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(54) **Organic light emitting display device**

(57) An organic light emitting display device (300) includes a plurality of pixels defined on a substrate. Each of the plurality of pixels includes a plurality of sub-pixels (SP_R, SP_W, SP_B, SP_G), and each of the plurality of sub-pixels includes a light emitting area (EA_R, EA_W, EA_B, EA_G) and a driving area (DA_R, DA_W, DA_B, DA_G). The driving areas of the plurality of sub-pixels have widths in a first direction (S1, S2, S3, S4), and the widths in the first direction of the respective driving areas of the plurality of sub-pixels are identical to each other. A size of a light emitting area of one of the plurality of sub-pixels (331W or 331B) is greater than a size of a light

emitting area of one of other sub-pixels (331R or 331G). In the organic light emitting display device according to an aspect of the present invention, while the widths in the first direction of the respective driving areas of the plurality of sub-pixels are maintained as being identical to each other, a size of a light emitting area of each of the plurality of sub-pixels can be optimized by changing sizes of the light emitting areas of the plurality of sub-pixels without making a change in the size of a pixel and a size of a driving area. Thus, reliability and life of the organic light emitting display device can be improved.

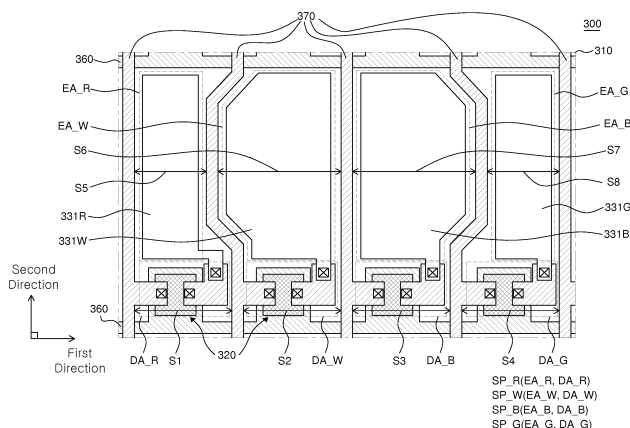


FIG. 3

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority of Korean Patent Application No. 10-2014-0048968 filed on April 23, 2014 and Korean Patent Application No. 10-2015-0037346 filed on March 18, 2015, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to an organic light emitting display device, and more particularly, to an organic light emitting display device having an optimum aperture ratio for each sub-pixel without making a change in driving elements.

Description of the Related Art

[0003] An organic light emitting display device (OLED), unlike a liquid crystal display (LCD) device, is a self-light emitting display device that does not need a separate light source, and, thus, the OLED can be made thinner. Further, the OLED has advantages in that it is driven with a low voltage to consume less power. Also, the OLED has excellent color expression ability, a high response time, a wide viewing angle, and a high contrast ratio (CR). Therefore, the OLED has been acknowledged as a next-generation display device.

[0004] FIG. 1 is a cross-sectional view provided to describe a typical organic light emitting display device. FIG. 1 illustrates a cross section of a sub-pixel SP of a general bottom-emission organic light emitting display device 100 for convenience in explanation. The bottom-emission organic light emitting display device refers to an organic light emitting display device in which a light emitted from an organic light emitting element is released toward the bottom of the organic light emitting display device. Also, the bottom-emission organic light emitting display device refers to an organic light emitting display device in which a light emitted from an organic light emitting element is released toward the bottom of a substrate on which a thin film transistor for driving the organic light emitting display device is formed.

[0005] Referring to FIG. 1, a thin film transistor 120 as a driving element for driving an organic light emitting element 130 is formed in a driving area DA on a substrate 110, and an overcoating layer 151 for planarizing an upper part of the thin film transistor 120 and a color filter 140 is formed. An organic light emitting element 130 including an anode 131 electrically connected with thin film transistor 120, an organic light emitting layer 132, and a cathode 133 is formed on the overcoating layer 151. If the organic light emitting display device 100 is a bottom-

emission organic light emitting display device, the anode 131 is formed of a transparent conductive material having a high work function value and the cathode 133 is formed of a reflective metallic material having a low work function value. The organic light emitting layer 132 is an organic light emitting layer for emitting white light. A light emitted from the organic light emitting layer 132 passes through the color filter 140 and is emitted toward the bottom of the substrate 110 on which the thin film transistor 120 is formed. A bank layer 152 is formed on the overcoating layer 151 and defines a light emitting area EA.

[0006] Generally, a pixel of an organic light emitting display device includes a plurality of sub-pixels. The respective sub-pixels are configured to emit lights of different colors from each other. Therefore, it is technically important to secure an aperture ratio for each sub-pixel to achieve an optimum luminance for each color. Herein, the aperture ratio refers to a ratio of a light emitting area to a sub-pixel. Optimization of the aperture ratio is closely involved in improving the life of an organic light emitting element.

[0007] In the sub-pixel SP of the organic light emitting display device 100 illustrated in FIG. 1, a light emitted from the organic light emitting element 130 cannot be emitted through the driving area DA in which the driving element such as the thin film transistor 120 is formed. Therefore, it is very difficult to secure an aperture ratio in an organic light emitting display device.

[0008] A method of reducing the size of a driving area in a sub-pixel may be considered in order to secure an aperture ratio in an organic light emitting display device. However, a driving area in a sub-pixel is optimized by considering the characteristics of an actual product. Therefore, if the number and/or a size of thin film transistors or capacitors disposed in the driving area are reduced to reduce a size of the driving area, reliability of an organic light emitting display device may decrease.

[0009] Meanwhile, a method of increasing a size of a pixel may be considered in order to secure an aperture ratio in an organic light emitting display device. However, a size of a pixel in an organic light emitting display device is determined by resolution of the organic light emitting display device. Particularly, in a high-resolution organic light emitting display device, a size of a sub-pixel is very small. Therefore, since the size of a pixel is limited by the resolution of the organic light emitting display device, it is practically impossible to secure an aperture ratio by increasing a size of a pixel.

SUMMARY OF THE INVENTION

[0010] The inventors of the present invention invented a new pixel structure having an optimum aperture ratio for each sub-pixel without making a change in a driving area in an organic light emitting display device having a limited size of a pixel that is suitable for resolution as described above.

[0011] Accordingly, an object of the present invention

is to provide an organic light emitting display device capable of providing different aperture ratios for respective sub-pixels included in a pixel without making a change in a size of the pixel and a size of a driving area.

[0012] Another object of the present invention is to provide an organic light emitting display device improved in reliability and life by securing a size of a light emitting area of each sub-pixel so as to be suitable for a current required for each sub-pixel.

[0013] Further, yet another object of the present invention is to provide an organic light emitting display device in which a size light emitting area of each sub-pixel is determined by considering efficiency of an organic light emitting element in each sub-pixel.

[0014] The objects of the present invention are not limited to the aforementioned objects, and other objects, which are not mentioned above, will be apparent to a person having ordinary skill in the art from the following description.

[0015] According to an aspect of the present invention to achieve the above-described objects, there is provided an organic light emitting display device. The organic light emitting display device includes: a plurality of pixels defined on a substrate. Each of the plurality of pixels includes a plurality of sub-pixels, and each of the plurality of sub-pixels includes a light emitting area and a driving area. The driving areas of the plurality of sub-pixels have widths in a first direction, and the widths in the first direction of the respective driving areas of the plurality of sub-pixels are identical to each other. A size of a light emitting area of one of the plurality of sub-pixels is greater than a size of a light emitting area of one of other sub-pixels. In the organic light emitting display device according to an aspect of the present invention, while the widths in the first direction of the respective driving areas of the plurality of sub-pixels are maintained as being identical to each other, a size of a light emitting area of each of the plurality of sub-pixels can be optimized by changing sizes of the light emitting areas of the plurality of sub-pixels without making a change in the size of area of a pixel and a size of a driving area. Thus, reliability and life of the organic light emitting display device can be improved.

[0016] According to another feature of the present invention, the plurality of sub-pixels are formed to extend in a second direction.

[0017] According to yet another feature of the present invention, the first direction is perpendicular to the second direction.

[0018] According to still another feature of the present invention, the plurality of sub-pixels in the pixel are disposed in sequence in the first direction.

[0019] According to still another feature of the present invention, the first and second sub-pixels are disposed so as to be adjacent to each other in the pixel.

[0020] According to still another feature of the present invention, a light emitting area of the first sub-pixel includes a portion extending into the second sub-pixel.

[0021] According to still another feature of the present invention, a width in the first direction of a light emitting area of the first sub-pixel is greater than a width in the first direction of a light emitting area of the second sub-pixel.

[0022] According to still another feature of the present invention, each of the plurality of pixels has a rectangular shape.

[0023] According to still another feature of the present invention, the plurality of sub-pixels are a red sub-pixel, a white sub-pixel, a blue sub-pixel, and a green sub-pixel. The blue sub-pixel or the white sub-pixel is a first sub-pixel and the red sub-pixel or the green sub-pixel is a second sub-pixel.

[0024] According to another aspect of the present invention to achieve the above-described objects, there is provided an organic light emitting display device. A plurality of first lines extended in a first direction and a plurality of second lines extended in a second direction are on a substrate. The first and second lines intersect each other. Each of a red sub-pixel, a white sub-pixel, a blue sub-pixel, and a green sub-pixel includes a light emitting area and a driving area. A driving area of the red sub-pixel, a driving area of the white sub-pixel, a driving area of the blue sub-pixel, and a driving area of the green sub-pixel are identical in a width to each other in the first direction. Sizes of light emitting area of the blue sub-pixel and the white sub-pixel are greater than sizes of a light emitting area of the green sub-pixel and a light emitting area of the red sub-pixel, respectively. In the organic light emitting display device according to another aspect of the present invention, sizes of light emitting areas of the blue sub-pixel and the white sub-pixel are greater than sizes of light emitting areas of the red sub-pixel and the green sub-pixel, respectively. Thus, life of the organic light emitting display device can be improved, and improved luminance of the organic light emitting display device can be achieved.

[0025] According to another feature of the present invention, the first direction is perpendicular to the second direction.

[0026] According to yet another feature of the present invention, a space between the second lines defining the driving area of the blue sub-pixel is smaller than a maximum space between the second lines defining the light emitting area of the blue sub-pixel. A space between the second lines defining the driving area of the white sub-pixel is smaller than a maximum space between the second lines of the light emitting area of the white sub-pixel.

[0027] According to still another feature of the present invention, a space between the second lines defining the driving area of the red sub-pixel is greater than a minimum space between the second lines defining the light emitting area of the red sub-pixel. A space between the second lines defining the driving area of the green sub-pixel is greater than a minimum space between the second lines of the light emitting area of the green sub-pixel.

[0028] According to still another feature of the present

invention, at least one of the second lines defining the white sub-pixel or the blue sub-pixel includes a slanted portion with respect to the first direction and the second direction.

[0029] According to still another feature of the present invention, the organic light emitting display device further includes a plurality of organic light emitting elements in the light emitting area of the red sub-pixel, the light emitting area of the white sub-pixel, the light emitting area of the blue sub-pixel, the light emitting area of the green sub-pixel, respectively, and each including an anode, an organic light emitting layer, and a cathode, and a plurality of driving elements in the driving area of the red sub-pixel, the driving area of the white sub-pixel, the driving area of the blue sub-pixel, and the driving area of the green sub-pixel, respectively, and configured to drive the organic light emitting elements.

[0030] According to still another feature of the present invention, the organic light emitting display device further includes color filters in the light emitting area of the red sub-pixel, the light emitting area of the blue sub-pixel, the light emitting area of the green sub-pixel, respectively, and the organic light emitting layer is configured to emit white light.

[0031] According to still another feature of the present invention, the second lines defining the driving area of the red sub-pixel, the driving area of the white sub-pixel, the driving area of the blue sub-pixel, and the driving area of the green sub-pixel are disposed with an equal space.

[0032] According to still another feature of the present invention, the size of the light emitting area of the white sub-pixel is greater than the size of the light emitting area of the red sub-pixel, the size of the light emitting area of the blue sub-pixel, and the size of the light emitting area of the green sub-pixel, respectively.

[0033] According to yet another aspect of the present invention to achieve the above-described objects, there is provided an organic light emitting display device in which first lines, second lines, and a plurality of pixels are on a substrate. Each of the plurality of pixels includes a plurality of sub-pixels with each including a light emitting area and a driving area. Sizes of the driving areas of the plurality of sub-pixels are identical to each other. Sizes of the light emitting areas of the plurality of sub-pixels are different from each other due to a slanted portion of at least one of the second lines.

[0034] According to another feature of the present invention, the plurality of pixels include a red sub-pixel, a white sub-pixel, a blue sub-pixel, and a green sub-pixel.

[0035] According to yet another feature of the present invention, the slanted portion defines the blue sub-pixel or the white sub-pixel.

[0036] According to still another feature of the present invention, the blue sub-pixel or the white sub-pixel includes a portion extending into toward the red sub-pixel or the green sub-pixel.

[0037] According to still another feature of the present invention, the white sub-pixel includes a portion extend-

ing into the red sub-pixel, and the blue sub-pixel includes a portion extending into the green sub-pixel.

[0038] According to still another feature of the present invention, the white sub-pixel includes a portion extending into the blue sub-pixel, and the blue sub-pixel includes a portion extending into the green sub-pixel.

[0039] According to still another feature of the present invention, the size of the light emitting area of the white sub-pixel is greater than the sizes of the light emitting area of the red sub-pixel, the size of the light emitting area of the blue sub-pixel, and the size of the light emitting area of the green sub-pixel, respectively.

[0040] According to still another feature of the present invention, the size of the light emitting area of the white sub-pixel or the size of the light emitting area of the blue sub-pixel is greater than the size of the light emitting area of the red sub-pixel or the size of the light emitting area of the green sub-pixel.

[0041] Details of other exemplary embodiments will be included in the detailed description of the invention and the accompanying drawings.

[0042] The present invention provides an organic light emitting display device in which each sub-pixel has an optimum size of a light emitting area in a state where a size of a pixel and a size of a driving area are determined on the basis of resolution of the organic light emitting display device.

[0043] Further, another object of the present invention is to secure an aperture ratio without making a change in a driving area, and, thus, it is possible to provide an organic light emitting display device improved in reliability of an element.

[0044] Furthermore, since a size of a light emitting area of each white sub-pixel is defined to be greater than areas of light emitting areas of the other sub-pixels, and, thus, it is possible to provide an organic light emitting display device improved in life and reliability.

[0045] Also, since an aperture ratio can be secured, it is possible to provide an organic light emitting display device which is improved in luminance and life that can be applied to a large-screen TV.

[0046] The effects of the present invention are not limited to the aforementioned effects, and other various effects are included in the present specification.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] The above and other aspects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a cross-sectional view provided to describe a typical organic light emitting display device;
FIG. 2 is a schematic diagram provided to describe a light emitting area and a driving area in each of a plurality of sub-pixels of an organic light emitting dis-

play device according to an exemplary embodiment of the present invention; and
FIG. 3 to FIG. 6 are plane views provided to describe organic light emitting display devices according to various exemplary embodiments of the present invention;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0048] Advantages and features of the present invention, and methods for accomplishing the same will be more clearly understood from exemplary embodiments described below with reference to the accompanying drawings. However, the present invention is not limited to the following exemplary embodiments but may be implemented in various different forms. The exemplary embodiments are provided only to complete disclosure of the present invention and to fully provide a person having ordinary skill in the art to which the present invention pertains with the category of the invention, and the present invention will be defined by the appended claims.

[0049] The shapes, sizes, ratios, angles, numbers, and the like illustrated in the accompanying drawings for describing the exemplary embodiments of the present invention are merely examples, and the present invention is not limited thereto. Like reference numerals generally denote like elements throughout the present specification. Further, in the following description, a detailed explanation of known related technologies may be omitted to avoid unnecessarily obscuring the subject matter of the present disclosure. The terms such as "including," "having," and "consist of" used herein are generally intended to allow other components to be added unless the terms are used with the term "only". Any references to singular may include plural unless expressly stated otherwise.

[0050] Components are interpreted to include an ordinary error range even if not expressly stated.

[0051] When the position relation between two parts is described using the terms such as "on", "above", "below", and "next", one or more parts may be positioned between the two parts unless the terms are used with the term "immediately" or "directly" is not used.

[0052] When an element or layer is referred to as being "on" another element or layer, it may be directly on the other element or layer, or intervening elements or layers may be present.

[0053] Although the terms "first", "second", and the like are used for describing various components, these components are not confined by these terms. These terms are merely used for distinguishing one component from the other components. Therefore, a first component to be mentioned below may be a second component in a technical concept of the present invention.

[0054] Throughout the whole specification, the same reference numerals denote the same elements.

[0055] Since size and thickness of each component

illustrated in the drawings are represented for convenience in explanation, the present invention is not necessarily limited to the illustrated size and thickness of each component.

[0056] The features of various embodiments of the present invention can be partially or entirely bonded to or combined with each other and can be interlocked and operated in technically various ways as can be fully understood by a person having ordinary skill in the art, and the embodiments can be carried out independently of or in association with each other.

[0057] Various exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0058] FIG. 2 is a schematic diagram provided to describe a light emitting area and a driving area in each of a plurality of sub-pixels of an organic light emitting display device according to an exemplary embodiment of the present invention. For convenience in explanation, FIG. 2 schematically illustrates a pixel P, sub-pixels SP_R, SP_W, SP_B, and SP_G, and light emitting areas EA_R, EA_W, EA_B, and EA_G and driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G. In FIG. 2, borders of the sub-pixels SP_R, SP_W, SP_B, and SP_G are indicated by solid lines, and borders between the light emitting areas EA_R, EA_W, EA_B, and EA_G and the driving areas DA_R, DA_W, DA_B, and DA_G within the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are indicated by dotted lines.

[0059] An organic light emitting display device 200 includes a plurality of pixels P defined on a substrate. Specifically, each pixel P has a square shape and may have a rectangular shape. A size of the pixel P is determined by characteristics of a product such as a screen size and resolution of the organic light emitting display device 200. In FIG. 2, only one of the plurality of pixels P of the organic light emitting display device 200 is illustrated for convenience in explanation.

[0060] Each of the plurality of pixels P includes a plurality of sub-pixels SP_R, SP_W, SP_B, and SP_G. The plurality of sub-pixels SP_R, SP_W, SP_B, and SP_G include a red sub-pixel SP_R for emitting a red light, a white sub-pixel SP_W for emitting a white light, a blue sub-pixel SP_B for emitting a blue light, and a green sub-pixel SP_G for emitting a green light. Since the organic light emitting display device 200 according to the exemplary embodiment of the present invention includes the white sub-pixel SP_W for emitting a white light in addition to the red sub-pixel SP_R, the green sub-pixel SP_G, and the blue sub-pixel SP_B, luminance of the organic light emitting display device 200 can be improved.

[0061] The plurality of sub-pixels SP_R, SP_W, SP_B, and SP_G within the pixel P are disposed in sequence in a first direction. That is, as illustrated in FIG 2, the white sub-pixel SP_W is disposed on one side of the red sub-pixel SP_R so as to be adjacent to each other in the first direction. The blue sub-pixel SP_B is disposed on one

side of the white sub-pixel SP_W so as to be adjacent to each other in the first direction, and the green sub-pixel SP_G is disposed on one side of the blue sub-pixel SP_B so as to be adjacent to each other in the first direction. The first direction may be an X-axis direction as illustrated in FIG. 2. Although FIG. 2 illustrates that the red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the sub-pixel SP_G are disposed in sequence, the present invention is not limited thereto. An arrangement sequence of the plurality of sub-pixels SP_R, SP_W, SP_B, and SP_G may be changed in various ways.

[0062] Referring to FIG. 2, each of the plurality of sub-pixels SP_R, SP_W, SP_B, and SP_G have a shape extending in a second direction. In other words, as illustrated in FIG. 2, each of the red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the green sub-pixel SP_G have a shape elongated in the second direction from one side of the pixel P. The second direction refers to a different direction from the first direction. For example, the second direction may be a Y-axis direction perpendicular to the first direction as illustrated in FIG. 2, but is not limited thereto.

[0063] The plurality of sub-pixels SP_R, SP_W, SP_B, and SP_G respectively include light emitting areas EA_R, EA_W, EA_B, and EA_G in which organic light emitting elements are disposed to emit lights to the outside of the organic light emitting display device 200 and driving areas DA_R, DA_W, DA_B, and DA_G in which driving elements such as thin film transistors for driving the organic light emitting elements are disposed. In the organic light emitting display device 200 according to the exemplary embodiment of the present invention, the light emitting areas EA_R, EA_W, EA_B, and EA_G and the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are separate areas each other so as not to be overlapped. FIG. 2 illustrates that the light emitting areas EA_R, EA_W, EA_B, and EA_G and the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G have rectangular shapes for convenience in explanation, but shapes of the light emitting areas EA_R, EA_W, EA_B, and EA_G and the driving areas DA_R, DA_W, DA_B, and DA_G are not limited thereto.

[0064] Sizes of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are determined on the basis of various characteristics of a product such as resolution and a current required for each sub-pixel of the organic light emitting display device 200 and characteristics of the organic light emitting elements. For example, a size of the pixel P may be first determined on the basis of the resolution of the organic light emitting display device 200, and sizes of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G may be determined on the basis of a current required for each sub-pixel for driving each of the sub-pixels

SP_R, SP_W, SP_B, and SP_G included in the pixel P. Then, the sizes of the driving areas DA_R, DA_W, DA_B, and DA_G can be optimized on the basis of the characteristics of the organic light emitting elements disposed on the respective sub-pixels SP_R, SP_W, SP_B, and SP_G. The above-described determination method is just one example, but the present invention is not limited thereto.

[0065] Referring to FIG. 2, first directional widths d1, d2, d3, and d4 of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are identical to each other. That is, the first directional width d1 of the driving area DA_R of the red sub-pixel SP_R, the first directional width d2 of the driving area DA_W of the white sub-pixel SP_W, the first directional width d3 of the driving area DA_B of the blue sub-pixel SP_B, and the first directional width d4 of the driving area DA_G of the green sub-pixel SP_G are identical to each other. Therefore, as illustrated in FIG. 2, if the sizes of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are identical to each other, second directional widths of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G may also be identical to each other. Further, if the sizes of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are different from each other, the second directional widths of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G may be different from each other.

[0066] In the present specification, being identical in width between two components means not only that the two components have exactly the same width, but also that the two components can be considered having substantially the same width although they do not have exactly the same width.

[0067] A size of a light emitting area of one sub-pixel of sub-pixels SP_R, SP_W, SP_B, and SP_G adjacent to each other is greater than a size of a light emitting area of the other sub-pixel. Herein, the white sub-pixel SP_W or the blue sub-pixel SP_B has a relatively large light emitting area, and the red sub-pixel SP_R or the green sub-pixel SP_G has a relatively small light emitting area. In the organic light emitting display device 200 according to the exemplary embodiment of the present invention, in order to improve the luminance of the light emitting area EA_B of the blue sub-pixel SP_B having a relatively short life as compared with the other sub-pixels SP_R and SP_G and the overall luminance of the organic light emitting display device 200, a size of the light emitting area EA_W of the white sub-pixel SP_W needs to be set greater than sizes of the light emitting areas EA_R and EA_G of the other sub-pixels SP_R and SP_G, and, thus, life and luminance of the organic light emitting display device 200 can be improved.

[0068] Referring to FIG. 2, a size of the light emitting area EA_W of the white sub-pixel SP_W is greater than

a size of the light emitting area EA_R of the red sub-pixel SP_R adjacent to the white sub-pixel SP_W. In particular, the light emitting area EA_W of the white sub-pixel SP_W includes a portion extending into the red sub-pixel SP_R. Therefore, a first directional width d6 of the light emitting area EA_W of the white sub-pixel SP_W is greater than a first directional width d5 of the light emitting area EA_R of the red sub-pixel SP_R. Likewise, a size of the light emitting area EA_B of the blue sub-pixel SP_B is greater than a size of the light emitting area EA_G of the green sub-pixel SP_G adjacent to the blue sub-pixel SP_B. Also, the light emitting area EA_B of the blue sub-pixel SP_B includes a portion extending into the green sub-pixel SP_G. Therefore, a first directional width d7 of the light emitting area EA_B of the blue sub-pixel SP_B is greater than a first directional width d8 of the light emitting area EA_G of the green sub-pixel SP_G.

[0069] Generally, a size of a pixel in an organic light emitting display device is determined by resolution of the organic light emitting display device. That is, an organic light emitting display device having a high resolution is formed of small-sized pixels than an organic light emitting display device having a low resolution, and each of the pixels is formed of plurality of sub-pixels. The plurality of sub-pixels are configured as an area for emitting lights of specific colors. Thus, it is important to achieve an optimum luminance for a color of a light emitted from each sub-pixel. Particularly, it is important to secure an aperture ratio for each sub-pixel. However, as described above, if an organic light emitting display device is designed as an organic light emitting display device having a high resolution, a pixel itself is small, and, thus, it is difficult to secure an aperture ratio for each sub-pixel in the pixel. Particularly, in the sub-pixels SP_R, SP_W, SP_B, and SP_G of the organic light emitting display device 200 according to the exemplary embodiment of the present invention, the driving areas DA_R, DA_W, DA_B, and DA_G for driving elements such as thin film transistors disposed on the substrate of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G cannot emit lights. Thus, it is difficult to secure an aperture ratio in the organic light emitting display device 200. Further, generally, a driving area of a sub-pixel is optimized to work effectively in a product. Thus, reducing the size of the driving area of the sub-pixel negatively affects the performance and reliability of an organic light emitting element. Therefore, in a pixel having a limited size, it is difficult to secure an aperture ratio of each sub-pixel without making a change in a size of the pixel and a size of a driving area of each optimally designed sub-pixel. That is, it is difficult to have desired resolution by having a suitable size of a pixel to have, and, thus, there is a limit in securing a desired aperture ratio suitable for each sub-pixel. Therefore, in the present invention, a shape of a line is changed without changing a size of a driving area in a sub-pixel, thereby securing a desired aperture ratio for each sub-pixel.

[0070] In the organic light emitting display device 200

according to the exemplary embodiment of the present invention, optimum aperture ratios for the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are provided by changing only sizes of the light emitting areas EA_R, EA_W, EA_B, and EA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G without changing a size of the optimally designed pixel P or sizes of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G. To be specific, in a state where the width d1 of the driving area DA_R of the red sub-pixel SP_R, the width d2 of the driving area DA_W of the white sub-pixel SP_W, the width d3 of the driving area DA_B of the blue sub-pixel SP_B, and the width d4 of the driving area DA_G of the green sub-pixel SP_G are maintained identical to each other, the width d6 of the light emitting area EA_W of the white sub-pixel SP_W and the width d7 of the light emitting area EA_B of the blue sub-pixel SP_B may be set to be greater than the width d5 of the light emitting area EA_R of the red sub-pixel SP_R and the width d8 of the light emitting area EA_G of the green sub-pixel SP_G. Thus, in the pixel P with the limited size, the width d6 of the light emitting area EA_W of the white sub-pixel SP_W and the width d7 of the light emitting area EA_B of the blue sub-pixel SP_B can be increased to improve life and luminance of the organic light emitting display device 200 without changing sizes of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G. Therefore, life and luminance of an organic light emitting display device can be improved without deteriorating the reliability of the organic light emitting display device.

[0071] FIG. 3 is a plane view provided to describe an organic light emitting display device according to an exemplary embodiment of the present invention. Referring to FIG. 3, an organic light emitting display device 300 includes a plurality of first lines 360 disposed on a substrate 310, a plurality of second lines 370, a red sub-pixel SP_R, a white sub-pixel SP_W, a blue sub-pixel SP_B, and a green sub-pixel SP_G. FIG. 3 illustrates only driving thin film transistors 320 without a switching thin film transistor or a capacitor among various driving elements for driving an organic light emitting element for convenience in explanation.

[0072] The plurality of first lines 360 are disposed so as to extend in a first direction on the substrate 310. The first direction may be in X-axis direction as illustrated in FIG. 3. The first lines 360 are configured as scan lines for applying scan signals to the thin film transistors 320 disposed in a driving area DA_R of the red sub-pixel SP_R, a driving area DA_W of the white sub-pixel SP_W, a driving area DA_B of the blue sub-pixel SP_B, and a driving area DA_G of the green sub-pixel SP_G, respectively.

[0073] The plurality of second lines 370 are disposed so as to extend in a second direction on the substrate 310, and intersect the plurality of first lines 360 extended in the first direction. For example, the second direction

may be in a Y-axis direction perpendicular to the first direction as illustrated in FIG. 3, but is not limited thereto. The first lines 360 are configured as lines for applying data signals to the thin film transistors 320 disposed in the driving area DA_R of the red sub-pixel SP_R, the driving area DA_W of the white sub-pixel SP_W, the driving area DA_B of the blue sub-pixel SP_B, and the driving area DA_G of the green sub-pixel SP_G, respectively.

[0074] The Plurality of pixels are defined on the substrate 310, and they include the red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the sub-pixel SP_G as illustrated in FIG. 3. The red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the sub-pixel SP_G are defined by the first lines 360 and the second lines 370. That is, closed areas on the substrate 310 defined by the two first lines 360 extended in the first direction and the two second lines 370 extended in the second direction correspond to the respective sub-pixels SP_R, SP_W, SP_B, and SP_G. The red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the sub-pixel SP_G may be defined by the first lines 360 and the second lines 370, but the present invention is not limited thereto. A sub-pixel may also be included when the first lines 360 or the second lines 370 share at least one sub-pixel.

[0075] The red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the sub-pixel SP_G respectively include the light emitting areas EA_R, EA_W, EA_B, and EA_G in which organic the light emitting elements are disposed to emit lights to the outside of the organic light emitting display device 300 and the driving areas DA_R, DA_W, DA_B, and DA_G in which driving elements such as the thin film transistors 320 for driving the organic light emitting elements are disposed.

[0076] The organic light emitting elements respectively disposed in the light emitting areas EA_R, EA_W, EA_B, and EA_G of the red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the sub-pixel SP_G include anodes 331R, 331W, 331B, and 331G, organic light emitting layers, and cathodes, respectively. If the organic light emitting display device 300 is a bottom-emission organic light emitting display device, the anodes 331R, 331W, 331B, and 331G are formed of a transparent conductive material having a high work function value and the cathodes are formed of a reflective metallic material having a low work function value. The organic light emitting layers are organic light emitting layers for emitting white lights. Lights emitted from the organic light emitting layers pass through color filters and are emitted toward the bottom of the substrate 310 on which the thin film transistors 320 is formed. However, a light emitted from the organic light emitting layer of the white sub-pixel SP_W does not pass through the color filter and is emitted toward the bottom of the substrate 310. In FIG. 3, illustration of the organic light emitting layers, the cathodes, and the color filters is omitted for convenience in explanation, but only the anodes 331R, 331W, 331B, and 331G disposed on the respective sub-pixels SP_R, SP_W,

SP_B, and SP_G are illustrated.

[0077] Although not illustrated in the drawing, the organic light emitting layer may be formed of two light emitting layers including a blue light emitting layer and a yellow-green light emitting layer so as to emit a white light. In this case, the blue sub-pixel SP_B or the white sub-pixel SP_W may be configured to have a shape extending into the red sub-pixel SP_R or the green sub-pixel SP_G. Therefore, a size of the light emitting area EA_B of the blue sub-pixel SP_B or a size of the light emitting area EA_W of the white sub-pixel SP_W may be greater than a size of the light emitting area EA_R of the red sub-pixel SP_R or a size of the light emitting area EA_G of the green sub-pixel SP_G. Thus, efficiency and luminance of the blue sub-pixel SP_B can be improved. Otherwise, in order to further improve efficiency of the blue sub-pixel SP_B, a size of the light emitting area EA_B of the blue sub-pixel SP_B can be much greater than a size of the light emitting area EA_W of the white sub-pixel SP_W. Herein, the blue light emitting layer may include a blue light emitting layer, a sky blue light emitting layer, and a deep blue light emitting layer. Further, the blue light emitting layer may have an emission wavelength in a range of 440 nm to 480 nm. The yellow-green light emitting layer may have an emission wavelength in a range of 510 nm to 580 nm.

[0078] Further, the organic light emitting layer may be formed of three light emitting layers including a blue light emitting layer a yellow-green light emitting layer, and a blue light emitting layer so as to emit a white light. In this case, the organic light emitting layer includes two blue light emitting layers, and, thus, both emission efficiency of the blue light emitting layer and life of the blue light emitting layers can be improved. In this case, the blue sub-pixel SP_B or the white sub-pixel SP_W may be configured to have a shape extending into the red sub-pixel SP_R or the green sub-pixel SP_G. Therefore, a size of the light emitting area EA_B of the blue sub-pixel SP_B or a size of the light emitting area EA_W of the white sub-pixel SP_W may be greater than a size of the light emitting area EA_R of the red sub-pixel SP_R or a size of the light emitting area EA_G of the green sub-pixel SP_G. Otherwise, the white sub-pixel SP_W may be configured to have a shape extending into the blue sub-pixel SP_B, and the blue sub-pixel SP_B may be configured to have a shape extending into the green sub-pixel. Therefore, a size of the light emitting area EA_B of the blue sub-pixel SP_B or a size of the light emitting area EA_W of the white sub-pixel SP_W may be greater than a size of the light emitting area EA_R of the red sub-pixel SP_R or a size of the light emitting area EA_G of the green sub-pixel SP_G. Otherwise, efficiency or luminance of the white sub-pixel SP_W can be improved by setting a size of the white sub-pixel SP_W to be greater than that of the blue sub-pixel SP_B. Alternatively, efficiency or luminance of the red sub-pixel SP_R can be further improved by setting a size of the red sub-pixel SP_R to be greater than that of the green sub-pixel SP_G. Herein,

the blue light emitting layer may include a blue light emitting layer, a sky blue light emitting layer, and a deep blue light emitting layer. Further, the blue light emitting layer may have an emission wavelength in a range of 440 nm to 480 nm. Further, the yellow-green light emitting layer may have an emission wavelength in a range of 510 nm to 580 nm. Furthermore, a sequence of the organic light emitting layers can be determined on the basis of the characteristic or a structure of the product. For example, if the organic light emitting layer is formed of two light emitting layers including a blue light emitting layer and a yellow-green light emitting layer, the blue light emitting layer may be configured to be close to an anode or the yellow-green light emitting layer may be configured to be close to an anode. Further, if the organic light emitting layer is formed of three light emitting layers including a blue light emitting layer, a yellow-green light emitting layer, and a blue light emitting layer, the blue light emitting layer, the yellow-green light emitting layer, and the blue light emitting layer may be disposed in sequence on an anode. Otherwise, the blue light emitting layer, the blue light emitting layer, and the yellow-green light emitting layer may be disposed in sequence on an anode. Alternatively, the yellow-green light emitting layer, the blue layer, and the blue layer may be disposed in sequence on an anode.

[0079] In order to improve emission efficiency of a red sub-pixel, a red light emitting layer may be further formed. If there are two light emitting layers including a blue light emitting layer and a yellow-green light emitting layer, a red light emitting layer may be further formed at the blue light emitting layer. If the blue light emitting layer is formed so as to be closer to the anode than the yellow-green light emitting layer, a red light emitting layer may be formed on the blue light emitting layer, which may be more advantageous in improving color reproduction ratio or color purity of the organic light emitting display device. If the yellow-green light emitting layer is formed so as to be closer to the anode than to the blue light emitting layer, a red light emitting layer may be formed under the blue light emitting layer, which may be more advantageous in improving the color reproduction ratio or color purity of the organic light emitting display device. Further, a red light emitting layer may be further formed on the yellow-green light emitting layer. If a red light emitting layer is further formed, a suitable position of the red light emitting layer may vary depending on an effect on improving the color reproduction ratio or color purity of the organic light emitting display device.

[0080] Further, even if there are three light emitting layers including a blue light emitting layer, a yellow-green light emitting layer, and a blue light emitting layer, a red light emitting layer may be further formed at the blue light emitting layer. If a red light emitting layer is further formed at the blue light emitting layer closer to the anode, the red light emitting layer may be formed on the blue light emitting layer, which may be more advantageous in improving the color reproduction ratio or color purity of the

organic light emitting display device. If a red light emitting layer is further formed at the blue light emitting layer closer to the cathode, the red light emitting layer may be formed under the blue light emitting layer, which may be more advantageous to improving the ratio of color reproduction or color purity of the organic light emitting display device. Further, if a red light emitting layer is further formed at the yellow-green light emitting layer, the red light emitting layer may be formed under the yellow-green light emitting layer, which may be more advantageous to improving the color reproduction ratio or color purity. Furthermore, if the blue light emitting layer, the blue light emitting layer, and the yellow-green light emitting layer are formed in sequence on the anode, a red light emitting layer may be formed under the blue light emitting layer or the yellow-green light emitting layer. Further, if the yellow-green light emitting layer, the blue light emitting layer, and the light emitting layer are formed in sequence on the anode, a red light emitting layer may be formed under the yellow-green light emitting layer. Otherwise, a red light emitting layer may be formed on the blue light emitting layer closer to the anode. Alternatively, a red light emitting layer may be formed on the blue light emitting layer closer to the cathode. That is, if a red light emitting layer is added, the red light emitting layer may be disposed at a position suitable for improving the color reproduction ratio or color purity of the organic light emitting display device, and a position of the red light emitting layer may be determined in various ways.

[0081] Therefore, regardless of light emitting layers constituting organic light emitting layers, the present invention can provide an organic light emitting display device improved in life by increasing a size of a light emitting area of a sub-pixel having a short life or a low efficiency as compared with other sub-pixels.

[0082] Further, light emitting layers constituting organic light emitting layers may be configured in various ways depending on characteristics of an organic light emitting display device. Therefore, the present invention can provide an organic light emitting display device improved in life or other characteristics by increasing a size of a light emitting area of a sub-pixel having a short life and inferior characteristics of an organic light emitting display device as compared with other sub-pixels in consideration of characteristics of an organic light emitting display device, such as an aperture ratio, life, luminance, reliability, color reproduction ratio, and color purity. Bank layers can define the light emitting areas EA_R, EA_W, EA_B, and EA_G of the sub-pixels SP_R, SP_W, SP_B, and SP_G, respectively. That is, in the respective sub-pixels SP_R, SP_W, SP_B, and SP_G, the areas covered by the bank layers can be defined as the driving areas DA_R, DA_W, DA_B, and DA_G and the areas which are not covered by the bank layers can be defined as the light emitting areas EA_R, EA_W, EA_B, and EA_G. Since FIG. 3 is a plane view, the bank layers are not illustrated in FIG. 3, and the light emitting areas EA_R, EA_W, EA_B, and EA_G and the driving areas DA_R, DA_W, DA_B, and

DA_G are schematically indicated by dotted lines.

[0083] Referring to FIG. 3, a space S1 between the second lines 370 defining the driving area DA_R of the red sub-pixel SP_R, a space S2 between the second lines 370 defining the driving area DA_W of the white sub-pixel SP_W, a space S3 between the second lines 370 defining the driving area DA_B of the blue sub-pixel SP_B, and a space S4 between the second lines 370 defining the driving area DA_G of the green sub-pixel SP_G are identical to each other. That is, the second lines 370 defining the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are equally spaced apart. Therefore, the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are defined by the second lines 370, and, thus, first directional widths of the driving area DA_R of the red sub-pixel SP_R, the driving area DA_W of the white sub-pixel SP_W, the driving area DA_B of the blue sub-pixel SP_B, and the driving area DA_G of the green sub-pixel SP_G are identical to each other.

[0084] A maximum space S6 between the second lines 370 defining the light emitting area EA_W of the white sub-pixel SP_W is greater than a minimum space S5 between the second lines 370 defining the light emitting area EA_R of the red sub-pixel SP_R adjacent to the white sub-pixel SP_W. That is, the second line which defines the light emitting area EA_W of the white sub-pixel SP_W that also defines the light emitting area EA_R of the red sub-pixel SP_R includes a slanted portion with respect to the first direction and the second direction such that the light emitting area EA_W of the white sub-pixel SP_W includes a portion extending into the red sub-pixel SP_R.

[0085] Further, a maximum space S7 between the second lines 370 defining the light emitting area EA_B of the blue sub-pixel SP_B is greater than a minimum space S8 between the second lines 370 defining the light emitting area EA_G of the green sub-pixel SP_G adjacent to the blue sub-pixel SP_B. That is, the second line which defines the light emitting area EA_B of the blue sub-pixel SP_B that also defines the light emitting area EA_G of the green sub-pixel SP_G includes a slanted portion with respect to the first direction and the second direction such that the light emitting area EA_B of the blue sub-pixel SP_B includes a portion extending into the green sub-pixel SP_G.

[0086] As described above, the second lines 370 defining the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G are equally spaced apart, and the light emitting area EA_W of the white sub-pixel SP_W and the light emitting area EA_B of the blue sub-pixel SP_B include the portions extending into the red sub-pixel SP_R and the green sub-pixel SP_G, respectively. Therefore, the space S3 between the second lines 370 defining the driving area DA_B of the blue sub-pixel SP_B is smaller than the maximum space S7 between the second lines 370 defining the light emitting area EA_B of the blue sub-pixel

SP_B. The space S2 between the second lines 370 defining the driving area DA_W of the white sub-pixel SP_W is smaller than the maximum space S6 between the second lines 370 defining the light emitting area EA_W of the white sub-pixel SP_W. In the same principle, the space S1 between the second lines 370 defining the driving area DA_R of the red sub-pixel SP_R is greater than the minimum space S5 between the second lines 370 defining the light emitting area EA_R of the red sub-pixel SP_R. The space S4 between the second lines 370 defining the driving area DA_G of the green sub-pixel SP_G is greater than the minimum space S8 between the second lines 370 defining the light emitting area EA_G of the green sub-pixel SP_G.

[0087] Referring to FIG. 3, a size of the light emitting area EA_B of the blue sub-pixel SP_B and a size of the light emitting area EA_W of the white sub-pixel SP_W are greater than a size of the light emitting area EA_G of the green sub-pixel SP_G and a size of the light emitting area EA_R of the red sub-pixel SP_R, respectively. This is because the light emitting area EA_B of the blue sub-pixel SP_B and the light emitting area EA_W of the white sub-pixel SP_W include the areas extending into the red sub-pixel SP_R and the green sub-pixel SP_G, respectively.

[0088] In the organic light emitting display device 300 according to the exemplary embodiment of the present invention, it is possible to secure desired sizes of the light emitting areas EA_R, EA_W, EA_B, and EA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G by changing only the lines defining the light emitting areas EA_R, EA_W, EA_B, and EA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G without changing a size of the optimally designed pixel P or sizes of the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G. That is, as illustrated in FIG. 3, a size of the light emitting area EA_W of the white sub-pixel SP_W is secured by allowing the second line 370 disposed between the light emitting area EA_W of the white sub-pixel SP_W and the light emitting area EA_R of the red sub-pixel SP_R to include an slanted portion. A size of the light emitting area EA_B of the blue sub-pixel SP_B is secured by allowing the second line 370 disposed between the light emitting area EA_B of the blue sub-pixel SP_B and the light emitting area EA_G of the green sub-pixel SP_G to include a slanted portion. Therefore, a size of the light emitting area EA_W of the white sub-pixel SP_W can be increased without changing the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G, and, thus, overall luminance of the organic light emitting display device 300 can be improved. Further, a size of the light emitting area EA_B of the blue sub-pixel SP_B can be increased without changing the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G, and, thus, life of the blue sub-pixel SP_B having a shorter life than that of other sub-pixels can be im-

proved. Otherwise, by increasing a size of a sub-pixel having a shorter life than the other sub-pixels depending on a structure or characteristics of an element, life of the sub-pixel having a shorter life can be improved.

[0089] In some exemplary embodiments, a size of the light emitting area EA_W of the white sub-pixel SP_W may be greater than a size of the light emitting area EA_R of the red sub-pixel SP_R, a size of the light emitting area EA_B of the blue sub-pixel SP_B, and a size of the light emitting area EA_G of the green sub-pixel SP_G. That is, by setting the light emitting area EA_W of the white sub-pixel SP_W to have a greater size than that of the light emitting areas EA_R, EA_G, and EA_B of the other sub-pixels SP_R, SP_G, and SP_B, luminance of the organic light emitting display device 300 can be further improved.

[0090] In some exemplary embodiments, sizes of the light emitting areas EA_W, EA_R, EA_G, and EA_B of the respective sub-pixels SP_W, SP_R, SP_G, and SP_B can be determined on the basis of efficiency of the organic light emitting elements disposed in the respective sub-pixels SP_W, SP_R, SP_G, and SP_B. That is, a size of a light emitting area of a sub-pixel having a relatively low efficiency of an organic light emitting element may be set to be greater than a size of a light emitting area of a sub-pixel having a relatively high efficiency of an organic light emitting element. For example, efficiency of an organic light emitting element is determined by a laminated structure of organic light emitting layers constituting an organic light emitting element, materials of an organic light emitting layer, and the like. If an organic light emitting layers have a low efficiency, life of the organic light emitting layers may be reduced. Thus, by setting a size of a light emitting area of a sub-pixel having a relatively low efficiency of an organic light emitting element to be greater than a size of a light emitting area of a sub-pixel having a relatively high efficiency of an organic light emitting element, life of an organic light emitting display device may be improved. Although FIG. 3 illustrates only driving thin film transistors among various driving elements for driving an organic light emitting element for convenience in explanation, switching thin film transistors or thin film transistors for compensation, or various capacitors may be included in driving elements and disposed in the driving areas DA_R, DA_W, DA_B, and DA_G of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G. Thus, the second lines 370 may include not only data lines but also Vdd lines or Vref lines. If the second lines 370 are of various kinds as such, the second lines 370 for defining the respective sub-pixels SP_R, SP_W, SP_B, and SP_G may be defined as the second lines closest to the left sides and the right sides of the respective sub-pixels SP_R, SP_W, SP_B, and SP_G.

[0091] FIG. 4 and FIG. 5 are plane views provided to describe organic light emitting display devices according to various exemplary embodiments of the present invention. As compared with the organic light emitting display

device 300 illustrated in FIG. 3, in organic light emitting display devices 400 and 500 illustrated in FIG. 4 and FIG. 5, respectively, positions of blue sub-pixels SP_B and green sub-pixels SP_G, shapes of the second lines 470 and 570, sizes of light emitting areas EA_W of white sub-pixels SP_W, and sizes of area of anodes 431B, 431G, 531W, 531G, and 531B are changed. Thus, redundant explanation of substantially the same components will be omitted.

[0092] Referring to FIG. 4 first, a white sub-pixel SP_W and a blue sub-pixel SP_B may not be adjacent to each other, and other sub-pixels SP_R, SP_W, SP_B, and SP_G may be positioned between the white sub-pixel SP_W and the blue sub-pixel SP_B. As illustrated in FIG. 4, a green sub-pixel SP_G may be positioned between the white sub-pixel SP_W and the blue sub-pixel SP_B, and a red sub-pixel SP_R may be positioned between the white sub-pixel SP_W and the blue sub-pixel SP_B. Since the white sub-pixel SP_W and the blue sub-pixel SP_B having relatively large light emitting areas EA_ are disposed so as not to be adjacent to each other, it may be easier to secure sizes of a light emitting area EA_ of the white sub-pixel SP_W and a light emitting area EA_ of the blue sub-pixel SP_B.

[0093] Then, referring to FIG. 5, all of second lines 570 defining a light emitting area EA_W of a white sub-pixel SP_W may include slanted portions with respect to a first direction and a second direction. If only the second line 570 positioned at one side of the light emitting area EA_W of the white sub-pixel SP_W is changed, a size of one sub-pixel SP_R, SP_W, SP_B, or SP_G, i.e., a size of a light emitting area EA_R of a red sub-pixel SP_R, needs to be reduced to secure a size of the light emitting area EA_W of the white sub-pixel SP_W. However, there may be a limit in reducing a size of the light emitting area EA_R of the red sub-pixel SP_R. Therefore, as illustrated in FIG. 5, the size of the light emitting area EA_W of the white sub-pixel SP_W may be further reliably secured by changing shapes of second lines 570 positioned on both sides of the light emitting area EA_W of the white sub-pixel SP_W.

[0094] Although FIG. 5 only illustrates an exemplary embodiment in which shapes of the second lines 570 positioned on both sides of the light emitting area EA_W of the white sub-pixel SP_W are changed for convenience in explanation, if necessary, shapes of the second lines 570 positioned on both sides of the light emitting area EA_B of the blue sub-pixel SP_B may be changed together with the second lines 570 positioned on both sides of the light emitting area EA_W of the white sub-pixel SP_W illustrated in FIG. 5.

[0095] FIG. 6 is a plane view provided to describe an organic light emitting display device according to an exemplary embodiment of the present invention. As compared with the organic light emitting display device 300 illustrated in FIG. 3, in an organic light emitting display device 600 illustrated in FIG. 6, sizes of a red sub-pixel SP_R, a green sub-pixel SP_G, a blue sub-pixel SP_B,

and a white sub-pixel SP_W, shapes of second lines 670, and sizes of light emitting areas EA_R, EA_G, EA_B, and EA_W and anodes 631R, 631G, 631B, and 631W of the respective sub-pixel SP_R, green sub-pixel SP_G, blue sub-pixel SP_B, and white sub-pixel SP_W are changed. Thus, redundant explanation of substantially the same components will be omitted.

[0096] Referring to FIG. 6, the light emitting area EA_R of the red sub-pixel SP_R includes a portion extending into the white sub-pixel SP_W. That is, among second lines 670 defining the light emitting area EA_R of the red sub-pixel SP_R, a second line 670 disposed between the red sub-pixel SP_R and the white sub-pixel SP_W includes a portion extending into the white sub-pixel SP_W and slanted with respect to a first direction and a second direction.

[0097] The light emitting area EA_W of the white sub-pixel SP_W includes a portion extending into the blue sub-pixel SP_B. That is, among second lines defining the light emitting area EA_W of the white sub-pixel SP_W, a second line 670 disposed between the white sub-pixel SP_W and the blue sub-pixel SP_B includes a portion extending into the blue sub-pixel SP_B and slanted portion with respect to the first direction and the second direction. Herein, a degree of a portion extending into the blue sub-pixel SP_B in the second line 670 between the white sub-pixel SP_W and the blue sub-pixel SP_B is larger than a degree a portion extending into the white sub-pixel SP_W in the second line 670 between the red sub-pixel SP_R and the white sub-pixel SP_W.

[0098] The light emitting area EA_B of the blue sub-pixel SP_B includes a portion extending into the green sub-pixel SP_G. That is, among second lines defining the light emitting area EA_B of the blue sub-pixel SP_B, a second line 670 disposed between the blue sub-pixel SP_B and the green sub-pixel SP_G includes a portion extending into the green sub-pixel SP_G and slanted portion with respect to the first direction and the second direction. Herein, a degree of a portion extending into the green sub-pixel SP_G in the second line 670 between the blue sub-pixel SP_B and the green sub-pixel SP_G is lower than a degree of a portion extending into the blue sub-pixel SP_B in the second line 670 between the white sub-pixel SP_W and the blue sub-pixel SP_B.

[0099] According to the arrangements of the second lines 670 as described above, the light emitting area EA_W of the white sub pixel SP_W has the greatest size. A size of a light emitting area is decreased in sequence from the light emitting area EA_R of the red sub pixel SP_R, the light emitting area EA_B of the blue sub pixel SP_B to the light emitting area EA_G of the green sub pixel SP_G. Thus, by setting the light emitting area EA_W of the white sub pixel SP_W to have a greater size than the light emitting areas EA_R, EA_G, and EA_B of the other sub-pixels SP_R, SP_G, and SP_B, luminance of the organic light emitting display device 600 can be further improved.

[0100] Further, for example, if an organic light emitting

element disposed on the green sub-pixel SP_G has a relatively high efficiency and an organic light emitting element on the red sub-pixel SP_R has a relatively low efficiency, as illustrated in FIG. 6, a size of the light emitting area EA_R of the red sub-pixel SP_R is increased and a size of the light emitting area EA_G of the green sub-pixel SP_G is decreased, and, thus, life of the organic light emitting display device can be improved.

[0101] The arrangements of the sub-pixels SP_R, SP_W, SP_B, and SP_G illustrated in FIG. 3 to FIG. 6 are randomly set for convenience in explanation, and the exemplary embodiments of the present invention are not limited to the arrangements of the sub-pixels SP_R, SP_W, SP_B, and SP_G illustrated in FIG. 3 to FIG. 6. That is, in order to secure a size of the light emitting area EA_B of the blue sub-pixel SP_B and a size of the light emitting area EA_W of the white sub-pixel SP_W, the red sub-pixel SP_R, the white sub-pixel SP_W, the blue sub-pixel SP_B, and the green sub-pixel SP_G may be set within a range in which a portion of the second line 670 can be formed so as to be slanted.

[0102] Although the exemplary embodiments of the present invention have been described in detail with reference to the accompanying drawings, the present invention is not limited thereto and may be embodied in many different forms without departing from the technical concept of the present invention. Therefore, the exemplary embodiments of the present invention are provided for illustrative purposes only but not intended to limit the technical concept of the present invention. The scope of the technical concept of the present invention is not limited thereto. The protective scope of the present invention should be construed based on the following claims, and all the technical concepts in the equivalent scope thereof should be construed as falling within the scope of the present invention.

Claims

1. An organic light emitting display device comprising:

a plurality of pixels on a substrate,
characterized in that each of the plurality of pixels includes a plurality of sub-pixels, each of the plurality of sub-pixels includes a light emitting area and a driving area, widths in a first direction of the driving areas of the plurality of sub-pixels are identical to each other, and
 a size of a light emitting area of a first sub-pixel of the plurality of sub-pixels is greater than a size of a light emitting area of a second sub-pixel of the plurality of sub-pixels.

2. The organic light emitting display device according to claim 1, wherein the first sub-pixel and the second sub-pixel are adjacent to each other in the pixel.

3. The organic light emitting display device according to claim 2, wherein the light emitting area of the first sub-pixel includes a portion extending into the second sub-pixel.
4. The organic light emitting display device according to claim 2, wherein a width in the first direction of a light emitting area of the first sub-pixel is greater than a width in the first direction of a light emitting area of the second sub-pixel.
5. The organic light emitting display device according to claim 1, wherein the plurality of sub-pixels include a red sub-pixel, a white sub-pixel, a blue sub-pixel, and a green sub-pixel, and the blue sub-pixel or the white sub-pixel is a first sub-pixel, and the red sub-pixel or the green sub-pixel is a second sub-pixel.
6. The organic light emitting display device according to claim 1, further comprising:
 - a plurality of first lines extending in a first direction on a substrate; and
 - a plurality of second lines intersecting the plurality of first lines and extending in a second direction on the substrate; wherein the first direction is perpendicular to the second direction.
7. The organic light emitting display device according to claim 6, wherein the plurality of sub-pixels include a red sub-pixel, a white sub-pixel, a blue sub-pixel, and a green sub-pixel,
 - a space between the second lines defining the driving area of the blue sub-pixel is smaller than a maximum space between the second lines defining the light emitting area of the blue sub-pixel, and
 - a space between the second lines defining the driving area of the white sub-pixel is smaller than a maximum space between the second lines of the light emitting area of the white sub-pixel.
8. The organic light emitting display device according to claim 6, wherein a space between the second lines defining the driving area of the red sub-pixel is greater than a minimum space between the second lines defining the light emitting area of the red sub-pixel, and
 - a space between the second lines defining the driving area of the green sub-pixel is greater than a minimum space between the second lines of the light emitting area of the green sub-pixel.
9. The organic light emitting display device according to claim 6, wherein at least one of the second lines defining the white sub-pixel or the blue sub-pixel includes a slanted portion with respect to the first direction and the second direction.
10. The organic light emitting display device according to claim 1, wherein the plurality of sub-pixels include a red sub-pixel, a white sub-pixel, a blue sub-pixel, and a green sub-pixel,
 - the organic light emitting display device further comprises:
 - a plurality of organic light emitting elements in the light emitting area of the red sub-pixel, the light emitting area of the white sub-pixel, the light emitting area of the blue sub-pixel, the light emitting area of the green sub-pixel, respectively, and each including an anode, an organic light emitting layer, and a cathode;
 - a plurality of driving elements in the driving area of the red sub-pixel, the driving area of the white sub-pixel, the driving area of the blue sub-pixel, and the driving area of the green sub-pixel, respectively, and configured to drive the organic light emitting elements; and
 - color filters in the light emitting area of the red sub-pixel, the light emitting area of the blue sub-pixel, the light emitting area of the green sub-pixel, respectively,
 - wherein the organic light emitting layer is configured to emit white light.
11. The organic light emitting display device according to claim 5, wherein the size of the light emitting area of the white sub-pixel is greater than the size of the light emitting area of the red sub-pixel, the size of the light emitting area of the blue sub-pixel, and the size of the light emitting area of the green sub-pixel, respectively.
12. The organic light emitting display device according to claim 6, wherein the plurality of sub-pixels include a red sub-pixel, a white sub-pixel, a blue sub-pixel, and a green sub-pixel,
 - sizes of the driving areas of the plurality of sub-pixels are identical to each other, and
 - sizes of the light emitting areas of the plurality of sub-pixels are different from each other due to an slanted portion of at least one of the second lines.
13. The organic light emitting display device according to claim 12, wherein the slanted portion defines the blue sub-pixel or the white sub-pixel.
14. The organic light emitting display device according to claim 12, wherein the white sub-pixel includes a portion extending into the red sub-pixel, and the blue sub-pixel includes a portion extending into the green sub-pixel.
15. The organic light emitting display device according to claim 12, wherein the white sub-pixel includes a portion extending into the blue sub-pixel, and the

blue sub-pixel includes a portion extending into the green sub-pixel.

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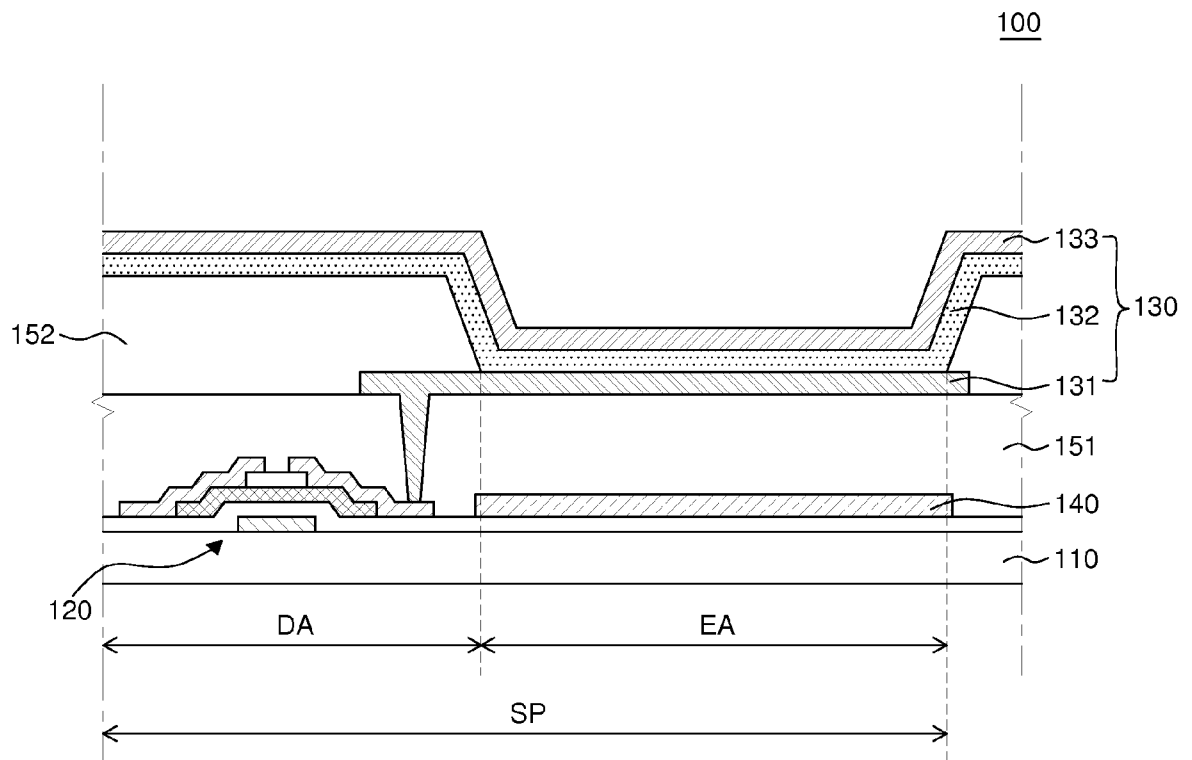


FIG. 1

FIG. 2

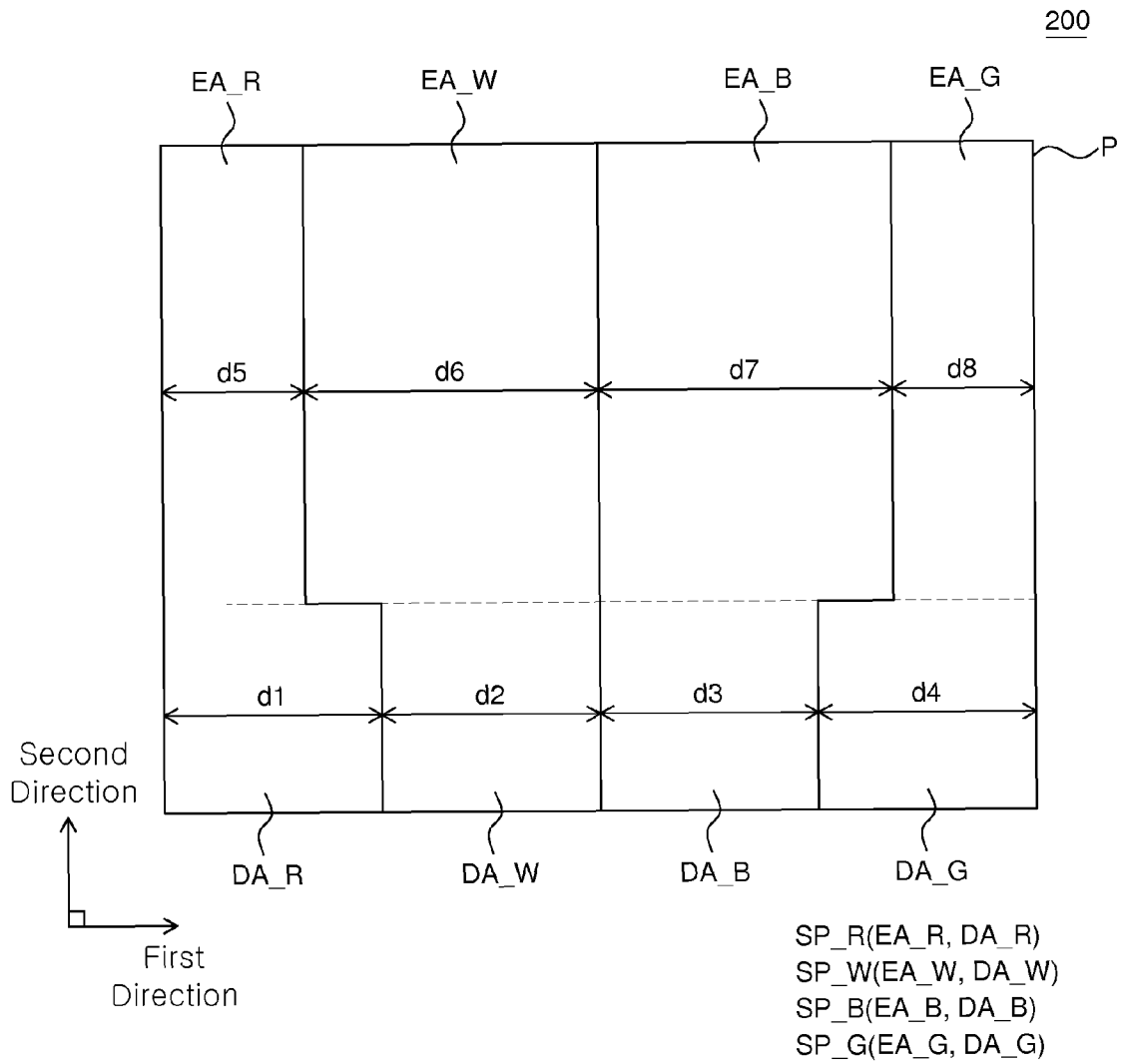


FIG. 2

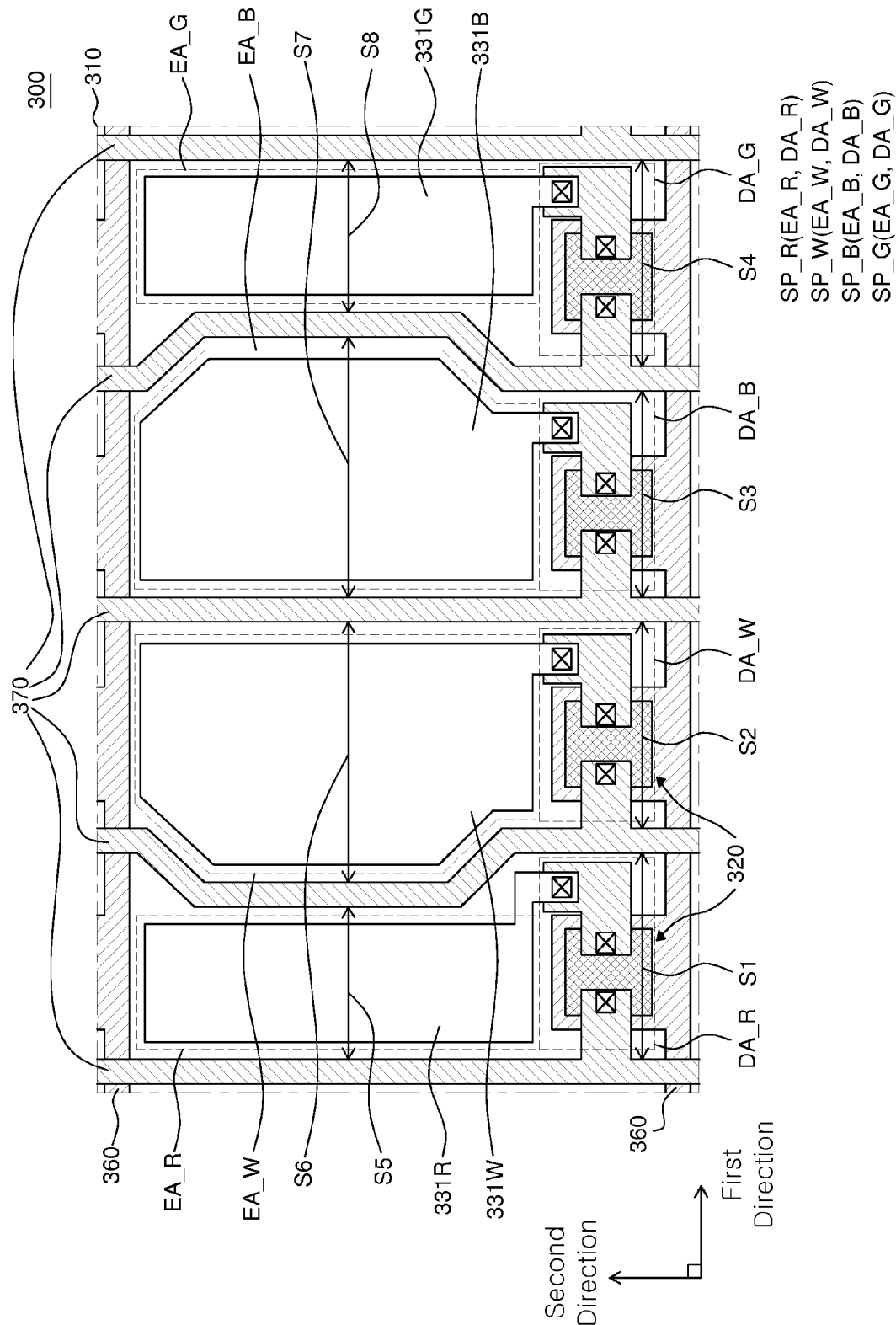


FIG. 3

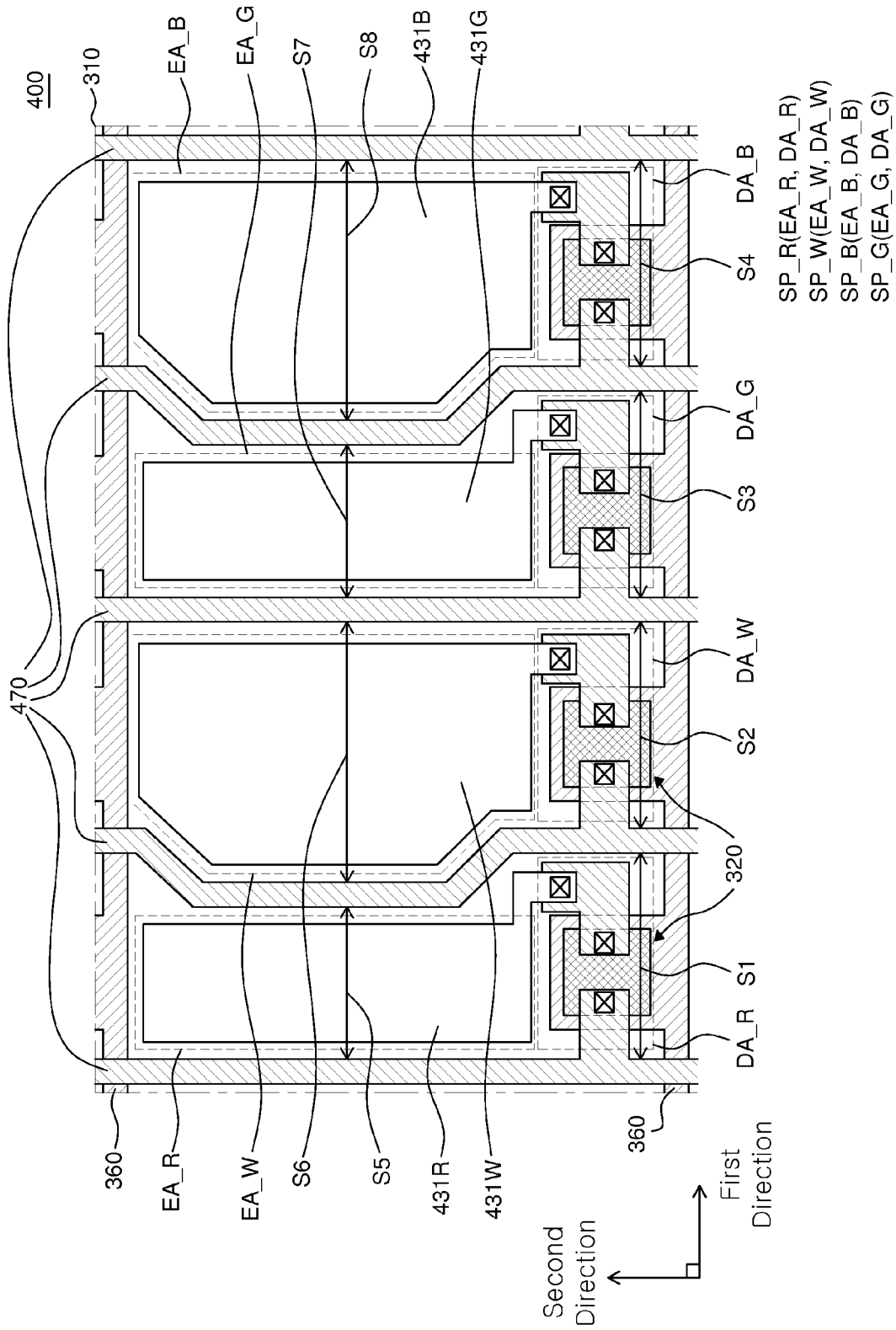


FIG. 4

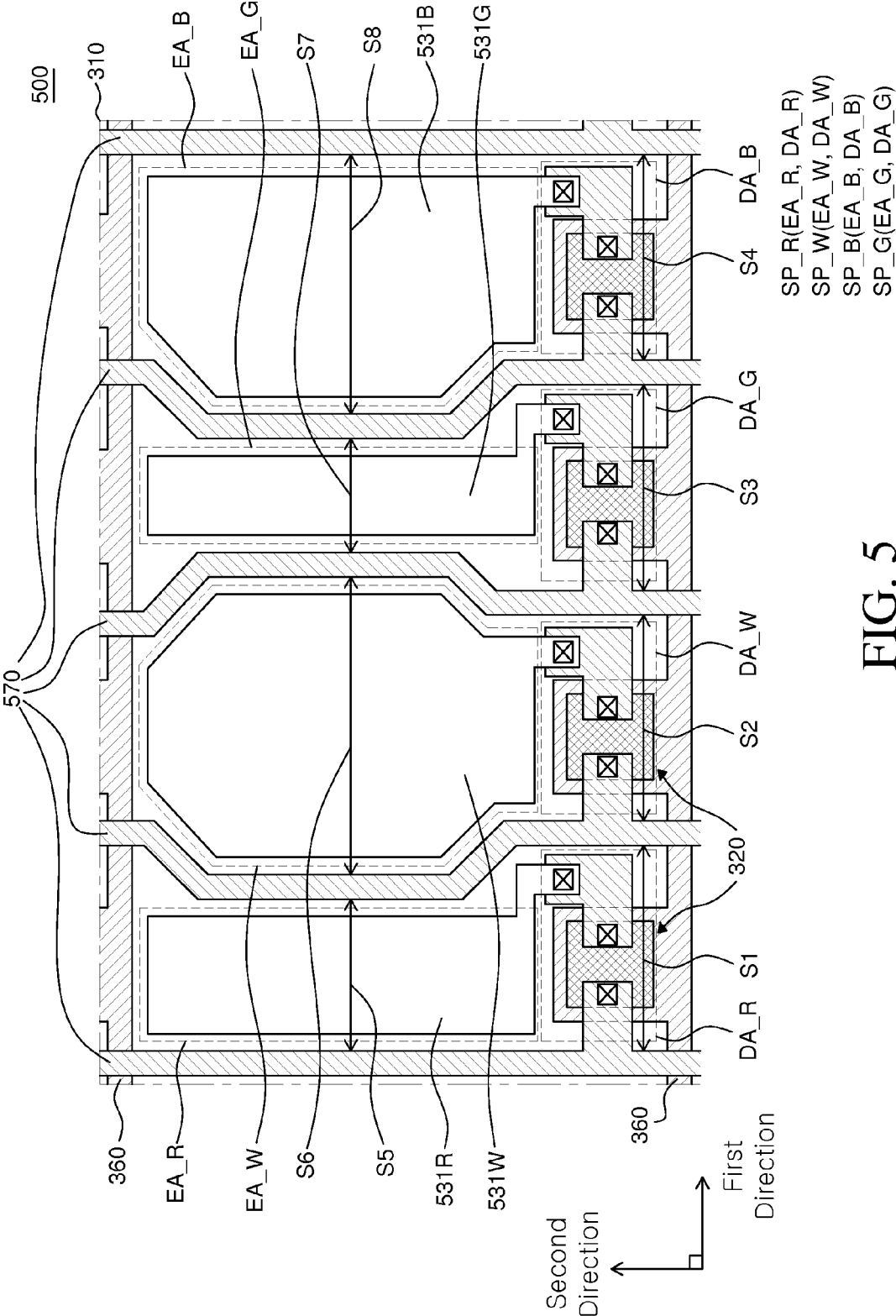


FIG. 5

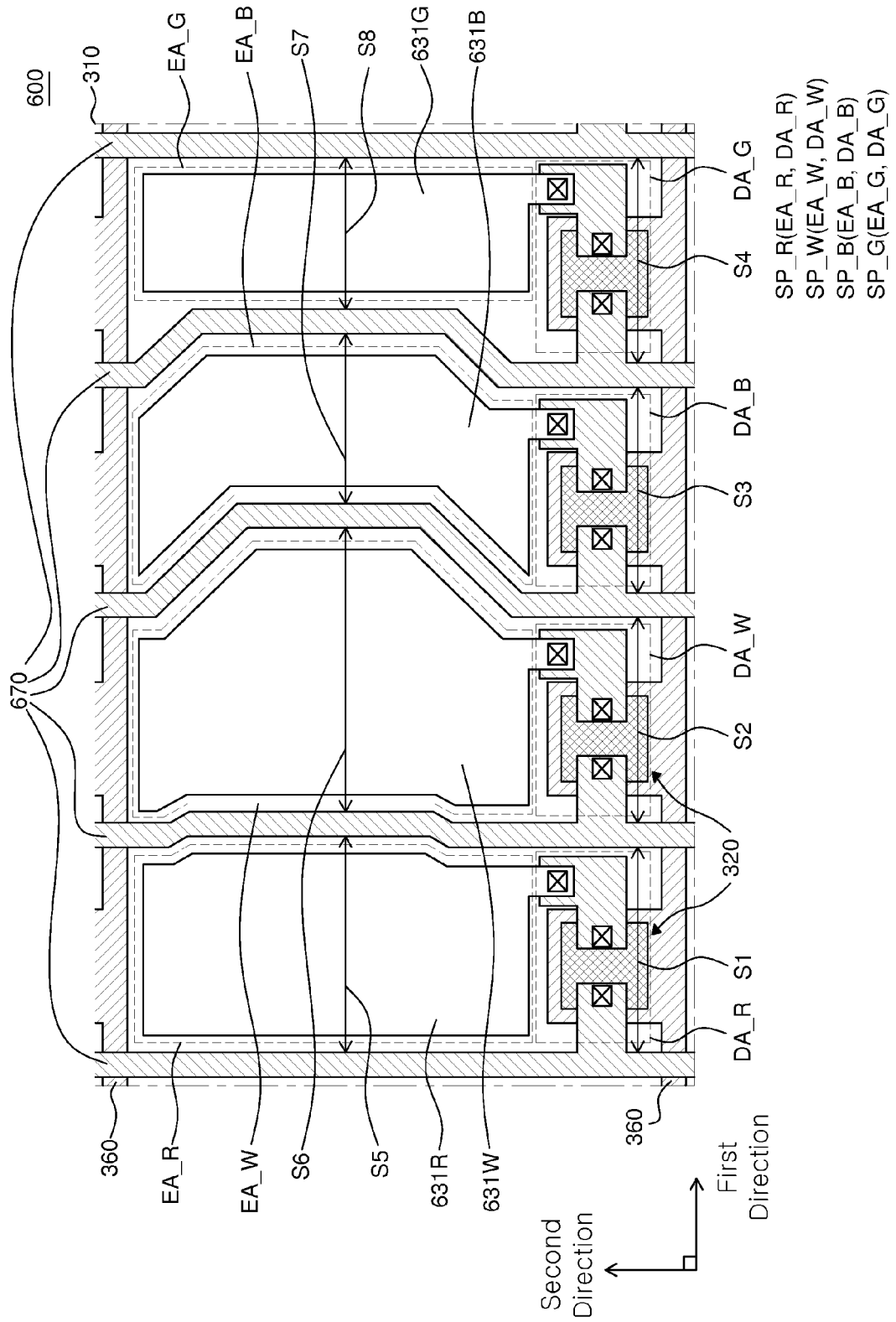


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
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X	US 2006/221092 A1 (NOGUCHI YUKIHIRO [JP] ET AL) 5 October 2006 (2006-10-05)	1-3,5,10,11	INV. H01L27/32
Y	* paragraph [0047] - paragraph [0050]; figure 8 *	1,7,14,15	
	* paragraph [0034] - paragraph [0036]; figures 1,3 *		

X	US 2006/087227 A1 (YAMANAKA SHIGETSUGU [JP]) 27 April 2006 (2006-04-27)	1-4,6	
	* paragraph [0039] - paragraphs [0045], [0094]; figures 1,4 *		

X	EP 1 032 045 A2 (SANYO ELECTRIC CO [JP]) 30 August 2000 (2000-08-30)	1,2,4,6	
	* paragraphs [0057] - [0059], [0062]; figures 1,4 *		
	* paragraphs [0069] - [0072]; figure 7 *		

X	US 2013/235289 A1 (YAMAGUCHI HIDEMASA [JP] ET AL) 12 September 2013 (2013-09-12)	1-6,8,9,12,13	
Y	* paragraph [0084] - paragraph [0093]; figures 3A,3B *	1,7,14,15	TECHNICAL FIELDS SEARCHED (IPC)
	* paragraph [0097] - paragraph [0141]; figures 4-8 *		H01L
	* paragraph [0146] - paragraph [0163]; figures 9A,10 *		

The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 September 2015	Examiner Pusch, Catharina
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 16 4739

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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09-09-2015

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专利名称(译)	有机发光显示装置		
公开(公告)号	EP2937904A1	公开(公告)日	2015-10-28
申请号	EP2015164739	申请日	2015-04-22
[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	CHOI MOONJUNG HONG SUNGJIN JEONG ILGI YOON JOONGSUN HAN HOBUM		
发明人	CHOI, MOONJUNG HONG, SUNGJIN JEONG, ILGI YOON, JOONGSUN HAN, HOBUM		
IPC分类号	H01L27/32		
审查员(译)	PUSCH, 凯萨琳娜		
优先权	1020140048968 2014-04-23 KR 1020150037346 2015-03-18 KR		
外部链接	Espacenet		

摘要(译)

有机发光显示装置 (300) 包括限定在基板上的多个像素。多个像素中的每个像素包括多个子像素 (SP_R, SP_W, SP_B, SP_G), 并且多个子像素中的每个包括发光区域 (EA_R, EA_W, EA_B, EA_G) 和驱动区域 (DA_R, DA_W, DA_B, DA_G)。多个子像素的驱动区域在第一方向上具有宽度 (S1, S2, S3, S4), 并且多个子像素的各个驱动区域在第一方向上的宽度彼此相同。多个子像素 (331W或331B) 之一的发光区域的尺寸大于其他子像素 (331R或331G) 之一的发光区域的尺寸。在根据本发明的一个方面的有机发光显示装置中, 在多个子像素的各个驱动区域的第一方向上的宽度保持彼此相同的同时, 发光的尺寸通过改变多个子像素的发光区域的尺寸, 可以优化多个子像素中的每个子像素的面积, 而不改变像素的尺寸和驱动区域的尺寸。因此, 可以提高有机发光显示装置的可靠性和寿命。

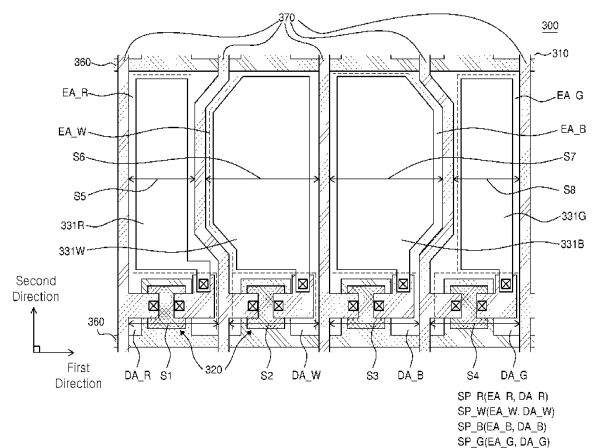


FIG. 3