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Jung et al.(10) **Pub. No.: US 2014/0198133 A1**(43) **Pub. Date: Jul. 17, 2014**(54) **ORGANIC LIGHT EMITTING DISPLAY****Publication Classification**(71) Applicant: **Samsung Display Co., Ltd.**,
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G09G 3/32 (2006.01)(72) Inventors: **Hae-Goo Jung**, Yongin-City (KR);
Do-Hyung Ryu, Yongin-City (KR)(52) **U.S. Cl.**
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(57) **ABSTRACT**

There is provided an organic light emitting display that includes a plurality of pixels arranged in a plurality of rows and columns. Each of the pixels includes a plurality of sub pixels. At least one sub pixel of the plurality of sub pixels of at least one pixel is divided into a plurality of divisional sub pixels. Since the divisional sub pixels alternately emit light, it is possible to reduce deterioration speed of the sub pixels, thereby preventing an afterimage from being generated by deterioration of the sub pixels.

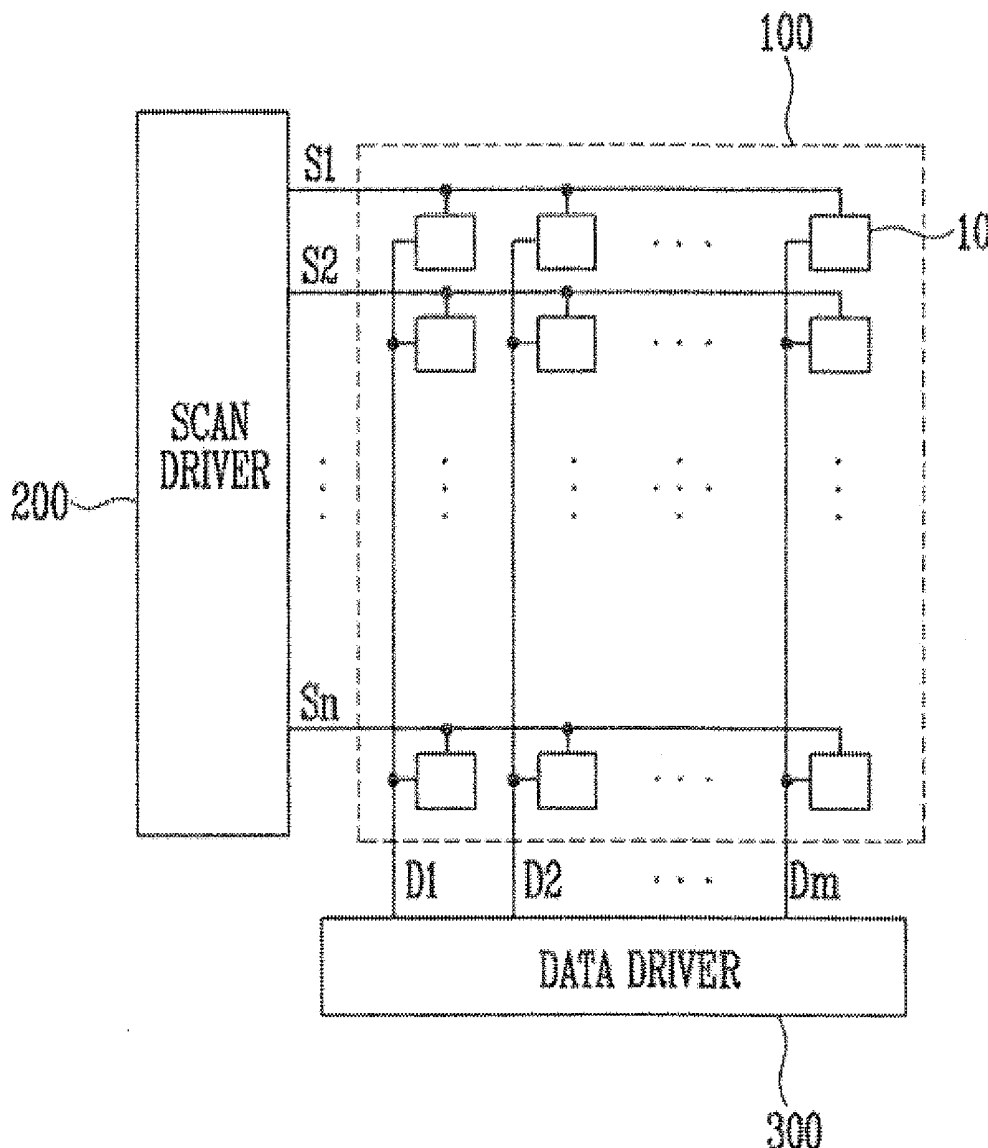


FIG. 1

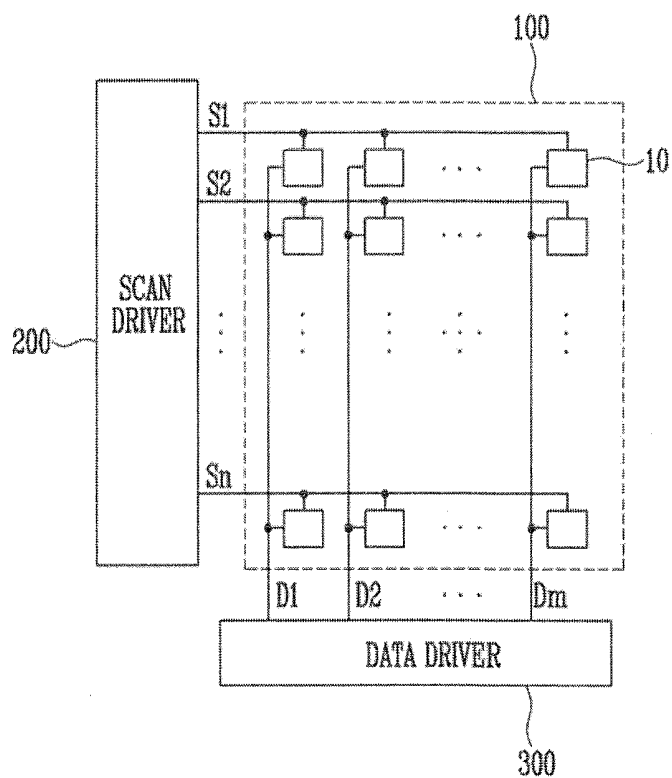


FIG. 2A

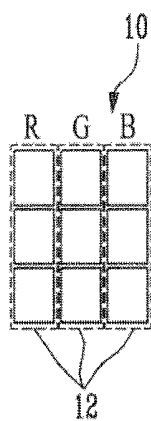


FIG. 2B

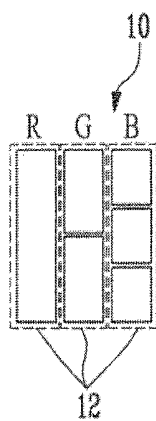


FIG. 2C

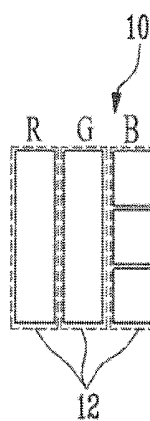


FIG. 3

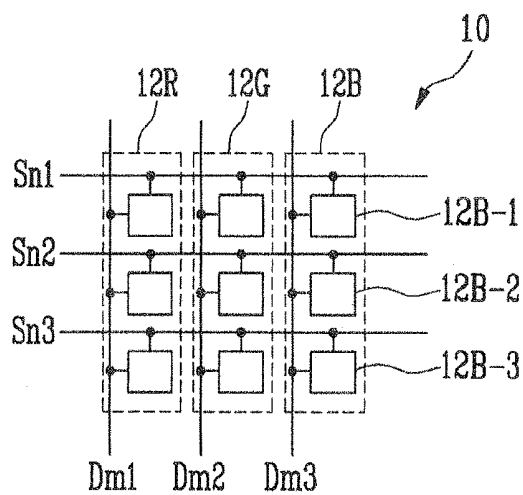


FIG. 4

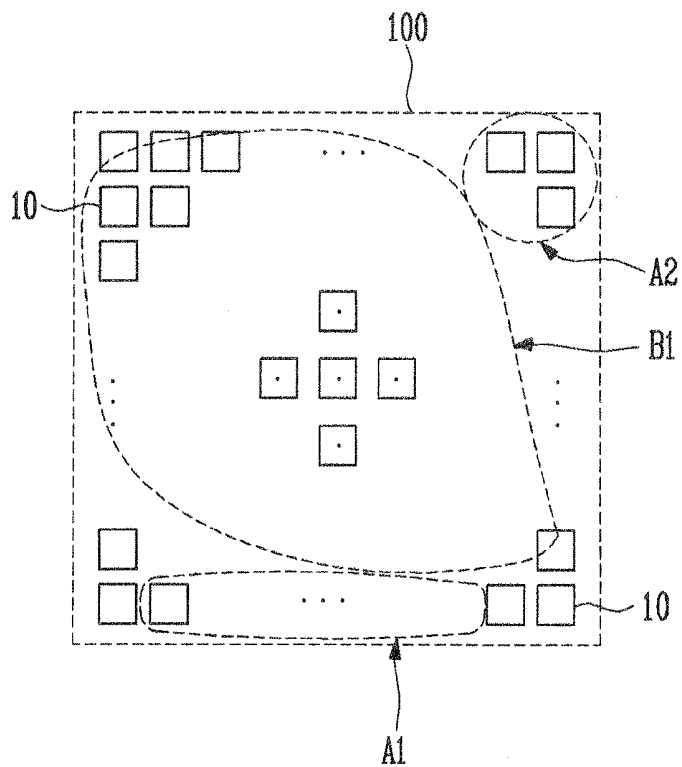


FIG. 5A

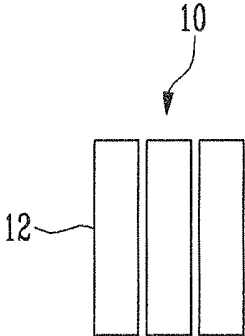
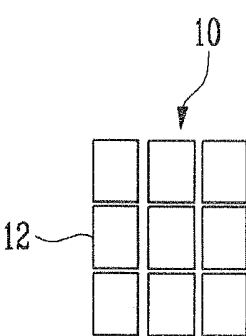


FIG. 5B



ORGANIC LIGHT EMITTING DISPLAY**CLAIM OF PRIORITY**

[0001] This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from an application earlier filed in the Korean Intellectual Property Office filed on 11 Jan. 2013 and there duly assigned Serial No. 10-2013-0003497.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an organic light emitting display capable of reducing deterioration speed of a pixel.

[0004] 2. Description of the Related Art

[0005] An organic light emitting diode (OLED) emits light by a difference in energy in a process where holes injected through an anode electrode and electrons injected through a cathode electrode are recombined in an organic light emitting layer. At this time, the emitted light may have different wavelengths, for example, red, green, and blue wavelengths in accordance with the organic light emitting layer. The wavelength of the emitted light is determined by a material (including host material and a dopant material) of the organic light emitting layer.

[0006] Since a characteristic of a part of the material of the organic light emitting layer is deteriorated in accordance with atmosphere and emission time, brightness of the light emitted from the OLED is gradually reduced. For example, meanwhile a brightness reduction ratio of an organic light emitting layer that emits light of green wavelength in accordance with time is relatively small, as brightness is rapidly reduced after a time in an organic light emitting layer that emits light of red wavelength. Therefore, due to a difference in the brightness reduction ratio caused by a difference in the characteristics of the materials, a difference in brightness is generated between OLEDs.

[0007] In addition, when the same image such as a logo, a time, and subtitles of a broadcaster is continuously displayed at a specific position, deterioration of the OLEDs may be accelerated. Due to deterioration caused by a long-time operation, an afterimage or image sticking may be generated. A spot caused by the afterimage may deteriorate picture quality.

SUMMARY OF THE INVENTION

[0008] Accordingly, the present invention has been made to provide an organic light emitting display capable of reducing deterioration speed of an organic light emitting diode (OLED).

[0009] The present invention has been also made to provide an organic light emitting display capable of preventing an afterimage from being generated.

[0010] According to one aspect of the present invention, there is provided an organic light emitting display that includes a plurality of pixels arranged in a plurality of rows and columns, wherein each of the pixels comprises a plurality of sub pixels, and wherein at least one of the plurality of sub pixels of at least one of the pixels includes a plurality of divisional sub pixels. The plurality of sub pixels may include a red sub pixel, a green sub pixel, and a blue sub pixel, each of the red sub pixel, the green sub pixel, and the blue sub pixel may be divided into a plurality of divisional sub pixels. Each

of the red sub pixel, the green sub pixel, and the blue sub pixel may be composed of differing numbers of divisional sub pixels, respectively. The plurality of sub pixels may include a red sub pixel, a green sub pixel, and a blue sub pixel, and only the blue sub pixel may be divided into a plurality of divisional sub pixels.

[0011] The divisional sub pixels within one of the sub-pixels may alternately emit light. The plurality of divisional sub pixels within any one of the sub-pixels may alternately emit light within a frame cycle or a time cycle. The plurality of divisional sub pixels may alternately emit light within a frame cycle or a time cycle corresponding to when accumulated operation time of the organic light emitting display is no less than a predetermined value.

[0012] The organic light emitting display device may also include a plurality of scan lines, each being coupled to a plurality of sub pixels in a row; and a plurality of data lines, each being coupled to a plurality of sub pixels in a column. The plurality of divisional sub pixels within a single sub pixel are coupled to the scan lines of different rows, respectively. The plurality of divisional sub pixels within a single sub pixel may be coupled to a same one of the data lines. The organic light emitting display device may also include a scan driver coupled to the plurality of scan lines and a data driver coupled to the plurality of data lines.

[0013] A same image is displayed on at least one pixel for a predetermined time. The at least one pixel that includes the sub pixels that include a plurality of divisional sub pixels may be intensively provided in a predetermined region of the plurality of rows and columns. The predetermined region may be a region adjacent to an edge of the plurality of rows and columns. The predetermined region may be a region adjacent to a corner of the plurality of rows and columns.

[0014] Ones of the plurality of divisional sub pixels within one of the sub pixels of a pixel may emit light of a same color and may be independently controlled by being connected to a separate signal lines. All of the pixels may include at least one sub pixel that includes a plurality of divisional sub pixels that are independently controlled. Only a portion of all of the pixels may include at least one sub pixel that includes a plurality of divisional sub pixels that are independently controlled and emits light of a same color. Each divisional sub pixels within a sub pixel emit light of a same color and are adapted to be driven in an alternate manner. All of the divisional sub pixels within a sub pixel emit a same color of light, and all of the sub pixels within a pixel may emit different color light from each other, and each of the divisional sub pixels within a sub pixel may be independently controlled.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings, in which like reference symbols indicate the same or similar components, wherein:

[0016] FIG. 1 is a block diagram illustrating an organic light emitting display according to an embodiment of the present invention;

[0017] FIGS. 2A to 2C are plan views illustrating an embodiment of the pixel illustrated in FIG. 1 in detail;

[0018] FIG. 3 is a plan view illustrating a coupling structure between sub pixels and scan lines and data lines for alternately emitting light for the pixel of FIG. 2A;

[0019] FIG. 4 is a plan view of a display unit illustrating an organic light emitting display according to an embodiment of the present invention; and

[0020] FIGS. 5A and 5B are plan views of a pixel for describing FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Hereinafter, certain exemplary embodiments according to the present invention will be described with reference to the accompanying drawings. Here, when a first element is described as being coupled to a second element, the first element may be not only directly coupled to the second element but may also be indirectly coupled to the second element via a third element. Further, some of the elements that are not essential to the complete understanding of the invention are omitted for clarity. Also, like reference numerals refer to like elements throughout.

[0022] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. The following embodiments are provided so that those skilled in the art may fully understand the present invention and may have various modifications. The scope of the present invention is not limited to the following embodiments.

[0023] Turning now to FIG. 1, FIG. 1 is a block diagram illustrating an organic light emitting display according to an embodiment of the present invention. Referring now to FIG. 1, an organic light emitting display according to the embodiment of the present invention includes a display unit 100 in which an image is displayed, a scan driver 200 and a data driver 300 for providing signals to display the image.

[0024] The display unit 100 includes a plurality of scan lines S1 to Sn arranged in one direction, for example, in a row direction, data lines D1 to Dm arranged in a direction that intersects the scan lines S1 to Sn, for example, in a column direction, and a plurality of pixels 10 arranged in a matrix at intersections between the scan lines S1 to Sn and the data lines D1 to Dm. The scan driver 200 is coupled to the scan lines S1 to Sn and the data driver 300 is coupled to the data lines D1 to Dm.

[0025] Each of the plurality of pixels 10 includes a plurality of sub pixels, for example, a red (R) sub pixel, a green (G) sub pixel, a blue (B) sub pixel, and a white (W) sub pixel. Each of the sub pixels may be formed of an organic light emitting diode (OLED). The OLED includes an anode electrode, an organic light emitting layer, and a cathode electrode. The anode electrode may be coupled to a power supply voltage ELVDD and the cathode electrode may be coupled to a ground voltage ELVSS.

[0026] In addition, in at least one pixel 10 or a partial pixel 10 of the plurality of pixels 10, at least one sub pixel of the plurality of sub pixels is divided into a plurality of divisional sub pixels.

[0027] Turning now to FIGS. 2A to 2C, FIGS. 2A to 2C are plan views illustrating in detail an embodiment of a pixel 10 of FIG. 1. Referring now to FIG. 2A, each of a plurality of sub pixels 12 that form one pixel 10 may be divided into a plurality of divisional sub pixels. For example, in FIG. 2A, each of the red (R) sub pixel, the green (G) sub pixel, and the blue (B) sub pixel may be divided into three divisional sub pixels.

[0028] Referring now to FIG. 2B, the plurality of sub pixels 12 that form one pixel 10 may be divided into varying numbers of divisional sub pixels, respectively. For example, in FIG. 2B, the red (R) sub pixel is not divided, the green (G) sub pixel is divided into two divisional sub pixels, and the blue (B) sub pixel is divided into three divisional sub pixels.

[0029] Referring now to FIG. 2C, only one of the sub pixels 12 that form one pixel 10 may be divided into a plurality of divisional sub pixels. For example, the red (R) sub pixel and the green (G) sub pixel are not divided, but only the blue (B) sub pixel may be divided into three divisional sub-pixels.

[0030] In FIG. 2C, the blue (B) sub pixel is divided into a plurality of divisional sub pixels. For example, a sub pixel having relatively high deterioration speed may be selected to be divided into a plurality of divisional sub pixels in consideration of a deterioration degree in accordance with the material characteristic of an organic light emitting layer of the blue (B) sub pixel.

[0031] In each of FIGS. 2A to 2C, each of the divisional sub pixels of a sub pixels 12 that is divided as described above may be adapted to alternately emit light with the remaining divisional sub pixels in any given sub pixel 12.

[0032] Turning now to FIG. 3, FIG. 3 is a plan view illustrating a coupling structure between divisional sub pixels, scan lines and data lines for alternately emitting light for the pixel arrangement of FIG. 2A. For example, as illustrated in FIG. 2A, when each of a red sub pixel 12R, a green sub pixel 12G, and a blue sub pixel 12B is divided into three divisional sub pixels, the divisional sub pixels of each of the sub pixels 12R, 12G, and 12B are coupled to scan lines Sn1, Sn2, and Sn3 of different rows and data lines Dm1, Dm2, and Dm3 of the same column. Consequently, divisional sub pixels of any one of the sub pixels can be independently controlled in any manner that the designer of the display sees fit. As discussed previously, design considerations can include, but are not limited to, elimination of the image sticking problem of a same image always being displayed, and/or compensation for the fact that some colors of organic light emitting layers deteriorate faster over the life of the display device than other colors.

[0033] In the above coupling structure, for example, at least one divisional sub pixel 12B-1 of the blue sub pixel 12B may alternately emit light (i.e. be alternately driven) with the remaining divisional sub pixels 12B-2 and 12B-3 in accordance with a time cycle or a frame cycle. For example, the divisional sub pixel 12B-1 and the divisional sub pixels 12B-2 and 12B-3 may alternately emit light according to a time cycle or a frame cycle, or the divisional sub pixel 12B-1 and the divisional sub pixels 12B-2 and 12B-3 emit light for a time (for example, 300 hours) and, after the time, the divisional sub pixel 12B-1 and the divisional sub pixels 12B-2 and 12B-3 may then alternately emit light in accordance with a time cycle and a frame cycle. The time can be an accumulated operation time or a total operation time of the organic light emitting display, and may be set in consideration of a point of time at which deterioration of the divisional sub pixels starts due to the material characteristics of the organic light emitting layer in that sub pixel.

[0034] The OLEDs that form the sub pixels deteriorate over the length of the life of the display due to the material characteristics of the organic light emitting layers. Due to a difference between the materials of the organic light emitting layers in accordance with the different wavelengths of light emitted by each of the sub pixels 12, deterioration rates and

degrees of the respective sub pixels vary. Deterioration of the OLED layer having high deterioration speed may be also be accelerated with the increase in emission time, which could be caused when a same image is frequently being displayed.

[0035] In conventional organic light emitting displays, since all of the pixels in the display unit have the same structure, when the same image is continuously displayed in a pixel at a specific location, deterioration of the sub pixel at that location is accelerated, so that an afterimage may be generated.

[0036] According to the embodiment of the present invention, sub pixels located at a specific location where the same image, such as a logo, the time, and subtitles of a broadcaster is continuously displayed, may be designed to have the structure of the embodiment described in FIGS. 2A, 2B, and 2C. The sub pixels according to the embodiment of the present invention may be intensively arranged in a predetermined region of the display.

[0037] Referring now to FIG. 4, the sub pixels according to the embodiment of the present invention are preferably arranged within a region A1 adjacent to the edge of the display unit 100 or a region A2 adjacent to a corner of the display unit 100. That is, the configuration of the sub pixels 12 (see FIG. 5B) that are arranged within pixels 10 that are arranged within regions A1 and A2 of FIG. 4 are different from the configuration of the sub pixels 12 (see FIG. 5A) that are arranged within pixels 10 that are arranged within region B1 of FIG. 4 and as illustrated in FIG. 5A. Furthermore, the sub pixels 12 arranged within pixels 10 arranged within region B1 and as illustrated in FIG. 5A may all have a same configuration. The term "configuration" is used here to describe the number, the size and the shape of the divisional sub-pixels within the sub pixels 12 of a pixel 10 as illustrated by for example in FIGS. 5A and 5B.

[0038] According to the embodiment of the present invention, each of the sub pixels 12 that form a partial pixel 10 among the plurality of pixels 10 arranged in a plurality of rows and columns is divided into a plurality of sub pixels, and at least one of the sub pixels 12 includes a plurality of divisional sub pixels that alternately emit light. Since the divisional sub pixels 12-x alternately emit light, deterioration speed of the sub pixels is reduced, so that a difference in brightness between the sub pixels 12 having different color may be reduced. In addition, when a pixel is arranged at a location where the same image is continuously displayed, such as a logo, a time, and subtitles of a broadcaster is continuously displayed, it is possible to prevent an afterimage (i.e. image sticking) from being generated due to deterioration of the sub pixels.

[0039] In the above embodiments, the pixel 10 of the partial regions A1 and A2 is formed to have the structure of the embodiment described in FIGS. 2A, 2B, and 2C. However, if necessary, all of the pixels 10 throughout the display unit 100 may be formed to have the structure of the embodiment described in FIGS. 2A, 2B, and 2C and still be within the scope of the present invention. For example, should a same image be continuously displayed on the entire display unit 100, the deterioration speed all the pixels 10 may be uniformly reduced.

[0040] The embodiments of the present invention can be used to address the problems of image sticking where a same image is being displayed over time, as well as the problem of organic light emitting materials for emitting different color wavelengths deteriorate at different rates over the length of

the life of the display. In the displays of the present invention, at least one of the pixels include at least one sub pixel that is divided into a plurality of independently controlled divisional sub pixels. Each sub pixel within a pixel emits light of a different color, and each divisional sub pixel within a sub pixel emits light of a same color. Pixels containing the divisional sub pixels may be arranged only at certain portions of the display that are prone to the image sticking problem, or to an entirety of the display. Furthermore, the divisional sub pixels within a sub pixel can be driven in an alternate manner to prevent deterioration of a display of a particular color. This may be achieved by alternately driving different ones of the divisional sub pixels within a sub pixel according to a frame cycle or a time cycle. Alternately, only ones of the divisional sub pixels may emit light for the first several hundred hours or so of the total operation time of the display, and after this predetermined time, other ones of the divisional sub pixels within a sub pixel may operate, or all of the divisional sub pixels within a sub pixel may then operate in an alternating manner according to a frame cycle or a time cycle. Consequently, the fading of one of the elemental colors with respect to others of the elemental colors over the length of the life of the display can be reduced or eliminated.

[0041] While the present invention has been described in connection with certain exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, and equivalents thereof.

What is claimed is:

1. An organic light emitting display, comprising:
a plurality of pixels arranged in a plurality of rows and columns, wherein each of the pixels comprises a plurality of sub pixels, and wherein at least one of the plurality of sub pixels of at least one of the pixels includes a plurality of divisional sub pixels.
2. The organic light emitting display of claim 1, wherein the plurality of sub pixels comprise a red sub pixel, a green sub pixel, and a blue sub pixel, and wherein each of the red sub pixel, the green sub pixel, and the blue sub pixel is divided into a plurality of divisional sub pixels.
3. The organic light emitting display of claim 2, wherein each of the red sub pixel, the green sub pixel, and the blue sub pixel are composed of differing numbers of divisional sub pixels, respectively.
4. The organic light emitting display of claim 1, wherein the plurality of sub pixels are comprised of a red sub pixel, a green sub pixel, and a blue sub pixel, and wherein only the blue sub pixel is divided into a plurality of divisional sub pixels.
5. The organic light emitting display of claim 1, wherein the divisional sub pixels within one of the sub-pixels alternately emits light.
6. The organic light emitting display of claim 5, wherein the plurality of divisional sub pixels within any one of the sub-pixels alternately emits light according to a frame cycle or a time cycle.
7. The organic light emitting display of claim 5, wherein the plurality of divisional sub pixels are alternately driven according to a frame cycle or a time cycle corresponding to when a total operation time of the display exceeds a predetermined value.

8. The organic light emitting display of claim 1, further comprising:

a plurality of scan lines, each being coupled to a plurality of sub pixels in a row; and

a plurality of data lines, each being coupled to a plurality of sub pixels in a column.

9. The organic light emitting display of claim 8, wherein the plurality of divisional sub pixels within a single sub pixel are coupled to the scan lines of different rows, respectively.

10. The organic light emitting display of claim 8, wherein the plurality of divisional sub pixels within a single sub pixel are coupled to a same one of the data lines.

11. The organic light emitting display of claim 8, further comprising:

a scan driver coupled to the plurality of scan lines; and

a data driver coupled to the plurality of data lines.

12. The organic light emitting display of claim 1, wherein a same image is displayed on at least one pixel for a predetermined time.

13. The organic light emitting display of claim 1, wherein the at least one pixel comprising the sub pixels that comprise a plurality of divisional sub pixels is intensively provided in a predetermined region of the plurality of rows and columns.

14. The organic light emitting display of claim 13, wherein the predetermined region is a region adjacent to an edge of the plurality of rows and columns.

15. The organic light emitting display of claim 13, wherein the predetermined region is a region adjacent to a corner of the plurality of rows and columns.

16. The organic light emitting display of claim 1, wherein ones of the plurality of divisional sub pixels within one of the sub pixels of a pixel emit light of a same color and are independently controlled by being connected to a separate signal lines.

17. The organic light emitting display of claim 1, wherein all of the pixels are comprised of at least one sub pixel that includes a plurality of divisional sub pixels that are independently controlled.

18. The organic light emitting display of claim 1, wherein only a portion of all of the pixels are comprised of at least one sub pixel that includes a plurality of divisional sub pixels that are independently controlled and emits light of a same color.

19. The organic light emitting display of claim 1, wherein each divisional sub pixels within a sub pixel emit light of a same color and are adapted to be driven in an alternate manner.

20. The organic light emitting display of claim 1, wherein all of the divisional sub pixels within a sub pixel emit a same color of light, and all of the sub pixels within a pixel emit different color light from each other, and each of the divisional sub pixels within a sub pixel is independently controlled.

* * * * *

专利名称(译)	有机发光显示器		
公开(公告)号	US20140198133A1	公开(公告)日	2014-07-17
申请号	US13/917080	申请日	2013-06-13
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
[标]发明人	JUNG HAE GOO RYU DO HYUNG		
发明人	JUNG, HAE-GOO RYU, DO-HYUNG		
IPC分类号	G09G3/32		
CPC分类号	G09G3/3208 G09G2300/0443 G09G2320/043 H01L27/322		
优先权	1020130003497 2013-01-11 KR		
其他公开文献	US10019936		
外部链接	Espacenet USPTO		

摘要(译)

提供了一种有机发光显示器，其包括以多个行和列布置的多个像素。每个像素包括多个子像素。至少一个像素的多个子像素中的至少一个子像素被划分为多个分割子像素。由于分割子像素交替地发光，因此可以降低子像素的劣化速度，从而防止由于子像素的劣化而产生余像。

