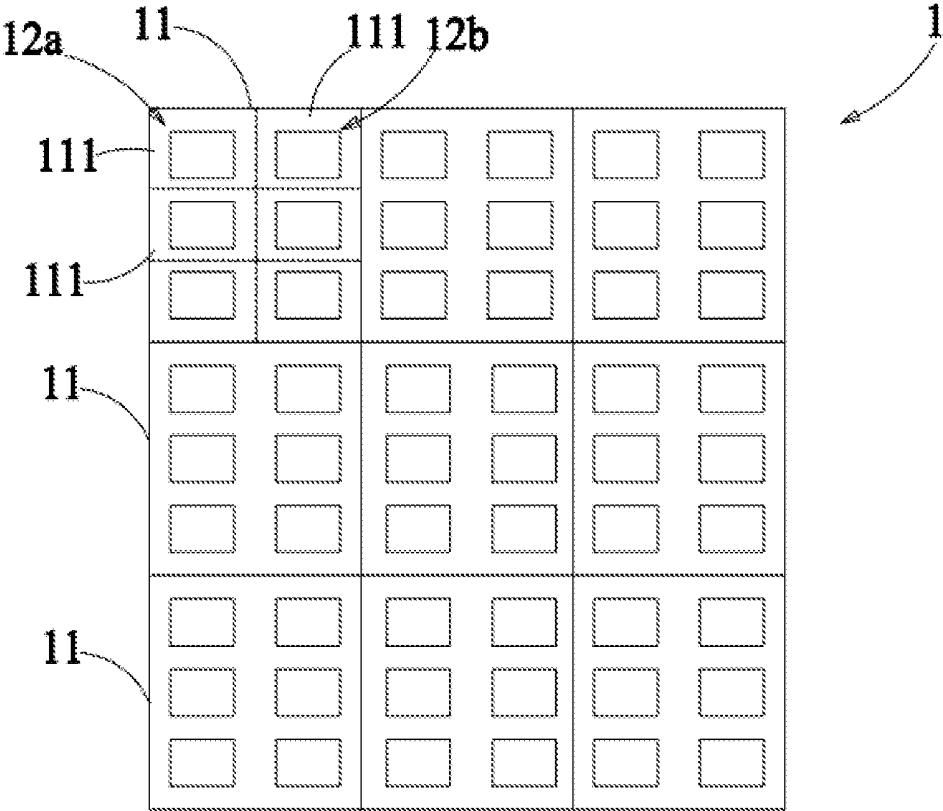


FIG. 1

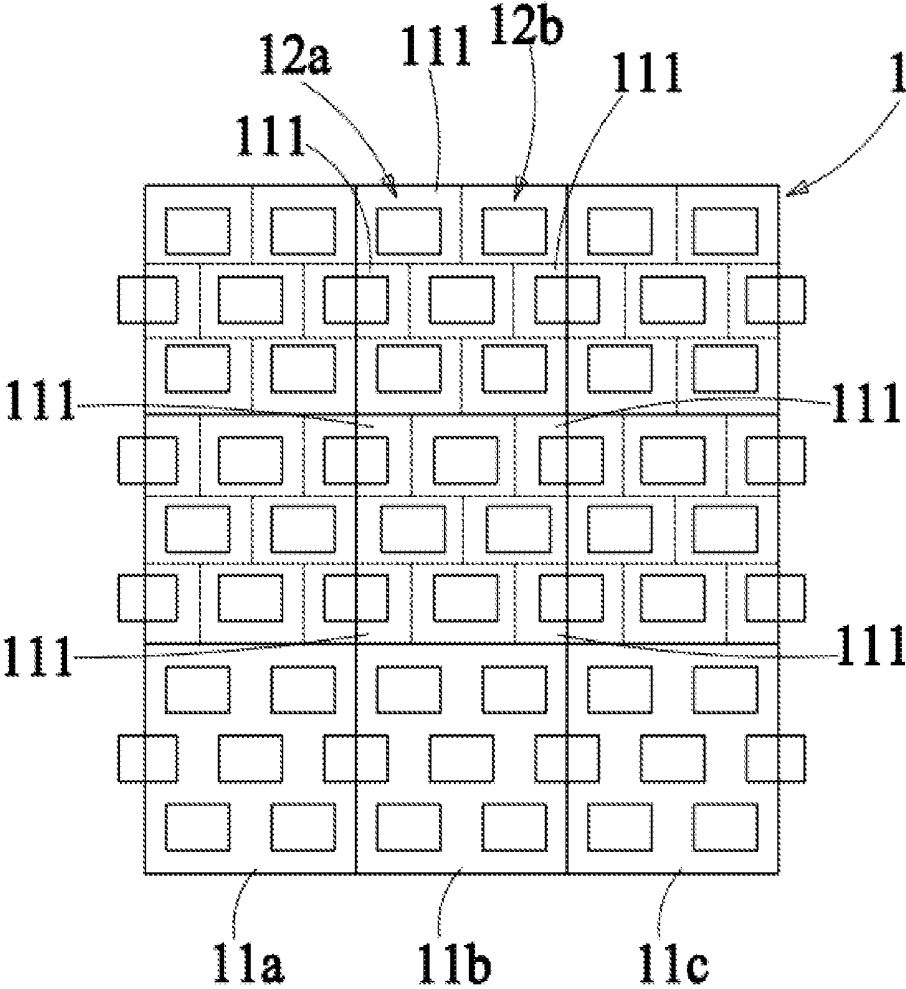


FIG. 2

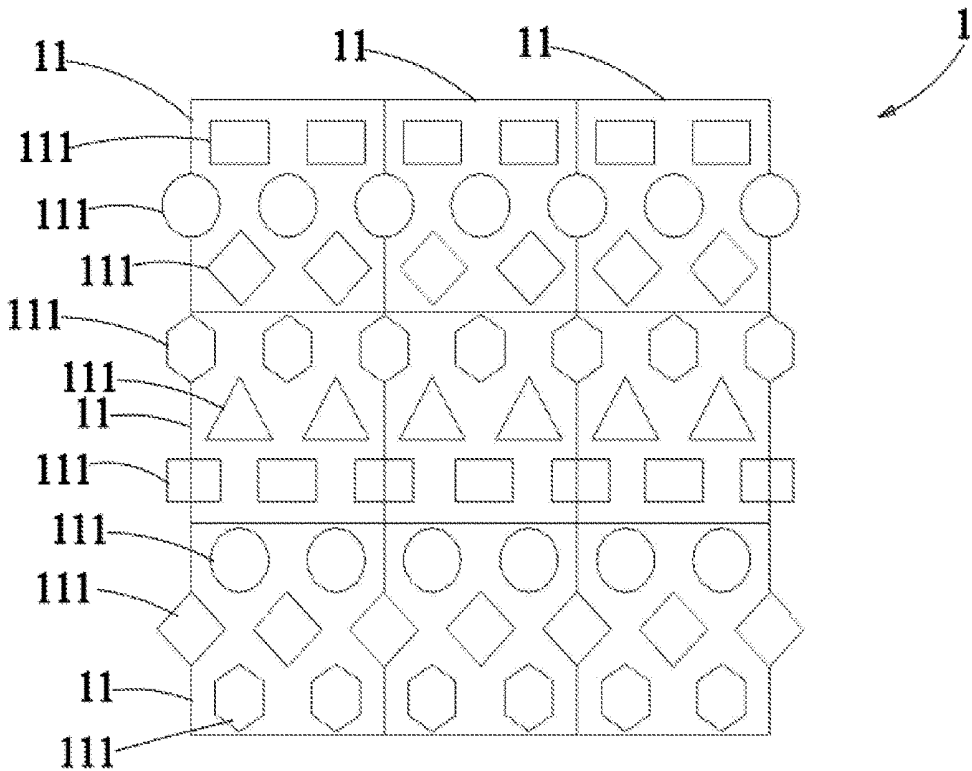


FIG. 3

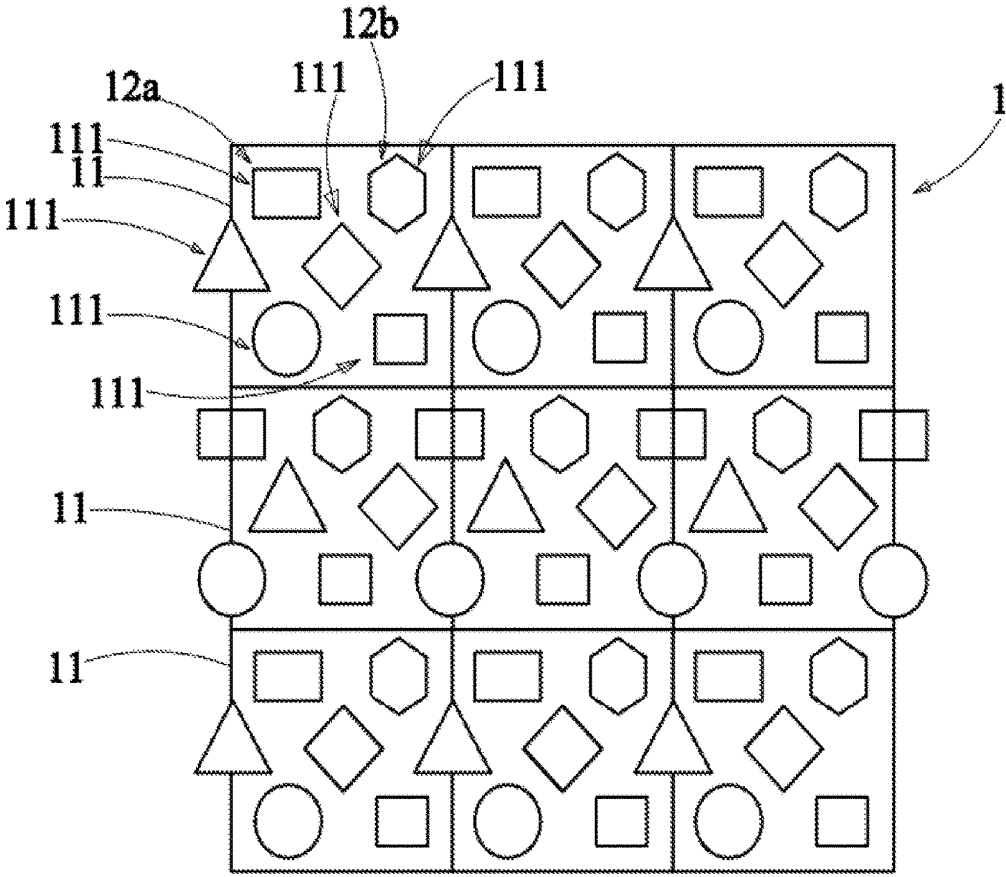


FIG. 4

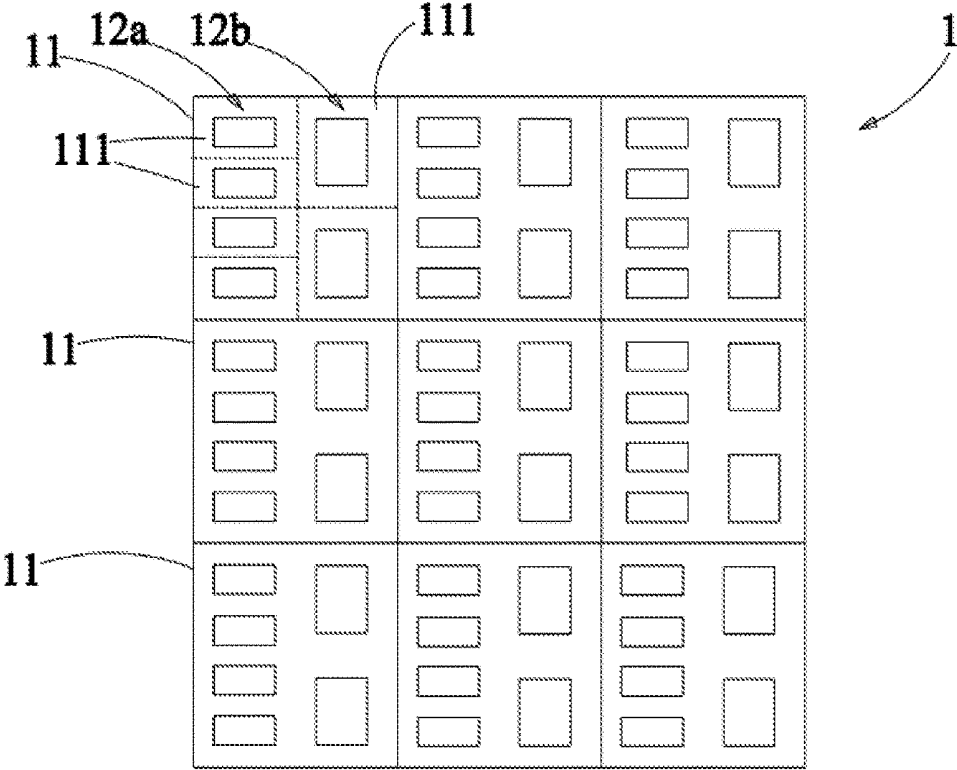


FIG. 5

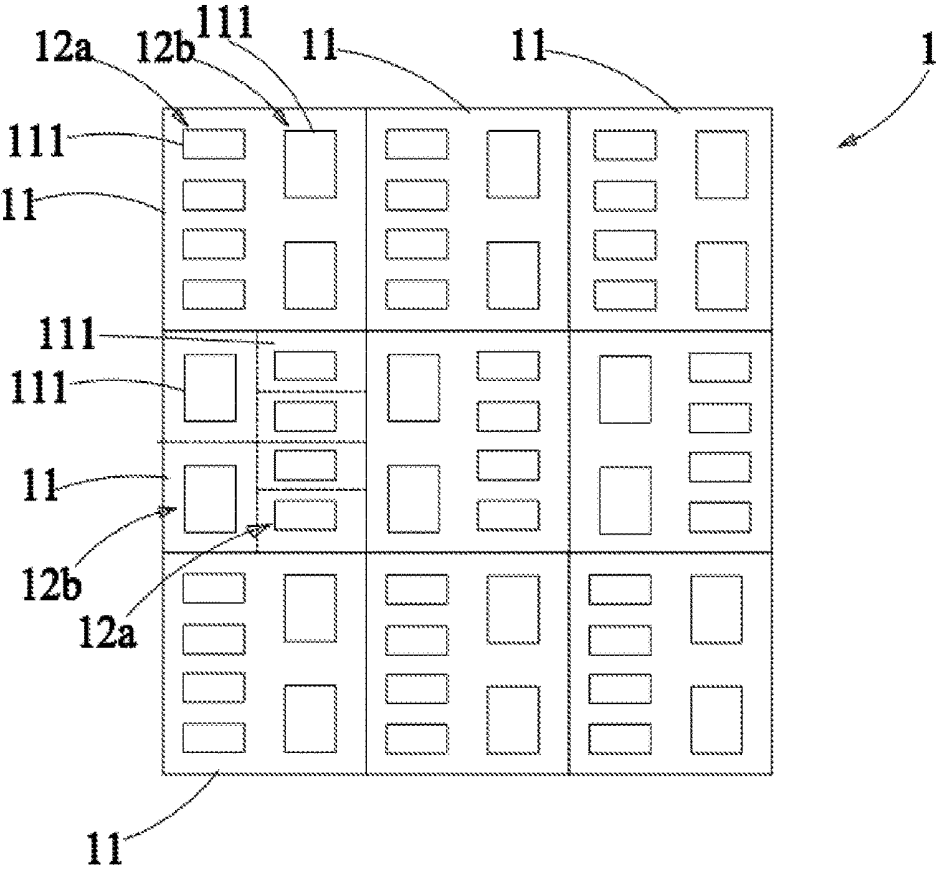


FIG. 6

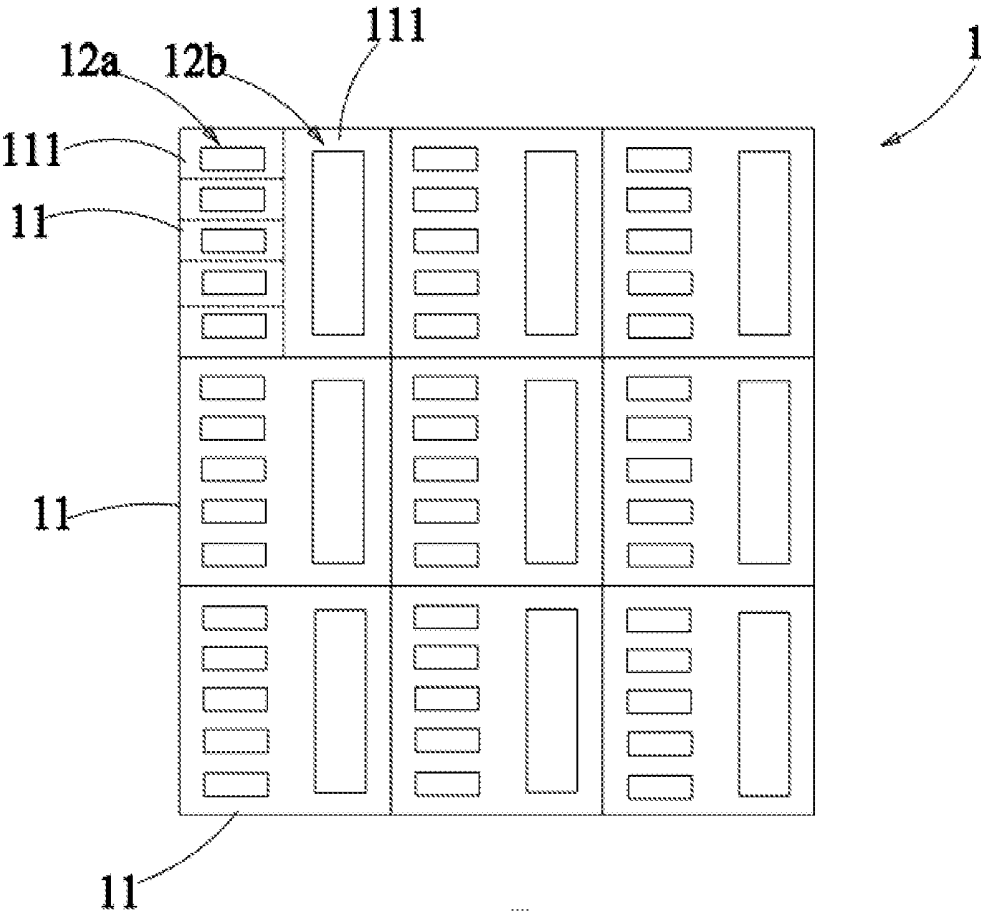


FIG. 7

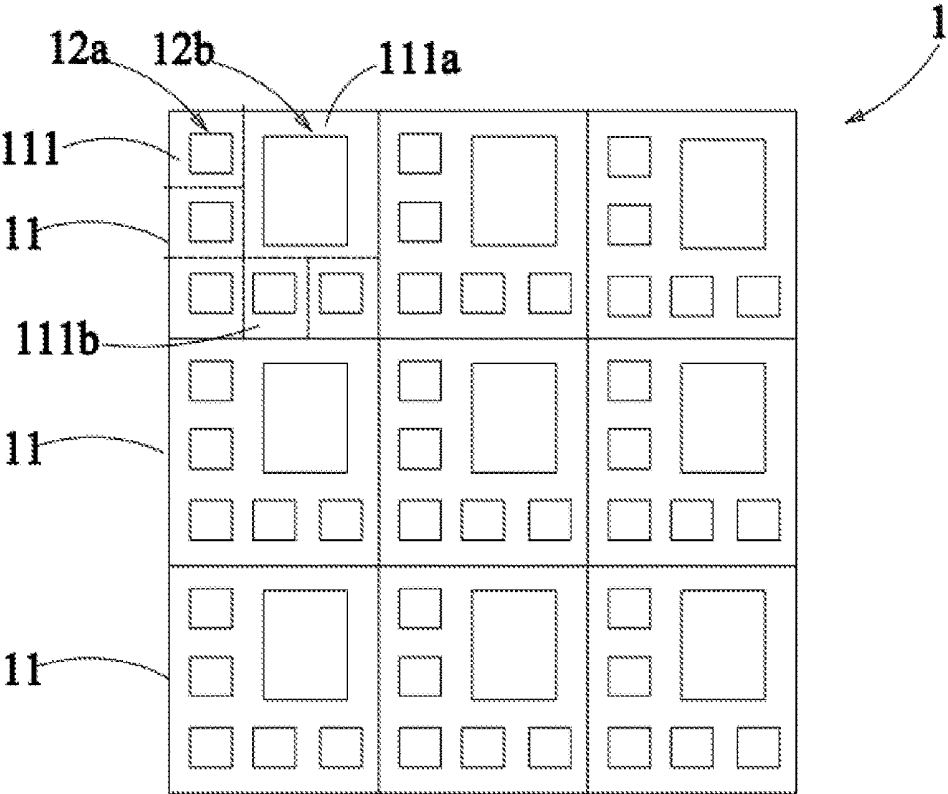


FIG. 8

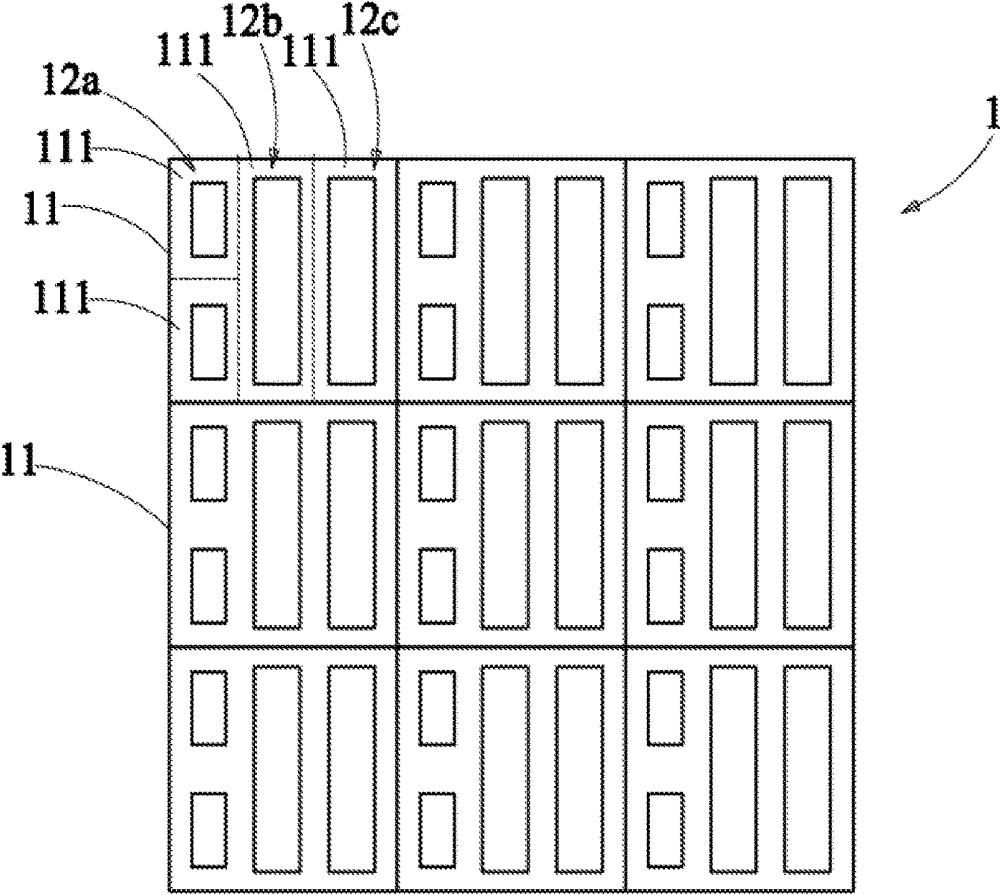


FIG. 10

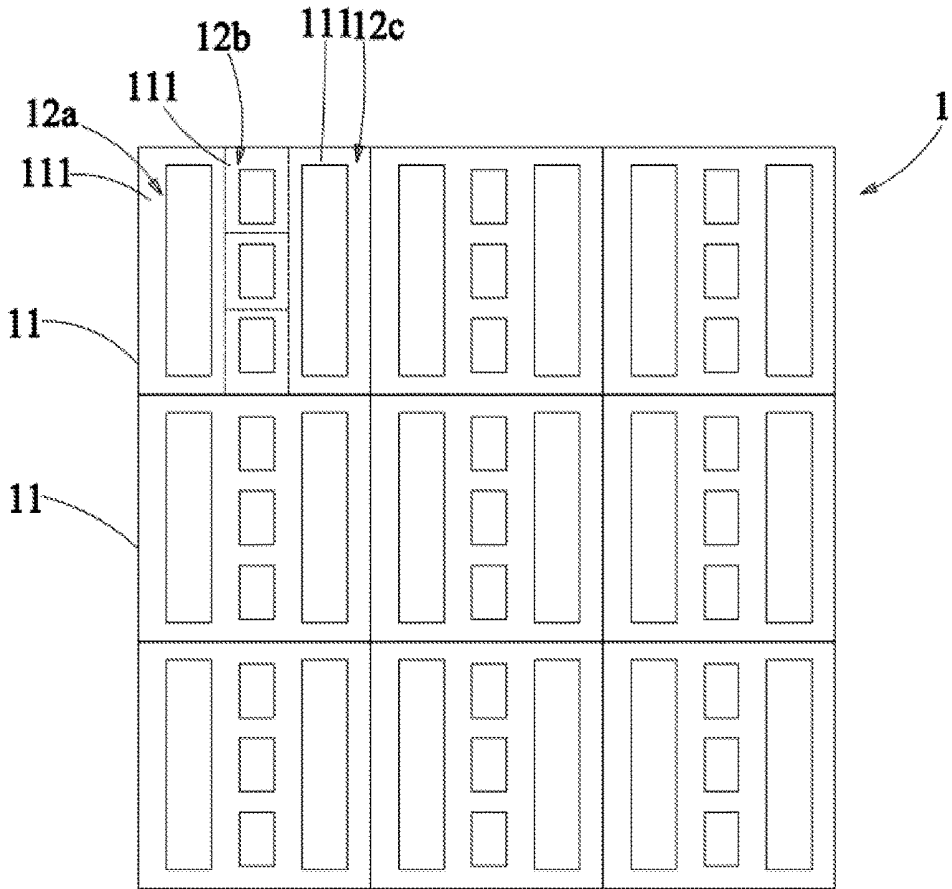


FIG. 11

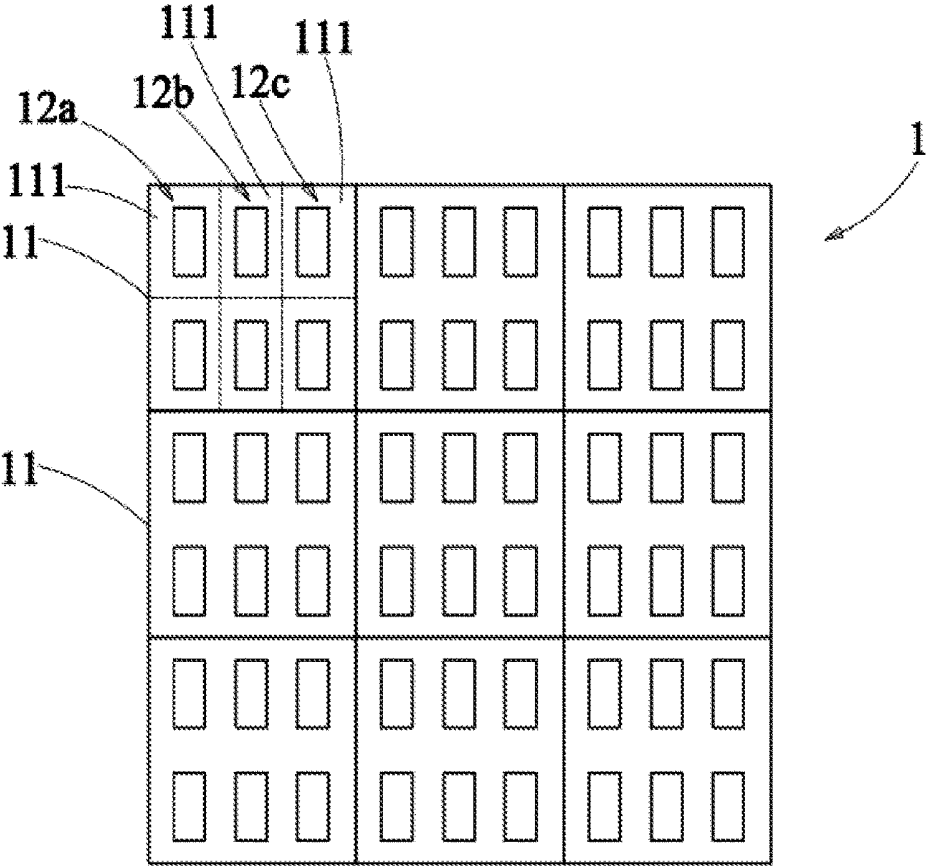


FIG. 12

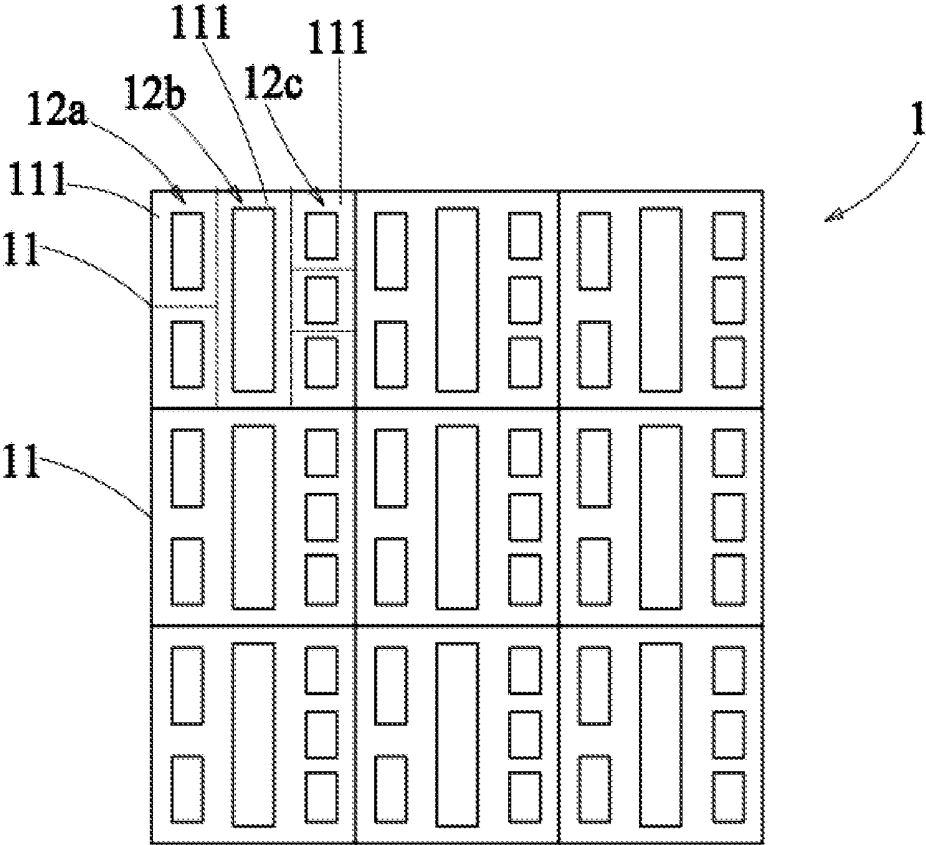


FIG. 13

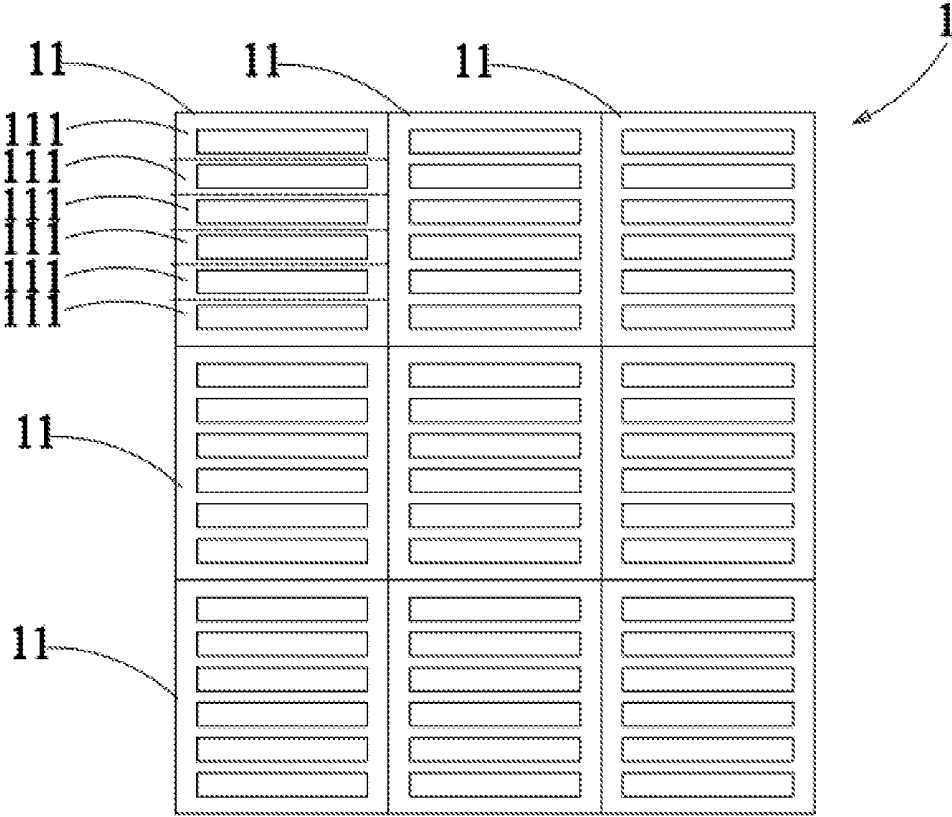


FIG. 14

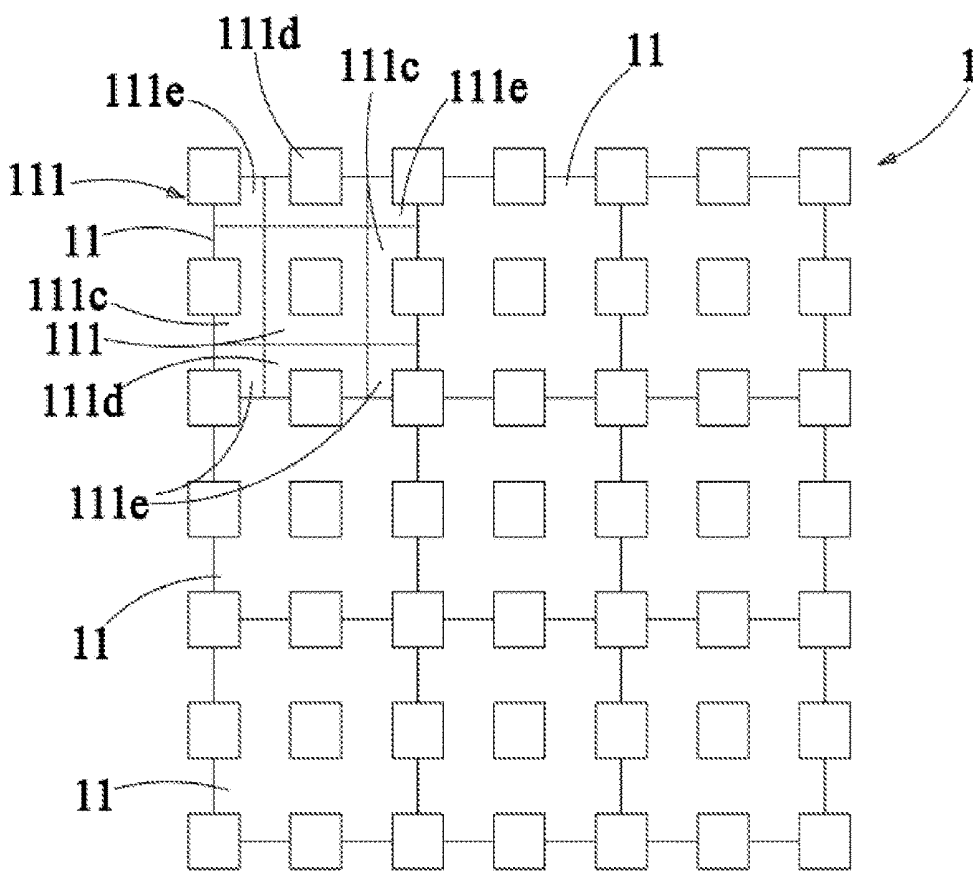


FIG. 15

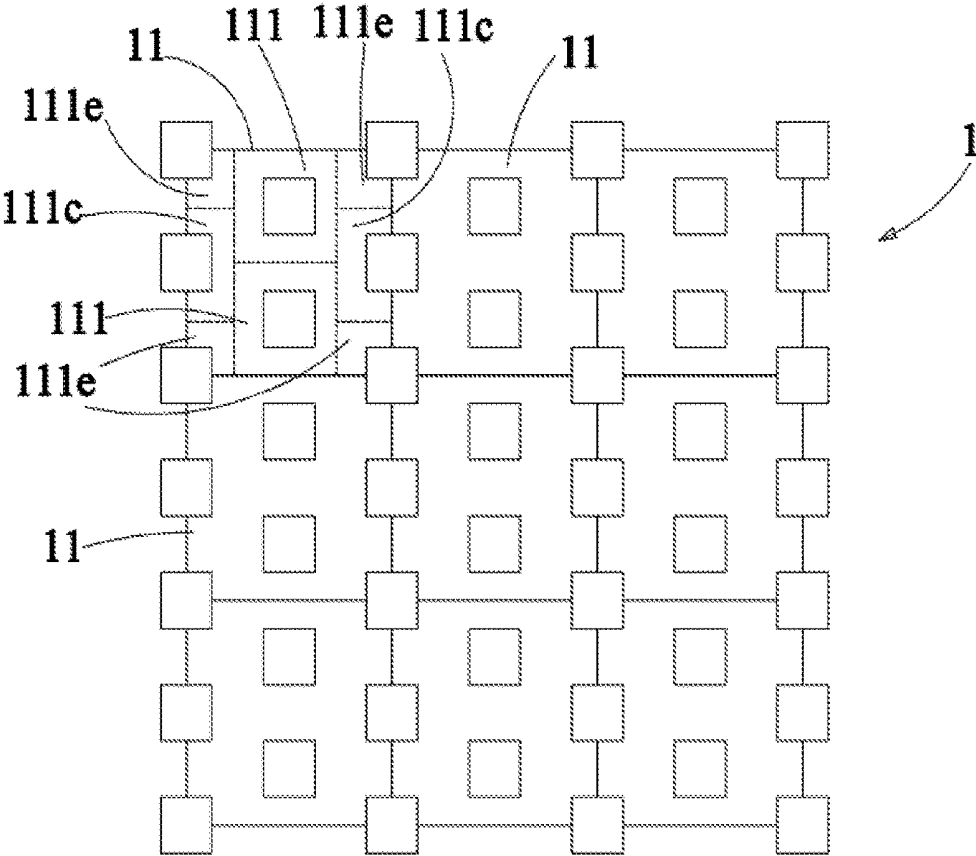


FIG. 16

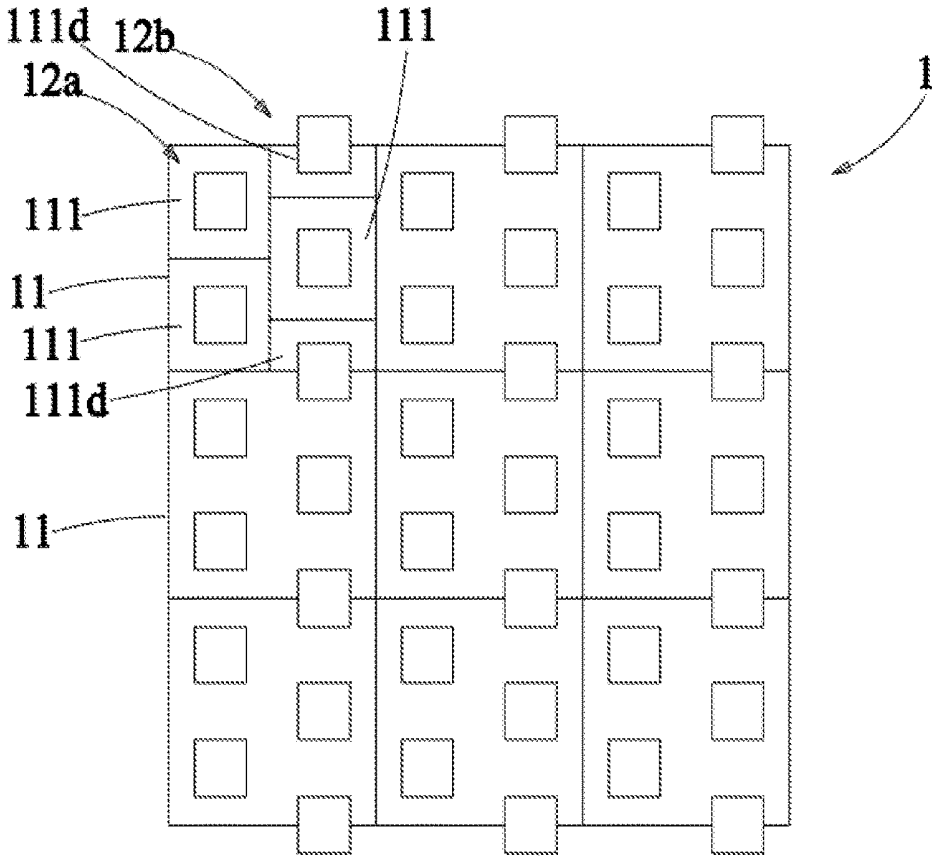


FIG. 17

PIXEL STRUCTURE OF ORGANIC LIGHT EMITTING DIODE DISPLAY

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority benefit of U.S. Provisional Application Ser. No. 62/540,050, filed Aug. 1, 2017, and Chinese Patent Application Serial Number 201810642102.1, filed on Jun. 21, 2018, the full disclosure of which are incorporated herein by reference.

BACKGROUND

Technical Field

[0002] The present disclosure relates to the field of displays, and in particular, to a pixel structure of an organic light emitting diode display.

RELATED ART

[0003] At present, an organic light emitting diode display has been developed to be equipped with various functions. The multi-functions display has a plurality of sensing functions in addition to the original display function, such as a light sensing function, a pressure touch sensing function, a fingerprint sensing function, Infrared light sensing function, heartbeat sensing function, photometric sensing function, iris recognition function or eye tracking sensing function.

[0004] The sensing component may not be arranged in the pixel arrangement of the organic light emitting diode display in the prior art. It is required to arrange the sensing component at a region outside the pixel, which may increase the volume of the display. If the sensing components are integrated into the pixels, the configuration of the sensing components affects the arrangement of the plurality of the color sub-pixels in the pixels, which would affect the resolution of the organic light-emitting diode display.

[0005] The prior art may also configure the sensing component into the gap of the plurality of pixels of the pixel structure. However, the sensing component of the prior art is not arranged in the light emitting region. Such arrangement still affects the resolution and image quality of the organic light-emitting diode display and cannot meet the requirements of high resolution and high image quality.

SUMMARY

[0006] The disclosure is related to a pixel structure of an organic light emitting diode display to solve the problem of the affection on the resolution and image quality of the organic light-emitting diode display arising from integrating the sensing component into the pixel.

[0007] In one embodiment, a pixel structure of an organic light emitting diode display comprises a substrate and a plurality of pixels arranged on the substrate. The plurality of pixels is closely arranged. Each of the pixels is a light-emitting region. Each of the pixels comprises a plurality of sub-regions arranged in at least one column. Each sub-region of each of the column of the pixels comprises a color sub-pixel, a transparent sub-pixel or a sensing component. At least one of the pluralities of sub-regions of each pixel is the sensing component and the sensing component is arranged in the light-emitting region.

[0008] In the embodiments of the disclosure, the sensing component is integrated into the pixel structure of the

display, and the sensing component is arranged in a light emitting region of the pixel of the pixel structure such that the pixel structure of the organic light emitting diode display has a sensing function in addition to the display function, and at the same time the such arrangement enables the display to have a resolution of more than 500 ppi.

[0009] It should be understood, however, that this summary may not contain all aspects and embodiments of the present invention, that this summary is not meant to be limiting or restrictive in any manner, and that the invention as disclosed herein will be understood by one of ordinary skill in the art to encompass obvious improvements and modifications thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The features of the exemplary embodiments believed to be novel and the elements and/or the steps characteristic of the exemplary embodiments are set forth with particularity in the appended claims. The Figures are for illustration purposes only and are not drawn to scale. The exemplary embodiments, both as to organization and method of operation, may best be understood by reference to the detailed description which follows taken in conjunction with the accompanying drawings in which:

[0011] FIG. 1 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a first embodiment of the present disclosure;

[0012] FIG. 2 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a second embodiment of the present disclosure;

[0013] FIG. 3 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a third embodiment of the present disclosure;

[0014] FIG. 4 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fourth embodiment of the present disclosure;

[0015] FIG. 5 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fifth embodiment of the present disclosure;

[0016] FIG. 6 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a sixth embodiment of the present disclosure;

[0017] FIG. 7 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a seventh embodiment of the present disclosure;

[0018] FIG. 8 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to an eighth embodiment of the present disclosure;

[0019] FIG. 9 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a ninth embodiment of the present disclosure;

[0020] FIG. 10 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a tenth embodiment of the present disclosure;

[0021] FIG. 11 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to an eleventh embodiment of the present disclosure;

[0022] FIG. 12 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a twelfth embodiment of the present disclosure;

[0023] FIG. 13 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a thirteenth embodiment of the present disclosure;

[0024] FIG. 14 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fourteenth embodiment of the present disclosure;

[0025] FIG. 15 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fifteenth embodiment of the present disclosure;

[0026] FIG. 16 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a sixteenth embodiment of the present disclosure; and

[0027] FIG. 17 is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a seventeenth embodiment of the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0028] The present disclosure will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. This present disclosure may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this present disclosure will be thorough and complete, and will fully convey the scope of the present disclosure to those skilled in the art.

[0029] Certain terms are used throughout the description and following claims to refer to particular components. As one skilled in the art will appreciate, manufacturers may refer to a component by different names. This document does not intend to distinguish between components that differ in name but function. In the following description and in the claims, the terms “include/including” and “comprise/comprising” are used in an open-ended fashion, and thus should be interpreted as “including but not limited to”. “Substantial/substantially” means, within an acceptable error range, the person skilled in the art may solve the technical problem in a certain error range to achieve the basic technical effect. Additionally, the term “couple” or “connect” covers any direct or indirect electrically coupling means. Therefore, when one device is electrically connected to another device in the context, that connection may be through a direct electrical connection, or through an indirect electrical connection via other devices and connections. The following description is of the best-contemplated mode of carrying out the invention. This description is made for the purpose of illustration of the general principles of the invention and should not be taken in a limiting sense. The scope of the invention is best determined by reference to the appended claims.

[0030] Moreover, the terms “include”, “contain”, and any variation thereof are intended to cover a non-exclusive inclusion. Therefore, a process, method, object, or device that includes a series of elements not only includes these elements, but also includes other elements not specified expressly, or may include inherent elements of the process, method, object, or device. If no more limitations are made, an element limited by “include a/an . . .” does not exclude other same elements existing in the process, the method, the article, or the device which includes the element.

[0031] In the following embodiment, the same reference numerals is used to refer to the same or similar elements throughout the disclosure.

[0032] The present disclosure provides a pixel structure of an organic light emitting diode display. The pixel structure includes a substrate a plurality of pixels formed on the substrate. The plurality of pixels is arranged closely. Each of the pixels is a light-emitting region

[0033] The disclosure provides a pixel structure of an organic light emitting diode display comprising a substrate and a plurality of pixels arranged on the substrate. The plurality of pixels is closely arranged. Each of the pixels is a light-emitting region. Each of the pixels comprises a plurality of sub-regions arranged in at least one column. The amount of the sub-regions in each pixel is the same. The amount of the sub-regions in each column may be the same or different. Each sub-region of each column comprises a color sub-pixel, a transparent sub-pixel or a sensing component. At least one of the plurality of sub-regions of each pixel is the sensing component and the sensing component is arranged in the light-emitting region. The color sub-pixel is a red sub-pixel, a green sub-pixel or a blue sub-pixel. The sensing component may be a light sensing component, pressure touch sensing component, fingerprint sensing component, infrared light sensing component, heartbeat sensing component, photometric sensing component, iris identification components or eye tracking sensing component. It is noted that the selection of sensing component is not limited to the above enumeration. The shape of the color sub-pixel, the transparent sub-pixel or the sensing component may be triangle, square, rectangle, rhombic, pentagon, hexagon, polygon, circle, or ellipse. A suitable shape can be selected in accordance with the actual functional requirements of the organic light emitting diode display. The shape of the color sub-pixel, the transparent sub-pixel or the sensing component respectively refers to the shape of the color sub-pixel, the transparent sub-pixel or the sensing component that actually functions. The disclosure integrates the color sub-pixel, the transparent sub-pixel and the sensing component into the same pixel such that the pixel structure of the organic light emitting diode display has a sensing function in addition to the display function, and at the same time the such arrangement enables the display to have a resolution of more than 500 ppi.

[0034] Various embodiments are provided to explain in details for the arrangement of the sub-regions of each pixel are arranged.

[0035] Refer to FIG. 1, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a first embodiment of the present disclosure. As shown in the figure, each pixel 11 of the pixel structure 1 of the organic light emitting diode display in this embodiment includes six sub-regions. The six

sub-regions 111 are divided into a first column 12a and a second column 12b arranged at the right side of the first column. The number of the sub-regions 111 of the first column 12a is the same as the number of the sub-regions 111 of the second column 12b. The number of the sub-regions 111 of the first column 12a is three. The number of the sub-regions 111 of the second column 12b is three. The plurality of the sub-regions 111 of the first column 12a correspond to the plurality of the sub-regions 111 of the second column 12b. In this embodiment, each sub-region 111 includes a color sub-pixel, a transparent sub-pixel or a sensing component. The shape of the color sub-pixel, the transparent sub-pixel or the sensing component is a rectangular. The color sub-pixel, the transparent sub-pixel or the sensing component in each sub-region 111 has the same area. In other words, the plurality of the sub-regions 111 of the first column 12a are symmetrically arranged with the plurality of the sub-regions 111 of the second column 12b. The above is merely one embodiment of the present disclosure. If each pixel 11 includes an even number of the sub-regions 111, such as four sub-regions 111, the sub-regions 111 may be equally arranged in the first column 12a and the second column 12b, such that the number of the sub-regions 111 of the first column 12a is equal to the sub-regions 111 of the second column 12b, and the number of the plurality of the sub-regions 111 of the first column 12a correspond to the plurality of sub-regions 111 of the second column 12b, respectively.

[0036] Refer to FIG. 2, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a second embodiment of the present disclosure. As shown in the figure, the difference between the pixel structure 1 of the organic light emitting diode display in this embodiment and the pixel structure of the organic light emitting diode display of the first embodiment lies in that the two sub-regions 111 in the second row are shifted left in relative to the sub-regions 111 in the first row and the third row such that the color sub-pixel, the transparent sub-pixel or the sensing component of the second sub-region 111 in the first column 12a may cross the adjacent pixel. Each row in this embodiment includes three pixels, referring as a first pixel 11a, a second pixel 11b and a third pixel 11c. The second sub-region 111 of the first column 12a of the second pixel 11b at the first row is shifted left and crosses to the first pixel 11a at the first row. The second sub-region 111 of the first column 12a of the third pixel 11c at the first row is shifted left and crosses to the second pixel 11b at the first row. The summation of the area, which is in the second pixel 11b, of the color sub-pixel, the transparent sub-pixel or the sensing component at the second sub-region 111 of the first column 12a of the second pixel 11b at the first row, and the area, which is in the second pixel 11b, of the color sub-pixel, the transparent sub-pixel or the sensing component at the second sub-region 111 of the first column 12a of the third pixel 11c at first row equals to the area of the sub-region 111 not crossing the adjacent pixels, which is in the second pixel 11b of the first row, of the color sub-pixel, the transparent sub-pixel or the sensing component. By way of such configuration, each pixel may have six sub-regions 111. The arrangement of the sub-regions 111 of each pixel at the third row is the same as the arrangement of the sub-regions 111 of each pixel at the first row.

[0037] In this embodiment, the first sub-region 111 and the third sub-region 111 at the first column 12a in each pixel at the second row are shifted right relative to the second sub-region 111 and cross to the adjacent pixels. For example, the first sub-region 111 and the third sub-region 111 at the first column 12a of the second pixel 11b at the second row, and the first sub-region 111 and the third sub-region 111 at the first column 12a of the third pixel 11c at the second row are shifted right and respectively cross to the first pixel 11a and the second pixel 11b at the second row. The summation of the area, which is in the second pixel 11b at the second row, of the color sub-pixel, the transparent sub-pixel or the sensing component of the first sub-region 111 and the third sub-region 111 of the first column 12a of the second pixel 11b at the second row, and the area, which is in the second pixel 11b, of the color sub-pixel, the transparent sub-pixel or the sensing component of the first sub-region 111 and the third sub-region 111 of the first column 12a of the third pixel 11c at the second row equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-regions 111 that do not cross to the adjacent region of the second pixel 11b at the second row. By way of such configuration, each pixel 11b may have six sub-regions 111. From the above description, a plurality of sub-regions 111 in the plurality of pixels cross the two adjacent pixels. The summation of the areas at the same pixel of the color sub-pixel, the transparent sub-pixel or the sensing component in the two sub-regions 111 crossing adjacent pixels in each pixel equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component in the sub-region 111 of the pixel, thereby forming six sub-regions 111 in a pixel.

[0038] Refer to FIG. 3, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a third embodiment of the present disclosure. As shown in the figure, the difference between the pixel structure 1 of the organic light emitting diode display in this embodiment and the pixel structure of the organic light emitting diode display of the second embodiment lies in that the arrangement of the sub-region 111 in each pixel 11 of this embodiment is the same as the arrangement of each pixel in the second embodiment. The shape of the color sub-pixel, the transparent sub-pixel or the sensing component in the sub-region 111 of each row of each pixel 11 is different. For example, the shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the plurality of sub-regions 111 at the first row in each pixel 11 of the first row are rectangular. The shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the plurality of sub-regions 111 at the second row in each pixel 11 of the first row are circular. The shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the plurality of sub-regions 111 at the third row in each pixel 11 of the first row are rhombic.

[0039] In this embodiment, the shape arrangement of the color sub-pixel, the transparent sub-pixel or the sensing component in the plurality of sub-regions 111 in each pixel is different. For example, the shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the plurality of sub-regions 111 arranged at the first row in the second pixel 11 of the first column are hexagon. The shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the sub-regions 111 arranged at the

second row in the second pixel **11** of the first column are triangle. The shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the sub-regions **111** arranged at the third row in the second pixel **11** of the first column are rectangular. By way of such configuration, the shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the sub-regions **111** arranged at the third row in the second pixel **11** of the first column different from the shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the sub-regions **111** arranged at the third row in the first pixel **11** of the first column.

[0040] From the above description, the shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the sub-regions **111** of each row of each pixel are the same. The shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in sub-regions **111** of each pixel in each column are different.

[0041] Refer to FIG. 4, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fourth embodiment of the present disclosure. As shown in the figure, the difference between the pixel structure **1** of the organic light emitting diode display in this embodiment and the pixel structure of the organic light emitting diode display of the third embodiment lies in that the arrangement of the sub-regions of each pixel **11** in this embodiment is the same as the arrangement of the sub-regions of each pixel in the second embodiment. The shape arrangement of the color sub-pixels, the transparent sub-pixels or the sensing components in the plurality of sub-regions **111** of each pixel **11** is the same. The shapes of the color sub-pixels, the transparent sub-pixels or the sensing components in the plurality of sub-regions **111** of the same pixel are different. In this embodiment, the shape of the color sub-pixel, the transparent sub-pixel or the sensing component in the first sub-region **111** of the first column **12a** is rectangular. The shape the color sub-pixel, the transparent sub-pixel or the sensing component in the second sub-region **111** of the first column **12a** is triangular. The shape the color sub-pixel, the transparent sub-pixel or the sensing component in the third sub-region **111** of the first column **12a** is circle. The shape the color sub-pixel, the transparent sub-pixel or the sensing component in the first sub-region **111** of the second column **12b** is hexagon. The shape the color sub-pixel, the transparent sub-pixel or the sensing component in the second sub-region **111** of the second column **12b** is rhombic. The shape the color sub-pixel, the transparent sub-pixel or the sensing component in the third sub-region **111** of the second column **12b** is square. In this embodiment, the arrangement of the sub-region **111** in the pixels at the first row and the third row is the same as the arrangement of the sub-region in the pixels at the first row and the third row in the second embodiment. The arrangement of the sub-region **111** in the pixels at the second rows the same as the arrangement of the sub-region in the pixels at the second row in the second embodiment. The detailed description thereof is not rendered again.

[0042] Refer to FIG. 5, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fifth embodiment of the present disclosure. As shown in the figure, the difference between the pixel structure **1** of the organic light emitting diode display in this embodiment and the pixel

structure of the organic light emitting diode display of the first embodiment lies in that the amount of the sub-regions **111** in the first column **12a** of each pixel **11** is greater than the amount of the sub-regions **111** in the second column **12b**. The amount of the sub-regions **111** in the first column **12a** is M. The amount of the sub-regions **111** in the second column **12b** is N. The summation of M and N is 5 to 6. When N is 2, M is N+1 or N+2. In this embodiment, the summation of M and N is 6. The amount (M) of the sub-regions **111** in the first column **12a** of each pixel is 4. The amount (N) of the sub-regions **111** in the second column **12b** of each pixel is 2. Each sub-region **111** of the second column **12b** correspond to the two adjacent sub-regions **111** of the first column **12a**. In this embodiment, each sub-region **111** includes a color sub-pixel, a transparent sub-pixel or a sensing component, the shape of which are all rectangular. The arrangement of the plurality of the sub-regions **111** of each pixel is the same. When the amount (N+M) of the sub-regions **111** of each pixel **11** is 5, the amount (N) of the sub-regions **111** of the second column **12b** in each pixel **11** remains as 2, while the amount (M) of the sub-regions **111** of the first column **12a** in each pixel **11** is 3.

[0043] Refer to FIG. 6, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a sixth embodiment of the present disclosure. As shown in the figure, the difference between the pixel structure **1** of the organic light emitting diode display in this embodiment and the pixel structure of the organic light emitting diode display of the fifth embodiment lies in that the arrangement of the plurality of the sub-regions of each pixel is the same. The organic light emitting diode display in this embodiment includes a plurality of pixels **11** arranged in a plurality of columns. The arrangement of the plurality of sub-regions **111** of the plurality of pixels **11** in each column is different from the arrangement of the plurality of the sub-regions **111** of the plurality of the adjacent pixels **11**. In this embodiment, the arrangement of the six sub-regions **111** of the pixels **11** at the first row and the third row is the same as the arrangement of the six sub-regions of each pixel in the fifth embodiment. The arrangement of the six sub-regions **111** of the pixels at the second row is contrary to the arrangement of the six sub-regions **111** of the pixels **11** at the first row and the third row. In other words, the second column **12b** of the pixel **11** at the second row is arranged at the left side of the first column **12a**, that is the first column **12a** and the second column **12b** are reversely arranged. Each sub-region **111** of the first column **12a** corresponds to the two adjacent sub-regions **111** of the second column **12b**.

[0044] Refer to FIG. 7, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a seventh embodiment of the present disclosure. As shown in the figure, the difference between the pixel structure **1** of the organic light emitting diode display in this embodiment and the pixel structure of the organic light emitting diode display of the fifth embodiment lies in that the amount of the sub-regions **111** in the first column **12a** of each pixel **11** is greater than the amount of the sub-regions **111** in the second column **12b**. The amount of the sub-regions **111** in the first column **12a** is M. The amount of the sub-regions **111** in the second column **12b** is N. The summation of M and N is 4 to 6. When N is 1, M is N+2, N+3 or N+4. In this embodiment, the summation of M and N is 6. The amount (M) of the

sub-regions **111** in the first column **12a** of each pixel **11** is 5. The amount (N) of the sub-regions **111** in the second column **12b** is 1. Each sub-region **111** of the second column **12b** corresponds to the five adjacent sub-regions **111** of the first column **12a**. In this embodiment, each sub-region **111** includes a color sub-pixel, a transparent sub-pixel or a sensing component. The shape of the color sub-pixel, the transparent sub-pixel or the sensing component is rectangular. The arrangement of the sub-regions **111** in the pixels **11** of the second row in this embodiment may be contrary to the arrangement of the sub-regions **111** in the pixels **11** of the first row and the third row, similar with the sixth embodiment. When the amount (M+N) of the sub-regions **111** in each pixel **11** is 4 or 5, the amount (N) of the sub-region **111** in the second column **12b** in each pixel **11** is 1, and the amount (M) of the sub-regions **111** in the first column **12a** in each pixel **11** is 3 or 4. Certainly, the arrangement of the sub-regions **111** in the pixels **11** at the second row may be contrary to the arrangement of the sub-regions **111** in the pixels **11** at the first row and the third row, similar with the sixth embodiment.

[0045] Refer to FIG. 8, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to an eighth embodiment of the present disclosure. As shown in the figure, each pixel **11** of the pixel structure **1** of the organic light emitting diode display in this embodiment includes six sub-regions **111**. The six sub-regions **111** are divided into a first column **12a** and the second columns **12b** right to the first column. The amount of the sub-regions **111** of the first column **12a** is 3. The amount of the sub-regions **111** of the second columns **12b** is 3, which are divided into a first sub-region **111a** and two second sub-regions **111b**. The first sub-region **111a** is arranged above to the two second sub-regions **111b**. The two second sub-regions **111b** are arranged side by side horizontally. The first sub-region **111a** corresponds to the two adjacent sub-regions **111** in the first column **12a**. The two second sub-regions **111b** correspond to one sub-region **111** in the first column **12a**. In this embodiment, each of the sub-regions **111**, the first sub-region **111a**, and the two second sub-regions **111b** include a color sub-pixel, a transparent sub-pixel or a sensing component. The shape of the color sub-pixel, the transparent sub-pixel or the sensing component is rectangular. Certainly, the arrangement of the sub-regions **111** in the pixels **11** at the second row may be contrary to the arrangement of the sub-regions **111** in the pixels **11** at the first row and the third row, similar with the sixth embodiment.

[0046] Refer to FIG. 9, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a ninth embodiment of the present disclosure. As shown in the figure, the six sub-regions **111** of the organic light emitting diode display **1** are divided into three columns, referred as the first column **12a**, the second column **12b** and the third column **12c**. The second column **12b** is arranged between the first column **12a** and the third column **12c**. The amount of the sub-regions **111** of the first column **12a** is M1. The amount of the sub-regions **111** of the second column **12b** is M2. The amount of the sub-regions **111** of the third column **12c** is M3. The summation of M1, M2, and M3 is 5. M1 equals to M2. M1 is greater than M3. M2 is greater than M3. In this embodiment, the amount (M1) of the sub-regions **111** of the first column **12a** is 2, the amount (M2) of the sub-regions

111 of the second column **12b** is 2, and the amount (M3) of the sub-regions **111** of the third column **12c** is 1. In this embodiment, the third column **12c** is arranged at the right side of the first column **12a**. Certainly the first column **12a** and the third column **12c** may be reversely arranged, that is the third column **12c** is arranged at the left side of the first column **12a**. Certainly, the arrangement of the sub-regions **111** in the pixels **11** at the second row may be contrary to the arrangement of the sub-regions **111** in the pixels **11** at the first row and the third row, similar with the sixth embodiment.

[0047] Refer to FIG. 10, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a tenth embodiment of the present disclosure. As shown in the figure, the difference between this embodiment and the above embodiment lies in the summation of M1, M2 and M3 in this embodiment is 4 to 6. M1 is greater than M2 and M3. M2 equals to M3. In this embodiment, the summation of M1, M2 and M3 is 4. The amount (M1) of the sub-regions **111** of the first column **12a** is 2, the amount (M2) of the sub-regions **111** of the second column **12b** is 1, and the amount (M3) of the sub-regions **111** of the third column **12c** is 1. When the summation of M1, M2 and M3 is 5, the amount (M1) of the sub-regions **111** of the first column **12a** is 3. When the summation of M1, M2 and M3 is 6, the amount (M1) of the sub-regions **111** of the first column **12a** is 4. In this embodiment, the third column **12c** is arranged at the right side of the first column **12a**. Certainly the first column **12a** and the third column **12c** may be reversely arranged, that is the third column **12c** is arranged at the left side of the first column **12a**. Certainly, the arrangement of the sub-regions **111** in the pixels **11** at the second row may be contrary to the arrangement of the sub-regions **111** in the pixels **11** at the first row and the third row, similar with the sixth embodiment.

[0048] Refer to FIG. 11, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to an eleventh embodiment of the present disclosure. As shown in the figure, the difference between this embodiment and the tenth embodiment lies in the summation of M1, M2 and M3 in this embodiment is 4 to 6. M2 is greater than M1 and M3. M1 equals M3. In this embodiment, the summation of M1, M2 and M3 is 5. The amount (M1) of the sub-regions **111** of the first column **12a** is 1, the amount (M2) of the sub-regions **111** of the second column **12b** is 3, and the amount (M3) of the sub-regions **111** of the third column **12c** is 1. When the summation of M1, M2 and M3 is 4, the amount (M2) of the sub-regions **111** of the second column **12b** is 2. When the summation of M1, M2 and M3 is 6, the amount (M2) of the sub-regions **111** of the second column **12b** is 4.

[0049] Refer to FIG. 12, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a twelfth embodiment of the present disclosure. As shown in the figure, the difference between this embodiment and the tenth embodiment lies in the summation of M1, M2 and M3 in this embodiment is 6. M1, M2, and M3 are equivalent. In this embodiment, the amount (M1) of the sub-regions **111** of the first column **12a**, the amount (M2) of the sub-regions **111** of the second column **12b**, and the amount (M3) of the sub-regions **111** of the third column **12c** is 2 respectively.

[0050] Refer to FIG. 13, which is a schematic view showing the arrangement of the sub-region of the pixels of

an organic light emitting diode display according to a thirteenth embodiment of the present disclosure. As shown in the figure, the difference between this embodiment and the tenth embodiment lies in the summation of M1, M2 and M3 in this embodiment is 6. M1, M2, and M3 are inequivalent. In this embodiment, the amount (M1) of the sub-regions 111 of the first column 12a is 2, the amount (M2) of the sub-regions 111 of the second column 12b is 1, and the amount (M3) of the sub-regions 111 of the third column 12c is 3. The sequence of these three columns may be arbitrarily arranged, which is not limited to the above arrangement.

[0051] Refer to FIG. 14, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fourteenth embodiment of the present disclosure. As shown in the figure, the plurality of the sub-regions 111 in each pixel 11 of the pixel structure of the organic light emitting diode display according to this embodiment is arranged in one column. The amount of the sub-regions 111 in each pixel 11 according to this embodiment is 6. Certainly, the amount of the sub-regions 111 in each pixel 11 may be 4 or 5. The description is not rendered again.

[0052] Refer to FIG. 15, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a fifteenth embodiment of the present disclosure. As shown in the figure, each pixel 11 of the pixel structure 1 of the organic light emitting diode display in this embodiment includes four sub-regions 111. The four sub-regions include one complete sub-region 111 in the center of the pixel 11. The other three sub-regions 111 are shared with the adjacent with the other pixels 11. In this embodiment, the third sub-regions 111c, 111d are respectively arranged at the right, left, top and the bottom side of the sub-region 111. The sub-regions 111c, 111d cross two pixels 11. The summation of the area, which is in the same pixel 11, of the color sub-pixel, the transparent sub-pixel or the sensing component in the two third sub-regions 111c at the right and left sides of the sub-regions 111 in the center of the pixel 11 equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region 111c in the center of the pixel 11. The summation of the area, which is in the same pixel 11, of the color sub-pixel, the transparent sub-pixel or the sensing component in the two third sub-regions 111c at the top and bottom sides of the sub-regions 111 in the center of the pixel 11 equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region 111c in the center of the pixel 11. Four fourth sub-regions 111e are respectively arranged at the four corners of the pixel 11. The fourth sub-regions 111e cross four pixels 11. The four fourth sub-regions 111e surround the sub-region 111. The summation of the area, which is in the same pixel 11, of the color sub-pixels, the transparent sub-pixels or the sensing components in the four fourth sub-regions 111e equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region 111 in the center of the pixel 11.

[0053] Refer to FIG. 16, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a sixteenth embodiment of the present disclosure. As shown in the figure, the pixel structure 1 of the organic light emitting diode display in this embodiment and the fifteenth embodi-

ment lies in that the four sub-regions 111 have two complete sub-regions 111 in the center of the pixel 11. The other two sub-regions are shared with the adjacent pixels 11. In this embodiment, the third sub-regions 111c are respectively at the right and left side of the sub-region 111 in the center of the pixel. The summation of the area, which is in the same pixel 11, of the color sub-pixel, the transparent sub-pixel or the sensing component in the two third sub-regions 111c at the right and left sides of the sub-regions 111 in the center of the pixel 11 equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region 111 in the center of the pixel 11. Four fourth sub-regions 111e are respectively arranged at the four corners of the pixel 11. The four fourth sub-regions 111e surround the sub-region 111. The summation of the area, which is in the same pixel 11, of the color sub-pixels, the transparent sub-pixels or the sensing components in the four fourth sub-regions 111d equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region 111 in the center of the pixel 11.

[0054] Refer to FIG. 17, which is a schematic view showing the arrangement of the sub-region of the pixels of an organic light emitting diode display according to a seventeenth embodiment of the present disclosure. As shown in the figure, the pixel structure 1 of the organic light emitting diode display in this embodiment and the sixteenth and the fifteenth embodiment lies in that three sub-regions 111 of the four sub-regions 111 are completely arranged in the pixel 11. The amount of the sub-regions 111 of the first column 12a in the pixel 11 is 2. The amount of the sub-regions 111 of the second column 12b in the pixel 11 is 2. Only one sub-region 111 of the two sub-regions at the second column 12b is completely arranged in the pixel 11. The third sub-regions 111d are respectively arranged at the top and the bottom side of the sub-region 111 completely arranged in the pixel 11. In this embodiment, the summation of the area, which is in the same pixel 11, of the color sub-pixel, the transparent sub-pixel or the sensing component in the two third sub-regions 111d at the top and bottom sides of the sub-regions 111 in the center of the pixel 11 equals to the area of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region 111 in the center of the pixel 11.

[0055] In summary, the present disclosure provides a pixel structure of an organic light emitting diode display, which mainly integrates a sensing component into the pixel structure of the organic light emitting diode display, and the sensing component is arranged in a light emitting region of the pixel of the pixel structure. The pixel structure formed by the above arrangement of the sub-regions of the above pixels has a sensing function in addition to the display function, and at the same time enables the display to have a resolution of more than 500 ppi.

[0056] It is to be understood that the term “comprises”, “comprising”, or any other variants thereof, is intended to encompass a non-exclusive inclusion, such that a process, method, article, or device of a series of elements not only includes those elements but also includes other elements that are not explicitly listed, or elements that are inherent to such a process, method, article, or device. An element defined by the phrase “comprising a . . .” does not exclude the presence of the same element in the process, method, article, or device that comprises the element.

[0057] Although the present disclosure has been explained in relation to its preferred embodiment, it does not intend to limit the present disclosure. It will be apparent to those skilled in the art having regard to this present disclosure that other modifications of the exemplary embodiments beyond those embodiments specifically described here may be made without departing from the spirit of the invention. Accordingly, such modifications are considered within the scope of the invention as limited solely by the appended claims.

What is claimed is:

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

a substrate; and

a plurality of pixels arranged on the substrate;

wherein each of the pixels is a light-emitting region, each of the pixels comprises a plurality of sub-regions arranged in a plurality of columns; each sub-region of each of the column of the pixels comprises a color sub-pixel, a transparent sub-pixel or a sensing component; at least one of the plurality of sub-regions of each pixel is the sensing component and the sensing component is arranged in the light-emitting region.

2. The pixel structure of an organic light emitting diode display according to claim 1, wherein the plurality of sub-regions of each of the pixels are divided into a first column and a second column at one side of the first column.

3. The pixel structure of an organic light emitting diode display according to claim 2, wherein the amount of the sub-regions of the first column equals to the amount of the sub-regions of the second column.

4. The pixel structure of an organic light emitting diode display according to claim 3, wherein the sub-regions of the first column correspond to the sub-regions of the second column.

5. The pixel structure of an organic light emitting diode display according to claim 4, wherein the sub-regions of the first column are configured symmetrically to the sub-regions of the second column.

6. The pixel structure of an organic light emitting diode display according to claim 4, wherein the amount of the sub-regions of the first column and the amount of the sub-regions of the second column is three; the sub-regions are arranged in three rows; two of the sub-regions of the second row are shifted in relative to the sub-regions of the first row and the sub-regions of the third row; one of the two of the sub-regions of the second row crosses two adjacent pixels.

7. The pixel structure of an organic light emitting diode display according to claim 4, wherein the amount of the sub-regions of the first column and the amount of the sub-regions of the second column is three; the sub-regions are arranged in three rows; the sub-regions of the first row and the sub-regions of the third row are shifted in relative to two of the sub-regions of the second row; two of the sub-regions of the first row and at least one of the sub-regions of the third row crosses two adjacent pixels.

8. The pixel structure of an organic light emitting diode display according to claim 1 wherein the summation of the area in the same pixel for the color sub-pixel, the transparent sub-pixel or the sensing component of the two sub-regions crossing the two adjacent pixels in each of the pixel equals to the total of region of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region in the same pixel.

9. The pixel structure of an organic light emitting diode display according to claim 6, wherein the summation of the area in the same pixel for the color sub-pixel, the transparent sub-pixel or the sensing component of the two sub-regions crossing the two adjacent pixels in each of the pixel equals to the total of region of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region in the same pixel.

10. The pixel structure of an organic light emitting diode display according to claim 7, wherein the summation of the area in the same pixel for the color sub-pixel, the transparent sub-pixel or the sensing component of the two sub-regions crossing the two adjacent pixels in each of the pixel equals to the total of region of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region in the same pixel.

11. The pixel structure of an organic light emitting diode display according to claim 1, wherein the summation of the area in the same pixel for the color sub-pixel, the transparent sub-pixel or the sensing component of the four sub-regions crossing the four adjacent pixels in each of the pixel equals to the total of region of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-region in the same pixel.

12. The pixel structure of an organic light emitting diode display according to claim 1, wherein the shape of the color sub-pixel, the transparent sub-pixel or the sensing component of the plurality of sub-regions of each pixel is different.

13. The pixel structure of an organic light emitting diode display according to claim 1, wherein the shape of the color sub-pixel, the transparent sub-pixel or the sensing component of the sub-regions of each row of each pixel is different.

14. The pixel structure of an organic light emitting diode display according to claim 1, wherein the arrangement shape of the color sub-pixel, the transparent sub-pixel or the sensing component of the plurality of sub-regions in each pixel of each row.

15. The pixel structure of an organic light emitting diode display according to claim 2, wherein the amount of the sub-region of the first column is M , the amount of the sub-region of the second column is N , and $M > N$.

16. The pixel structure of an organic light emitting diode display according to claim 15, wherein when N is 2, M is $N+1$ or $N+2$.

17. The pixel structure of an organic light emitting diode display according to claim 16, wherein the sub-regions of the second column corresponds to the two adjacent sub-regions of the first column.

18. The pixel structure of an organic light emitting diode display according to claim 15, wherein when N is 1, M is $N+1$, $N+2$, $N+3$ or $N+4$.

19. The pixel structure of an organic light emitting diode display according to claim 18, wherein the sub-regions of the second column corresponds to M sub-regions of the first column.

20. The pixel structure of an organic light emitting diode display according to claim 3, wherein the amount of the sub-regions of the first column and the second column is three, the three sub-regions of the second column comprises a first sub-region and two second sub-regions arranged side by side horizontally, the first sub-region corresponds to the two adjacent sub-regions in the first column, the second sub-region corresponds to the sub-region in the first column.

21. The pixel structure of an organic light emitting diode display according to claim **15**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is the same.

22. The pixel structure of an organic light emitting diode display according to claim **16**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is the same.

23. The pixel structure of an organic light emitting diode display according to claim **17**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is the same.

24. The pixel structure of an organic light emitting diode display according to claim **18**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is the same.

25. The pixel structure of an organic light emitting diode display according to claim **19**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is the same.

26. The pixel structure of an organic light emitting diode display according to claim **20**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is the same.

27. The pixel structure of an organic light emitting diode display according to claim **15**, wherein the arrangement of the plurality of sub-regions of the pixels of each row is contrary to the arrangement of the plurality of sub-regions of the adjacent pixel.

28. The pixel structure of an organic light emitting diode display according to claim **16**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is contrary to the arrangement of the plurality of sub-regions of the adjacent pixel.

29. The pixel structure of an organic light emitting diode display according to claim **17**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is contrary to the arrangement of the plurality of sub-regions of the adjacent pixel.

30. The pixel structure of an organic light emitting diode display according to claim **18**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is contrary to the arrangement of the plurality of sub-regions of the adjacent pixel.

31. The pixel structure of an organic light emitting diode display according to claim **19**, wherein the arrangement of

the plurality of sub-regions of the pixels of each column is contrary to the arrangement of the plurality of sub-regions of the adjacent pixel.

32. The pixel structure of an organic light emitting diode display according to claim **20**, wherein the arrangement of the plurality of sub-regions of the pixels of each column is contrary to the arrangement of the plurality of sub-regions of the adjacent pixel.

33. The pixel structure of an organic light emitting diode display according to claim **1**, wherein the plurality of sub-regions of each pixel are divided into a first column, a second column and a third column, the amount of the sub-regions in the first column is $M1$, the amount of the sub-regions in the second column is $M2$, and the amount of the sub-regions in the third column is $M3$.

34. The pixel structure of an organic light emitting diode display according to claim **33**, wherein the sum of $M1$, $M2$, and $M3$ is 4 to 6, $M1$ equals to $M2$, $M1 > M3$, and $M2 > M3$.

35. The pixel structure of an organic light emitting diode display according to claim **33**, wherein the sum of $M1$, $M2$, and $M3$ is 4 to 6, $M1 > M2$, $M1 > M3$, and $M2 = M3$.

36. The pixel structure of an organic light emitting diode display according to claim **33**, wherein the sum of $M1$, $M2$, and $M3$ is 4 to 6, $M2 > M1$, $M2 > M3$, and $M1 = M3$.

37. The pixel structure of an organic light emitting diode display according to claim **33**, wherein the sum of $M1$, $M2$, and $M3$ is 6, and $M1$, and $M2$, and $M3$ are equivalent.

38. The pixel structure of an organic light emitting diode display according to claim **33**, wherein the sum of $M1$, $M2$, and $M3$ is 6, and $M1$, and $M2$, and $M3$ are inequivalent.

39. The pixel structure of an organic light emitting diode display according to claim **1**, wherein the color sub-pixel is a red sub-pixel, a green sub-pixel or a blue sub-pixel.

40. The pixel structure of an organic light emitting diode display according to claim **1**, wherein the sensing component is a light sensing component, pressure touch sensing component, fingerprint sensing component, infrared light sensing component, heartbeat sensing component, photometric sensing component, iris identification components or eye tracking sensing component.

41. The pixel structure of an organic light emitting diode display according to claim **1**, wherein the shape of the color sub-pixel, the transparent sub-pixel or the sensing component is triangle, square, rectangle, rhombic, pentagon, hexagon, polygon, circle, or ellipse.

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专利名称(译)	有机发光二极管显示器的像素结构		
公开(公告)号	US20190043932A1	公开(公告)日	2019-02-07
申请号	US16/050009	申请日	2018-07-31
[标]发明人	SHIH KUO HSING LI CHIA CHEN YAN CHIN RUNG		
发明人	SHIH, KUO-HSING LI, CHIA-CHEN YAN, CHIN-RUNG		
IPC分类号	H01L27/32		
CPC分类号	H01L27/3213 H01L27/3225 H01L27/3218 H01L27/3216 H01L27/3227 H01L27/323 G09F9/33 H01L27/3232		
优先权	201810642102.1 2018-06-21 CN 62/540050 2017-08-01 US		
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基板和布置在基板上的多个像素。多个像素紧密排列。每个像素是发光区域。每个像素包括布置在至少一列中的多个子区域。每列像素的每个子区域包括彩色子像素，透明子像素或感测组件。每个像素的多个子区域中的至少一个是感测组件，并且感测组件布置在发光区域中。除了显示功能之外，本公开的有机发光二极管显示器的像素结构还具有感测功能，并且同时这种布置使得显示器具有大于500ppi的分辨率。

