US 20050087740A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0087740 A1**

Matsumoto et al. (43) **Pub. Date: Apr. 28, 2005**

(54) **ORGANIC ELECTROLUMINESCENT DISPLAY DEVICE OF TOP EMISSION TYPE**

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(21) Appl. No.: **10/941,075**

(22) Filed: **Sep. 15, 2004**

(30) **Foreign Application Priority Data**

Sep. 24, 2003 (JP) 2003-330929

Publication Classification

(51) **Int. Cl.**^{7} **H01L 29/04**

(52) **U.S. Cl.** **257/72**

(57) **ABSTRACT**

In an organic EL display device, emissive regions are arrayed in various patterns without depending on array patterns of the TFT formation regions and so on. A plurality of TFT formation regions PTr of pixels P is formed in a stripe array on a display portion. Emissive regions R1 of the organic EL element **11A** emitting red light, emissive regions G1 of the organic EL element **11A** emitting green light, and emissive regions B1 of the organic EL element **11A** emitting blue light are arrayed on these TFT formation regions PTr. The emissive regions R1, G1, and B1 are disposed in delta array over the adjacent TFT formation regions PTr.

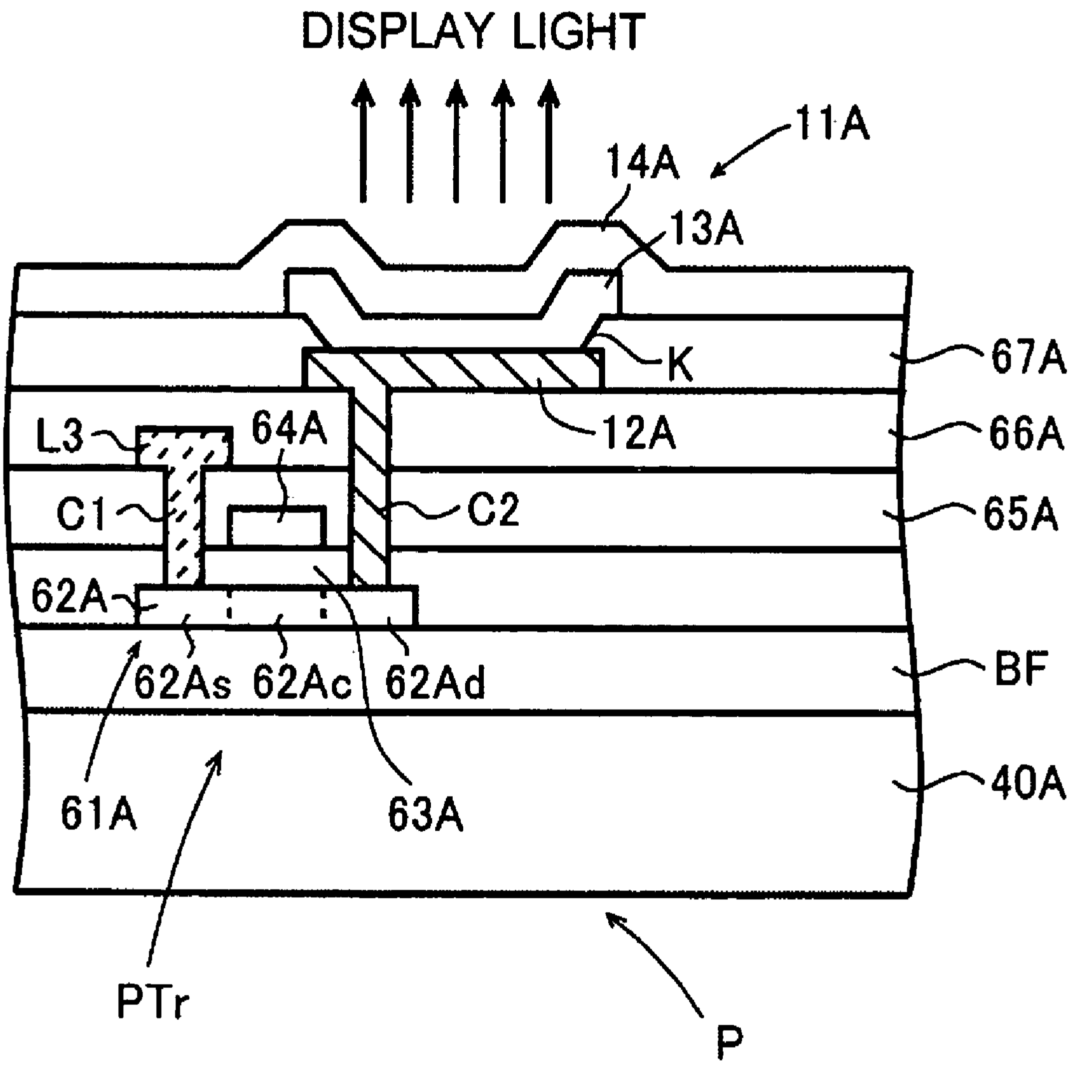


Fig. 1A

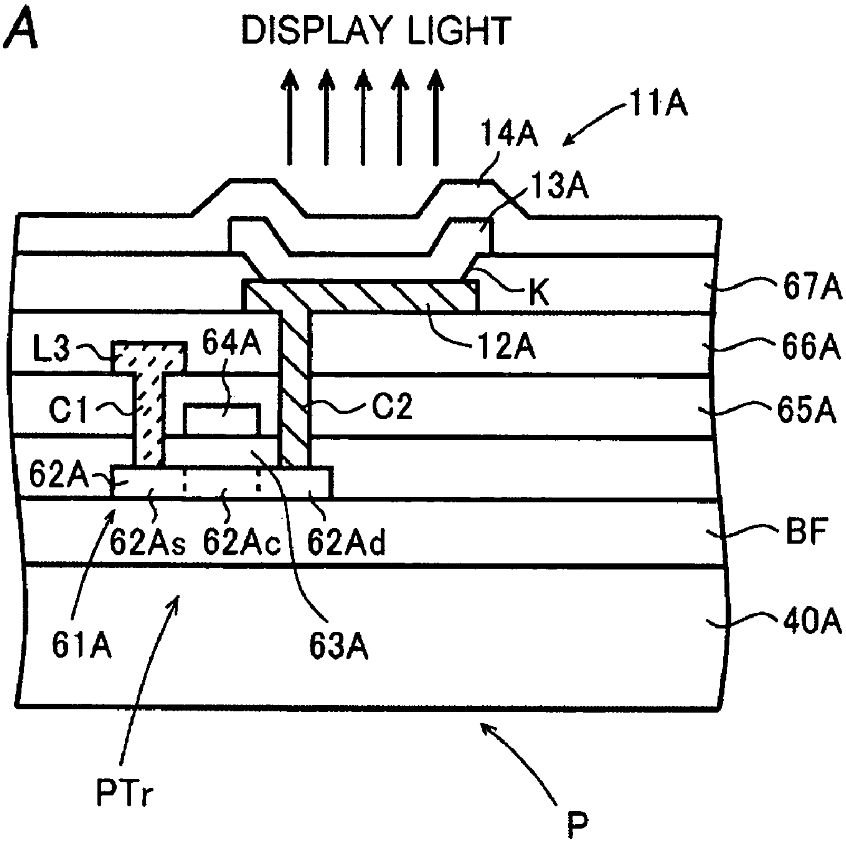

DISPLAY LIGHT
11A
14A
13A
K
67A
12A
66A
L3
64A
C1
C2
65A
62A
62As
62Ac
62Ad
BF
40A
61A
63A
PTr
P

Fig. 1B

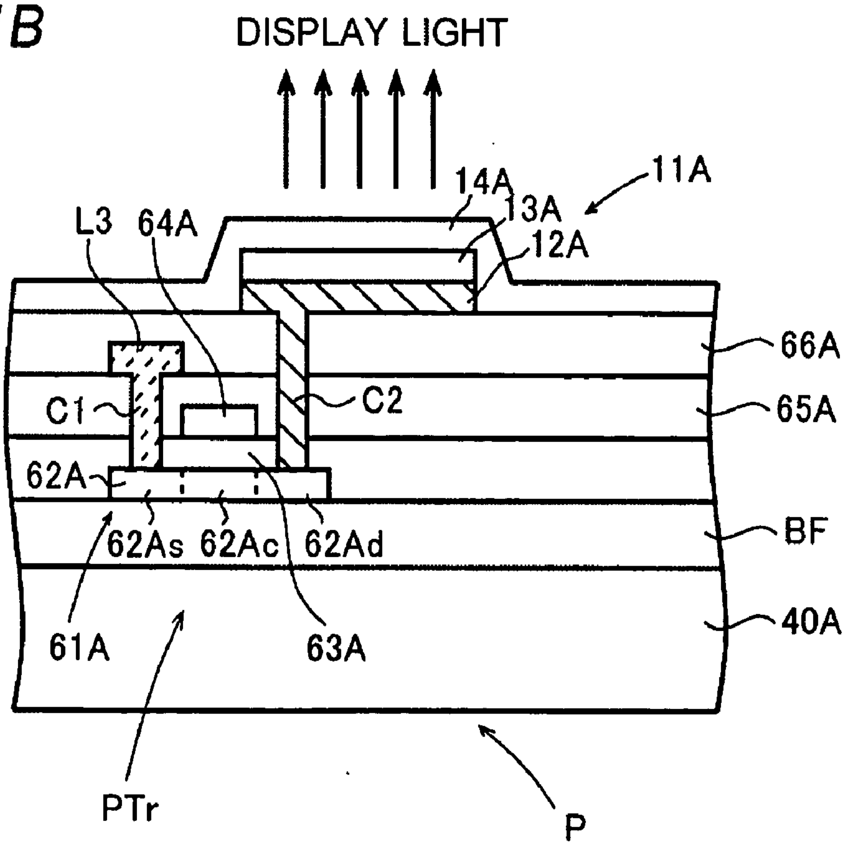

DISPLAY LIGHT
11A
14A
13A
12A
L3
64A
66A
C1
C2
65A
62A
62As
62Ac
62Ad
BF
40A
61A
63A
PTr
P

Fig.2

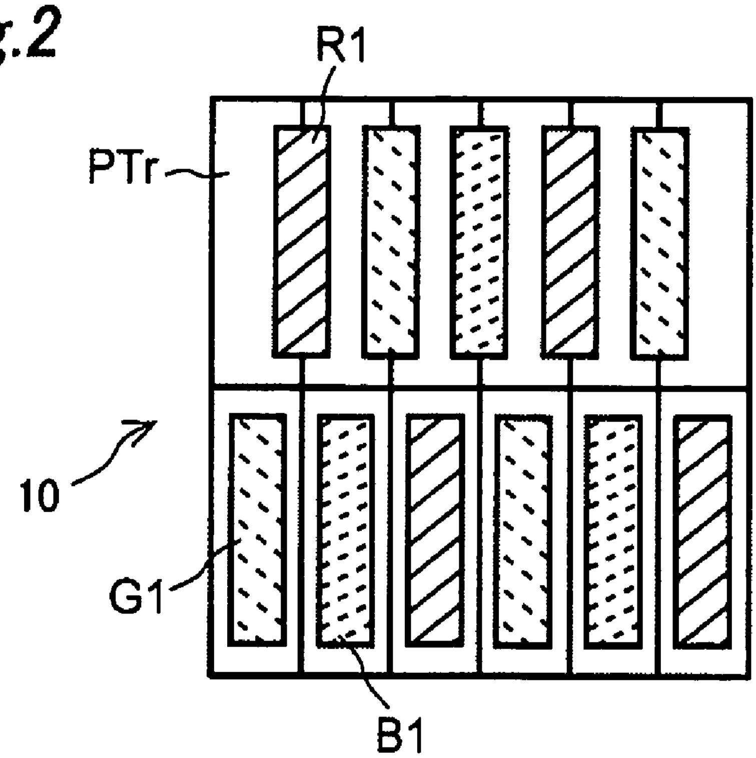


Fig.3

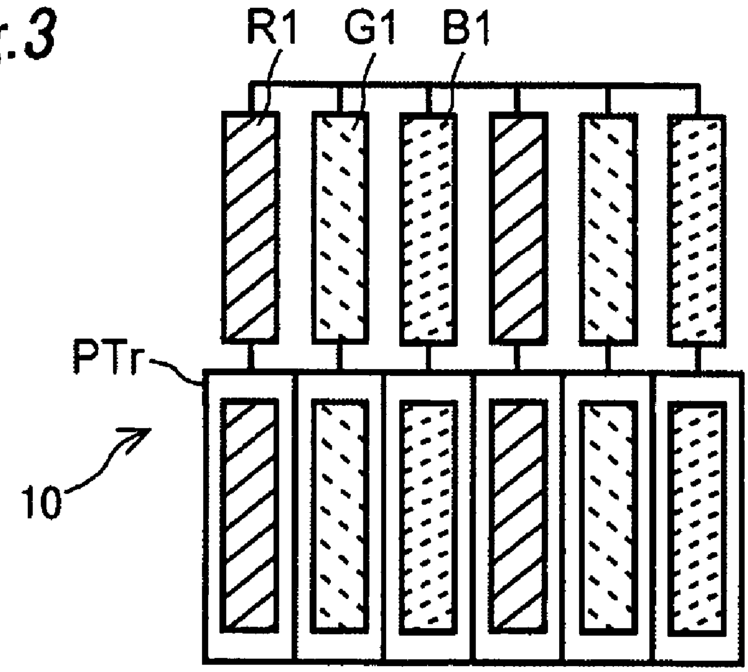


Fig.4

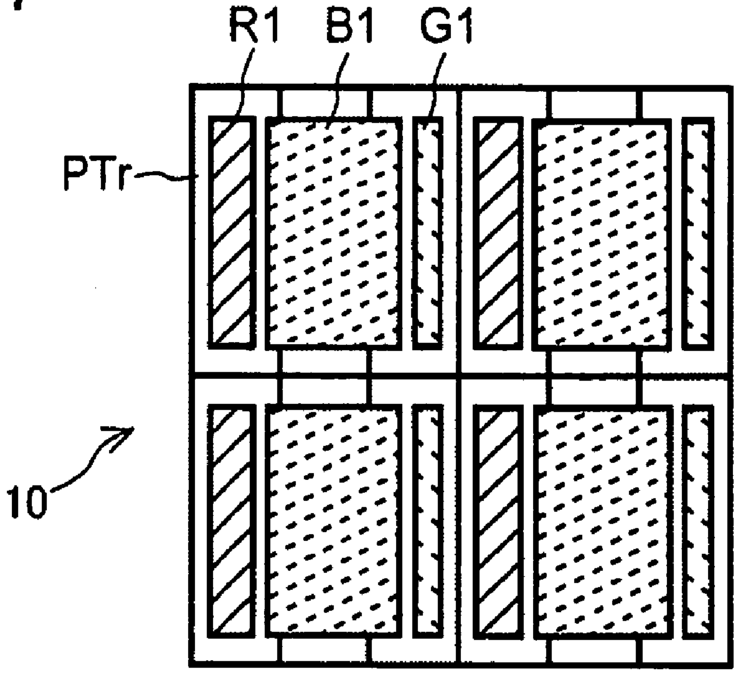


Fig.5

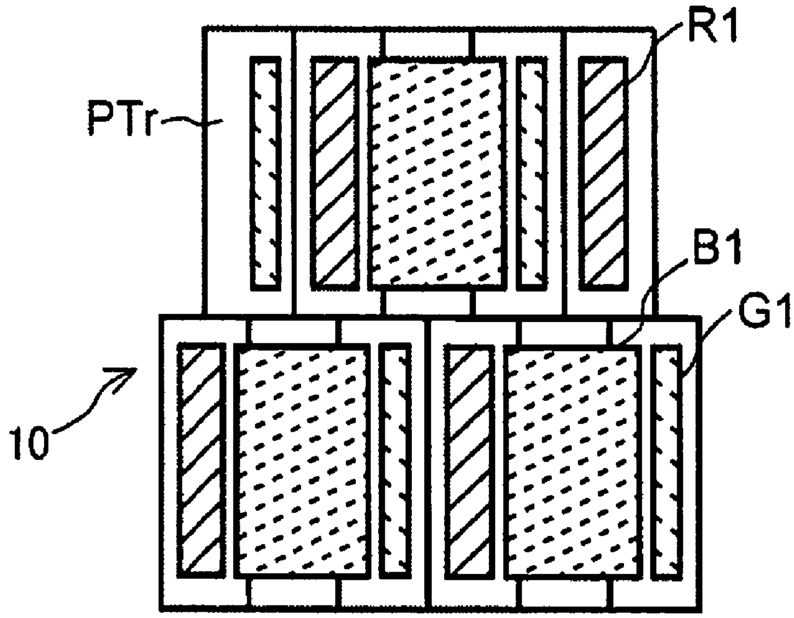


Fig.6

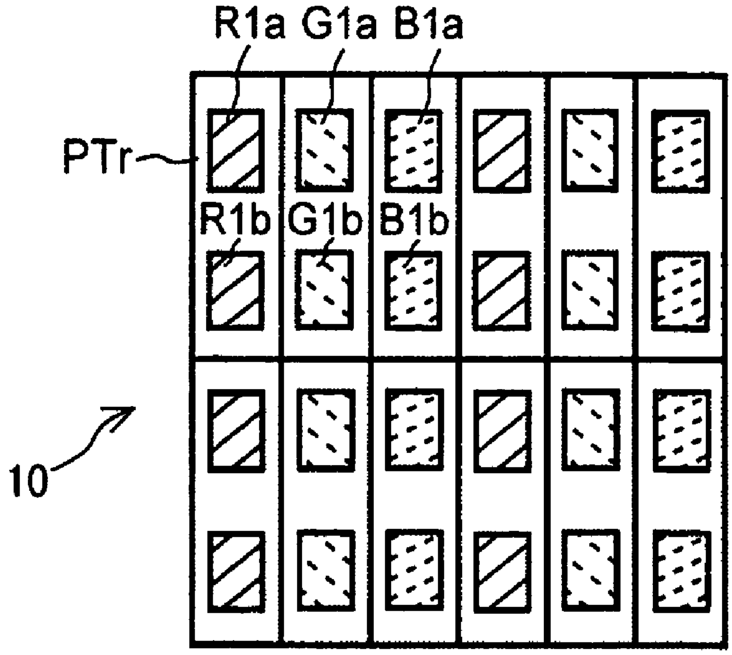


Fig.7

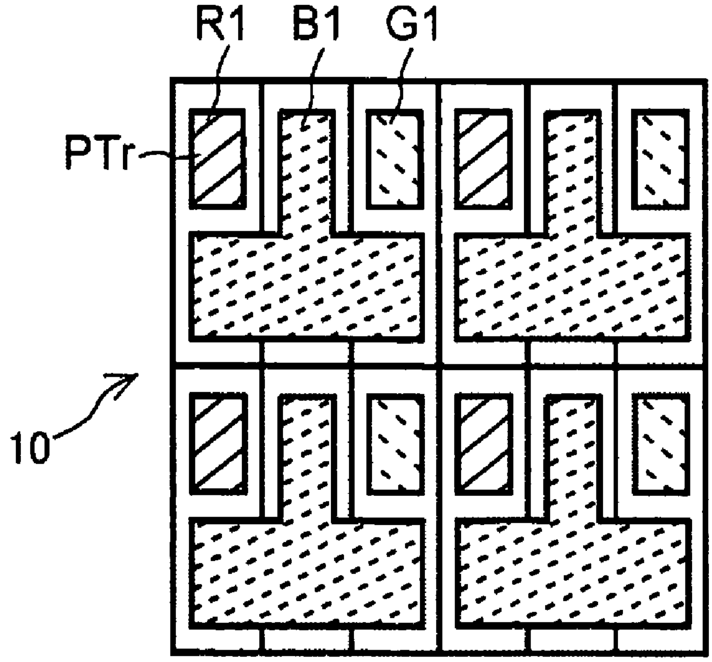


Fig.8

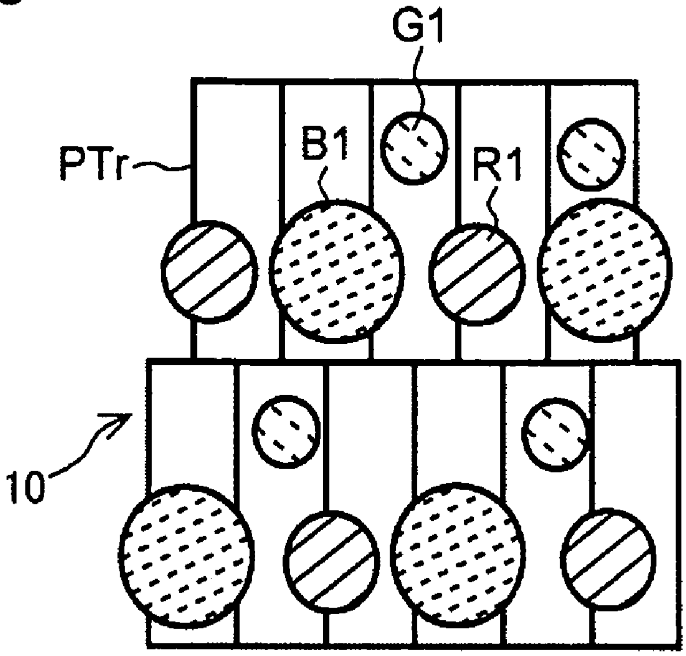


Fig.9

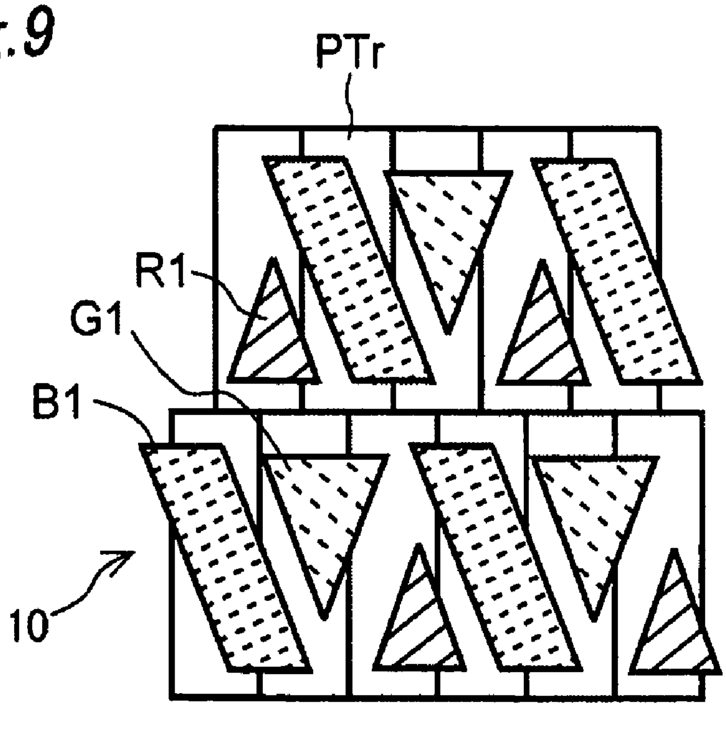


Fig.10

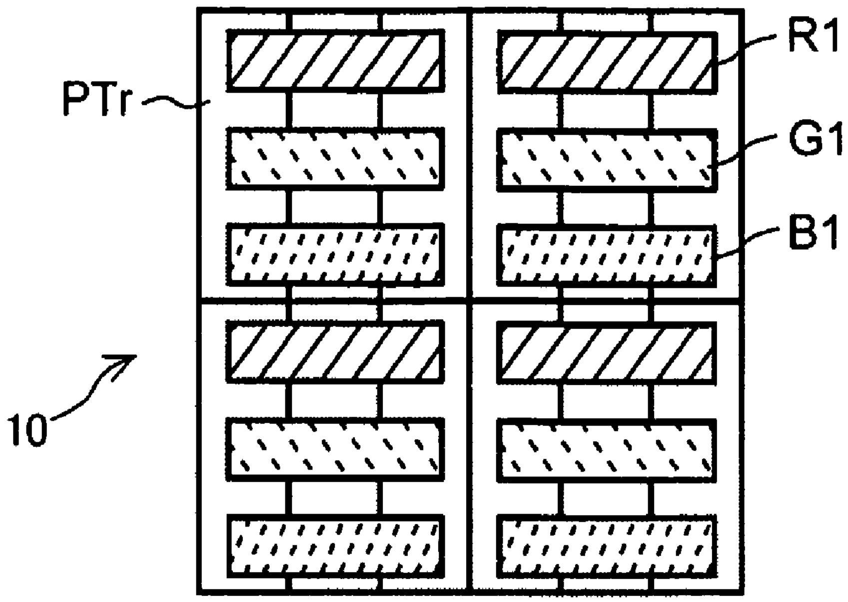


Fig.11

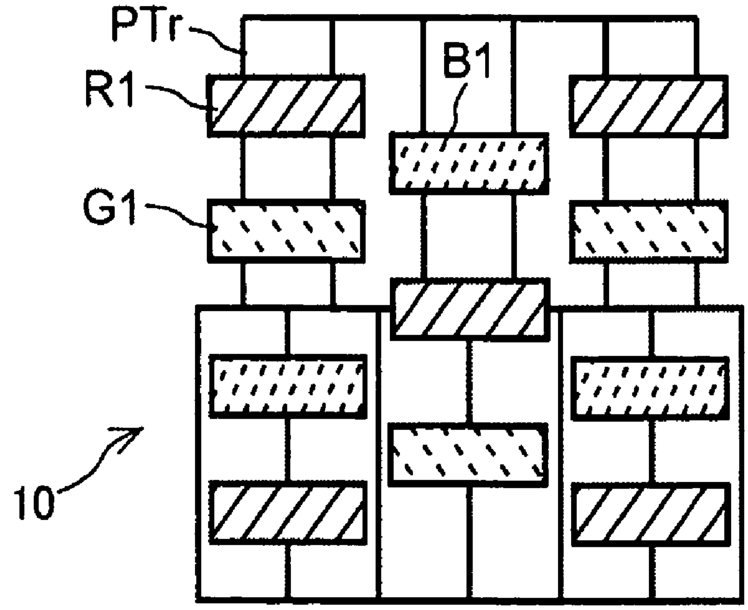


Fig.12

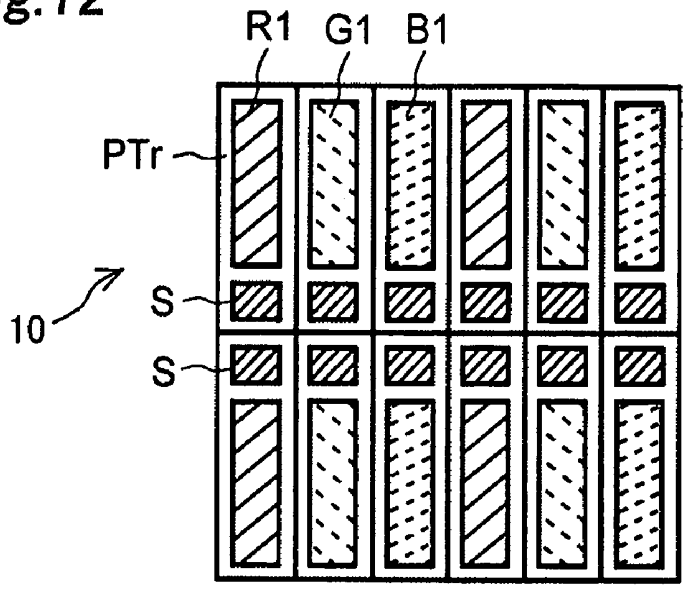


Fig.13 PRIOR ART

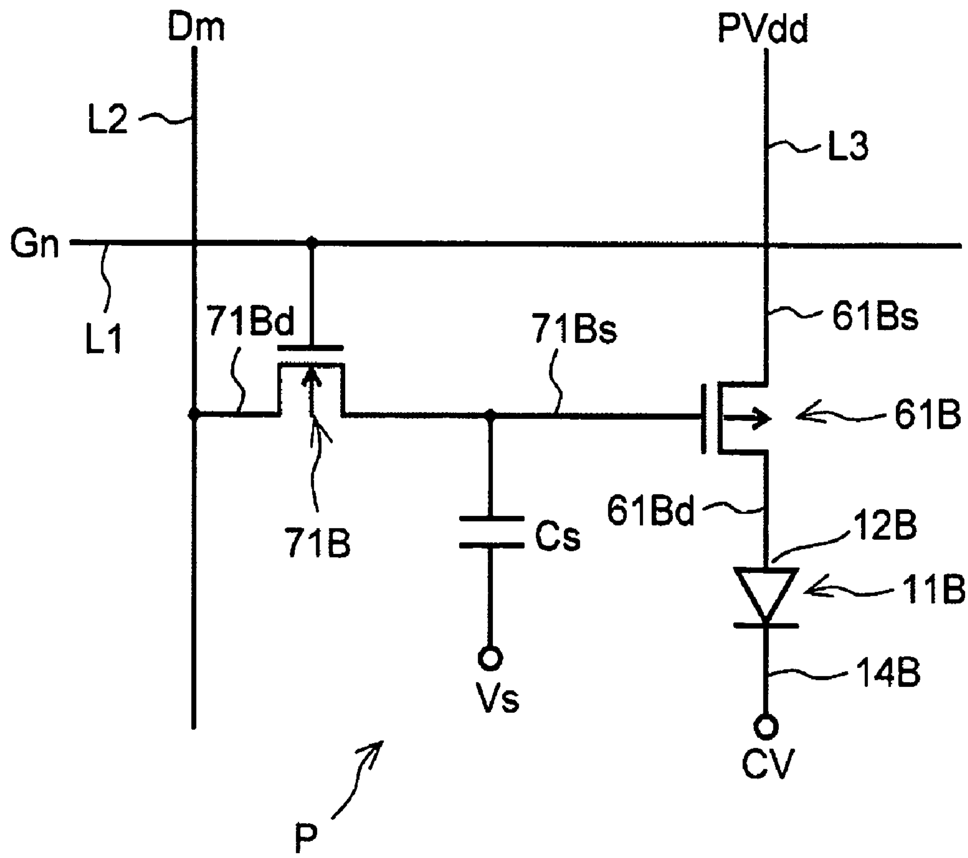


Fig. 14 PRIOR ART

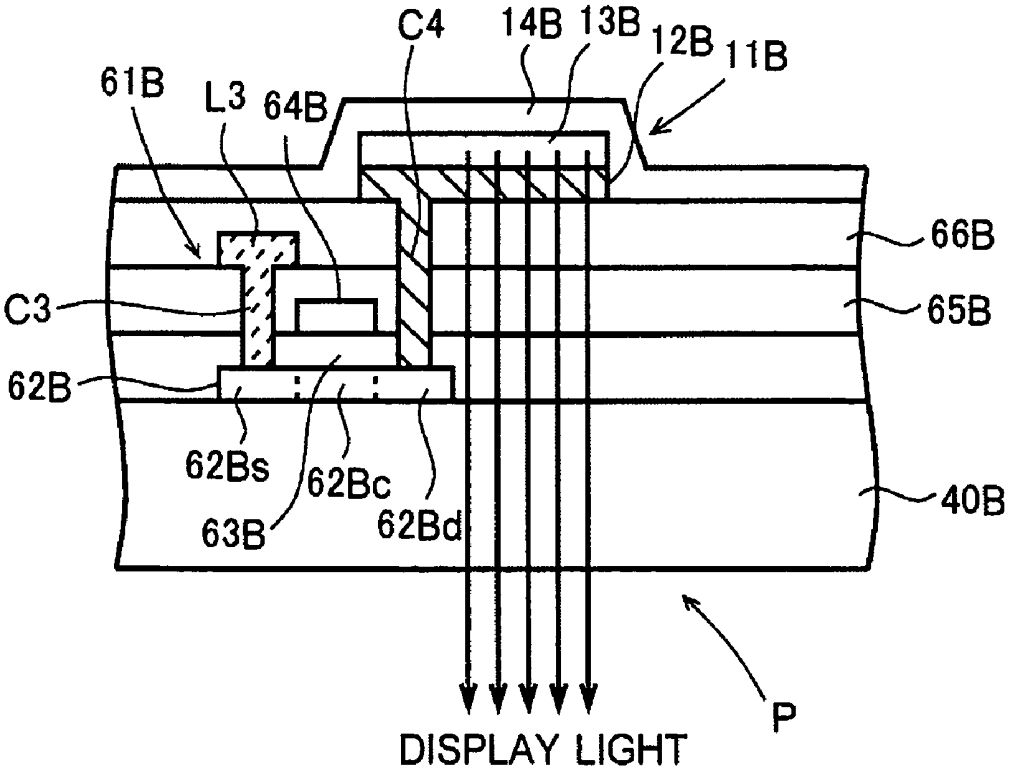
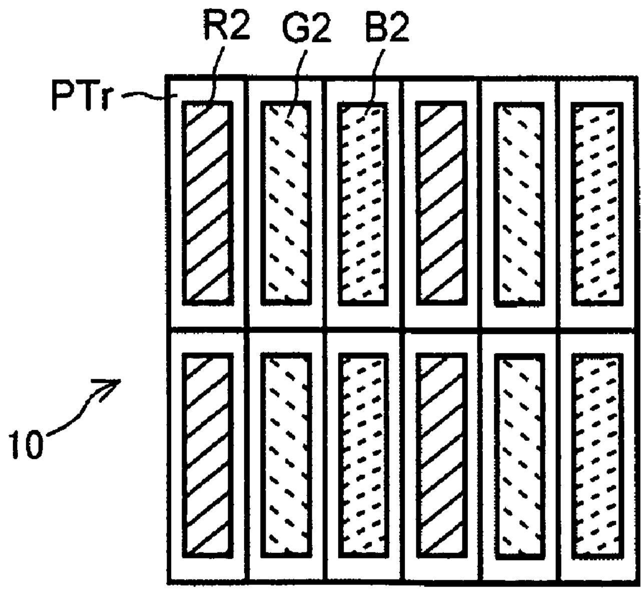


Fig. 15 PRIOR ART



ORGANIC ELECTROLUMINESCENT DISPLAY DEVICE OF TOP EMISSION TYPE

CROSS-REFERENCE OF THE INVENTION

[0001] This invention is based on Japanese Patent Application No. 2003-330929, the content of which is incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] This invention relates to an organic electroluminescent display device, particularly to an organic electroluminescent display device where flexibility in array positions of emissive regions of organic electroluminescent elements is increased

[0004] 2. Description of the Related Art

[0005] In recent years, organic electroluminescent (hereafter, referred to as EL) display devices using EL elements are receiving attention as a new display device substituted for a CRT or an LCD. Particularly, an organic EL display device having thin film transistors (hereafter, referred to as TFTS) as switching elements for driving the organic EL elements is being developed.

[0006] A bottom emission type and a top emission type have been known in the organic EL display device. Hereinafter, the organic EL display device of bottom emission type will be described with reference to drawings

[0007] **FIG. 13** shows an equivalent circuit diagram of a pixel P on a display portion (not shown) of the organic EL display device of bottom emission type of conventional art. Although a plurality of the pixels P is arrayed in a matrix of rows and columns on the display portion, **FIG. 13** shows one pixel P only.

[0008] A gate signal line L1 supplying a gate signal Gn for selecting the pixels P and a drain signal line L2 supplying a display signal Dm for each of the pixels P are crossing each other in the pixel P. An organic EL element **11**B serving as a self-emissive element, a driving TFT **61**B for supplying a current to the organic EL element **11**B, and a pixel selecting TFT **71**B for selecting the pixel P are disposed in the region the crossing of these signal lines.

[0009] A gate of the pixel selecting TFT **71**B is connected with the gate signal line L1 and supplied with the gate signal Gn therefrom, and a drain **71**Bd of the pixel selecting TFT **71**B is connected with the drain signal line L2 and supplied with the display signal Dm therefrom. A source **71**Bs of the pixel selecting TFT **71**B is connected with a gate of the driving TFT **61**B. A drain **61**Bd of the driving TFT **61**B is connected with a pixel electrode **12**B serving as an anode of the organic EL element **11**B. A cathode **14**B of the organic EL element **11**B is supplied with power supply voltage CV.

[0010] The gate of the driving TFT **61**B is connected with a storage capacitor Cs. The storage capacitor Cs is provided to store the display signal Dm to be applied to the pixel P for a field period by storing electric charge corresponding to the display signal Dm. The pixel P described above is operated as follows.

[0011] When the gate signal Gn becomes high level for one horizontal period, the pixel selecting TFT **71**B turns on. Then, the display signal Dm is applied from the drain signal line L**2** to the gate of the driving TFT **61**B through the pixel selecting TFT **71**B. Conductance of the driving TFT **61**B changes in accordance with the display signal Dm supplied to the gate thereof, and a drive current in accordance with the conductance is supplied to the organic EL element **11**B through the driving TFT **61**B, thereby lighting the organic EL element **11**B. When the driving TFT **61**B turns off in accordance with the display signal Dm supplied to the gate, a drive current does not flow in the driving TFT **61**B, thereby turning off the light of the organic EL element **11**B.

[0012] Next, a structure of the pixel P will be described with reference to a schematic cross-sectional view. **FIG. 14** is a schematic cross-sectional view of the pixel P. **FIG. 14** shows one of the plurality of the pixels P arrayed in a matrix on a display portion **10**. The organic EL element **11**B of the display pixel P is of bottom emission type, and light emitted from the organic EL element **11**B, i.e., a display light, is emitted outside through the transparent glass substrate **40**B. A configuration of these elements will be described hereafter.

[0013] An active layer **62**B, a gate insulating film **63**B, a gate electrode **64**B are formed on the transparent glass substrate **40**B. A channel **62**Bc, a source **62**Bs, and a drain **62**Bd are provided in the active layer **62**B, the source **62**Bs and the drain **62**Bd being disposed on both sides of the channel **62**B, respectively.

[0014] An interlayer insulating film **65**B is formed on the whole surfaces of the gate insulating film **63**B and the gate electrode **64**B. A contact hole C**3** is provided in the interlayer insulating film **65**B in a position corresponding to the source **62**Bs, and a power supply line L**3** is provided therein by filling the contact hole C**3** with a metal such as Al. Furthermore, an insulating film **66**B is provided on the whole surface. A contact hole C**4** is provided in the insulting film **66**B in a position corresponding to the drain **62**Bd, and metal such as Al fills the contact hole C**4** so that the drain **62**Bd and the pixel electrode **12**B serving as an anode of the organic EL element **11**B are in contact with each other.

[0015] The organic EL element **11**B is formed in each of the pixels P, being isolated as an island. The organic EL element **11**B is formed by laminating the pixel electrode **12**B, an emissive layer **13**B, and a cathode **14**B reflecting light emitted from the emissive layer **13**B without transmission, in this order. The cathode **14**B is supplied with power supply voltage CV (not shown). In this organic EL element **11**B, holes injected from the pixel electrode **12**B and electrons injected from the cathode **14**B are recombined in the emissive layer **13**B. The recombined holes and electrons activate organic molecules forming the emissive layer **13**B to generate excitons. Then, light is emitted from the emissive layer **13**B in a process of radiation of the excitons and released outside from the transparent glass substrate **40**B through the pixel electrode **12**B.

[0016] Next the arrangements of the driving transistors, the pixel selecting transistors and the pixel electrodes **12**B, which correspond to the emissive layer **13**B, are explained. First, two types of arrangements, a stripe array and a delta array, are defined. A stripe array is a configuration in which a row of individual components are placed next to the neighboring row so that the individual components in the upper row are placed right next to the corresponding individual components in the lower row so as to form columns of the components. This arrangement is represented by the stacking arrangement of the white rectangular portions (PTr) shown in **FIG. 2**. A delta array is a configuration in which a row of individual components are placed next to the neighboring row so that the individual components in the upper low shit, relative to the lower row, in the row direction so as to place them out of the column positions of the lower row. This arrangement is represented by the stacking arrangement of the white rectangular portions (PTr) shown in **FIG. 3**.

[**0017**] Next, a "TFT formation region" is defined as one division of the substrate on which a corresponding driving TFT **61**B and a corresponding pixel selecting TFT **71**B are formed. This TFT formation region could include more than one driving TFT and more than one pixel selecting TFT as long as they are directed to one pixel element corresponding to the division of the substrate. In addition, the TFT formation region could include a storage capacitor Cs. In the drawings, the TFT formation regions are indicted by "PTr."

[**0018**] **FIG. 15** is a plan view showing an array example of a pixel electrode where the plurality of the pixel P is disposed in a stripe array. The TFT formation regions PTr are formed in a stripe array on the display portion **10**. In these TFT formation regions PTr, pixel electrodes R**2** of the organic EL elements emitting red light (R), pixel electrodes G**2** of the organic EL elements emitting green light (g), and pixel electrodes B**2** of the organic EL elements emitting blue light (B) are placed in a stripe array. Each of the pixel electrodes R**2**, G**2**, and B**2** is disposed within each of the TFT formation regions PTr. That is, these pixel electrodes R**2**, G**2** and B**2** are arrayed so that light from the emissive layer **13**B is not blocked by elements or wiring of the driving TFT **61**B and so on.

[**0019**] Relevant technologies are disclosed in Japanese Patent Application Publication No. 2002-175029, for example.

[**0020**] However, in the organic EL display device of bottom emission type where the described pixel electrodes R**2**, G**2** and B**2** determine the emissive regions, light from the emissive layer **13**B is released through the transparent glass substrate **40**B. Therefore, the pixel electrodes R**2**, G**2** and B**2** of the organic EL element **11**B are arrayed so that this light is not blocked by the elements or wiring of the driving TFT **61**B and so on. This causes limitation on the array patterns of the emissive regions.

[**0021**] Furthermore, in a case where the pixel electrodes R**2**, G**2** and B**2** are covered with an insulating film having openings and the openings determine the emissive regions, limitation occurs on the array patterns of the emissive regions with the same reason as above.

[**0022**] The invention is directed to an organic EL display device of top emission type where flexibility on array patterns of the emissive regions is improved and the emissive regions are arrayed in various patterns.

SUMMARY OF THE INVENTION

[**0023**] In an organic EL display device of top emission type of the invention, a plurality of TFT formation regions of display pixels is disposed in a stripe array on a display portion, and emissive regions of organic EL elements are disposed in a delta array over the adjacent TFT formation regions.

[**0024**] In an organic EL display device of top emission type of the invention, a plurality of TFT formation regions of pixels is formed in a delta array on a display portion, and emissive regions of organic EL elements are disposed in a stripe array over the adjacent TFT formation regions.

[**0025**] In an organic EL display device of top emission type of the invention, a plurality of TFT formation regions of pixels is formed in a stripe array on a display portion, and emissive regions of organic EL elements are disposed in a stripe array over the adjacent TFT formation regions, being shifted in a first direction in alternate rows.

[**0026**] In an organic EL display device of top emission type of the invention, a plurality of TFT formation regions of pixels is disposed in a delta array on a display portion, and emissive regions of organic EL elements are disposed in a delta array over the adjacent TFT formation regions, being shifted in a first direction in alternate rows.

[**0027**] In an organic EL display device of top emission type of the invention, emissive regions of organic EL elements are arrayed, being turned by 90 degrees based on a side of first or second direction.

[**0028**] This invention can realize an organic EL display device where the emissive regions are arrayed in various patterns without depending on array patterns of the driving TFTs, the pixel selecting TFTs, and the storage capacitors. This enables application of a glass substrate formed with TFTs in same array patterns to various organic EL display devices.

[**0029**] Furthermore, two emissive regions are formed in a region having the driving TFT, the pixel selecting TFT, and the storage capacitor in each of the pixels P to provide redundancy in the emissive region. Therefore, even when one of the emissive regions is unusable, light emission can be continued.

[**0030**] Furthermore, a plurality of regions having the driving TFTs, the pixel selecting TFTs, and the storage capacitors for the pixels is collectively provided in a specific region on the display portion, so that an area of the emissive regions can increase.

[**0031**] Furthermore, the emissive regions respectively corresponding to each of the colors can be formed having an area of different from each other. Therefore, influence (variance in luminance or life cycle) caused by differences in characteristics between emissive materials (organic materials etc forming the emissive layer **13**A) which differ among colors can be minimized by adjusting the areas of the emissive regions.

BRIEF DESCRIPTION OF THE DRAWINGS

[**0032**] **FIGS. 1A and 1B** are cross-sectional views of a pixel of an organic EL display device of top emission type of embodiments of the invention.

[**0033**] **FIG. 2** is a plan view showing a display portion of an organic EL display device of top emission type of a first embodiment of the invention.

[0034] **FIG. 3** is a plan view showing a display portion of an organic EL display device of top emission type of a second embodiment of the invention.

[0035] **FIG. 4** is a plan view showing a display portion of an organic EL display device of top emission type of a third embodiment of the invention.

[0036] **FIG. 5** is a plan view showing a display portion of an organic EL display device of top emission type of a fourth embodiment of the invention.

[0037] **FIG. 6** is a plan view showing a display portion of an organic EL display device of top emission type of a fifth embodiment of the invention.

[0038] **FIG. 7** is a plan view showing a display portion of an organic EL display device of top emission type of a sixth embodiment of the invention.

[0039] **FIG. 8** is a plan view showing a display portion of an organic EL display device of top emission type of a seventh embodiment of the invention.

[0040] **FIG. 9** is a plan view showing a display portion of an organic EL display device of top emission type of an eighth embodiment of the invention.

[0041] **FIG. 10** is a plan view showing a display portion of an organic EL display device of top emission type of a ninth embodiment of the invention.

[0042] **FIG. 11** is a plan view showing a display portion of an organic EL display device of top emission type of a tenth embodiment of the invention.

[0043] **FIG. 12** is a plan view showing a display portion of an organic EL display device of top emission type of an eleventh embodiment of the invention.

[0044] **FIG. 13** is an equivalent circuit diagram of a pixel of an organic EL display device of the invention.

[0045] **FIG. 14** is a schematic cross-sectional view of an organic EL display device of bottom emission type of a conventional art.

[0046] **FIG. 15** is a plan view showing a display portion (in a stripe array) of an organic EL display device of bottom emission type of the conventional art.

DETAILED DESCRIPTION OF THE INVENTION

[0047] A structure of an organic EL display device of top emission type of embodiments of the invention will be described with reference to drawings.

[0048] **FIGS. 1A and 1B** are cross-sectional views of a pixel P of the EL display device of top emission type of the embodiments of the invention. **FIG. 1** shows one of a plurality of the pixels P arrayed in a matrix of rows and columns on a display portion (not shown). Note that an equivalent circuit diagram of the pixel P and its operation are the same as those shown in the description of the related art (**FIG. 13**). Furthermore, **FIG. 1** shows only a periphery of the driving TFT **61**A in a region PTr where the driving TFT **61**A, the pixel selecting TFT **71**A, and the storage capacitor Cs, which form the pixel P.

[0049] In this embodiment, an organic EL element **11**A of the pixel P is an organic EL element of top emission type where light generated from the organic EL element **11**A, that is, a display light, is emitted outside through a transparent cathode **14**A of the organic EL element **11**A formed on the glass substrate **40**A and not through the glass substrate **40**A. A configuration of these elements will be described hereafter.

[0050] **FIG. 1A** is a cross-sectional view of the organic EL display device of top emission type of this embodiment in a case where a two-layered planarization insulating film is formed.

[0051] As shown in **FIG. 1A**, a buffer layer BF is formed on a glass substrate **40**A. On the buffer layer BF, an active layer **62**A formed by poly-crystallizing an a-Si film by laser irradiation, a gate insulating film **63**A, and a gate electrode **64**A formed of a metal having a high melting point such as Cr (chromium) or Mo (molybdenum) are formed in this order. The active layer **62**A is provided with a channel **62**Ac, a source **62**As and a drain **62**Ad, the source **62**As and the drain **62**Ad being disposed on both sides of the channel **62**Ac, respectively.

[0052] An interlayer insulating film **65**A formed by laminating an SiO_2 film, an SiN_x film and an SiO_2 film in this order are formed on the whole surfaces of the gate insulating film **63**A and the gate electrode **64**A. A contact hole C**1** is provided in the interlayer insulating film **65**A in a position corresponding to the source **62**As, and a power supply line L3 to be supplied with a positive power supply voltage PVdd is provided by filling the contact hole C**1** with a metal such as Al. Furthermore, a first planarization insulating film **66**A for planarizing a surface, which is made of, for example, an organic resin, is formed on the whole surface. A contact hole C**2** is provided in the first planarization insulating film **66**A in a position corresponding to the drain **62**Ad, and metal such as Al fills the contact hole C**2** so that the drain **62**Ad and the pixel electrode **12**A serving as an anode of the organic EL element **11**A are in contact with each other. The pixel electrode **12**A is an electrode made of Al and so on, which reflects light without transmission. The pixel electrode **12**A can be transparent or half-transparent.

[0053] On the first planarization insulating film **66**A or on part of the first planarization insulating film **66**A and the pixel electrode **12**A, a second planarization insulating film **67**A (e.g. made of an organic resin) having an opening K is formed. An emissive layer **13**A is formed on the pixel electrode **12**A in a position corresponding to the opening K, and a transparent cathode **14**A transmitting light emitted from the emissive layer **13**A is formed thereon. The transparent cathode **14**A is supplied with power supply voltage CV (not shown). Light emitted from the emissive layer **13**A is emitted through the transparent cathode **14**A and not through the pixel electrode **12**A. A half-transparent cathode can be used instead of the transparent cathode **14**A.

[0054] In this embodiment, when the described two-layered planarization insulating film is formed, the size of the emissive region (planar region releasing light emitted from the emissive layer **13**A outside) depends on the opening K of the second planarization insulating film **67**A.

[0055] Although the organic EL display device of top emission type described above has the two-layered planarization insulating film (the first and second planarization insulating films **66**A and **67**A), the organic EL display device of top emission type can be formed with a single layer of a planarization insulating film. Next, an embodiment in which a single layer of the planarization insulating film is formed will be described with reference to drawings.

[0056] **FIG. 1B** is a cross-sectional view of the organic EL display device of top emission type of this embodiment in which a single layer of the planarization insulating film is formed. Note that the same numerals are provided to the same components as those of **FIG. 1A**, and description thereof will be omitted in **FIG. 1B**.

[0057] As shown in **FIG. 1B**, the organic EL element **11**A is formed in each of the pixels P, being isolated as an island. The organic EL element **11**A is formed by laminating the pixel electrode **12**A, the emissive layer **13**A, and the transparent cathode **14**A transmitting light emitted from the emissive layer **13**A, in this order. The transparent cathode **14**A is supplied with power supply voltage CV (not shown). Light emitted from the emissive layer **13**A is released out through the transparent cathode **14**A without transmitting through the pixel electrode **12**A. A half-transparent cathode can be used instead of the transparent cathode **14**A.

[0058] In this embodiment, since the single layer of the planarization insulating film is formed, the size of the emissive region depends on the contact area between the pixel electrode **12**A and the emissive layer **13**A (the size of the overlapping area of the pixel electrode **12**A and the emissive layer **13**A).

[0059] In each of the embodiments shown in **FIGS. 1A and 1B**, it is preferable that the pixel electrode **12**A and corresponding TFT formation region PTr overlap each other at least in a region for contact. The contact holes respectively provided in each of the TFT formation regions PTr can be disposed in different regions in the TFT formation regions PTr.

[0060] When the organic EL display device of these embodiments is of full color display type, three pixels each emitting red light (R), green light (G) and blue light (B) form one color pixel (not shown) to provide full color display based on the principle of three primary colors of light. Although there are several methods of emitting the three colors, a three-color-light emitting method is used in this embodiment. That is, each of the emissive layers **13**A in the pixels, which corresponds to each of the three colors, is made of an organic material corresponding to each of the colors.

[0061] Since the pixel P has the structure described above, the emissive regions, the size of which depends on the opening K of the second planarization insulating film **67**A or the overlapping region of the pixel electrode **12**A and the emissive layer **13**A, can be arrayed without being limited by elements or wiring of the driving TFT **61**A and so on formed on the glass substrate **40**A. This increases flexibility in array patterns of the emissive regions or the TFT formation regions PTr, and the emissive region can be formed in various array patterns when seen from above a front surface of the display portion.

[0062] Next, embodiments where the emissive regions are arrayed in various patterns on the TFT formation regions PTr will be described with reference to drawings. Note that description will be made hereafter on the organic EL display device of top emission type performing full color display. That is, three emissive regions of the pixels each emitting red light (R), green light (G) and blue light (B) operates as one unit, and a plurality of the units is arrayed in positions adjacent to each other.

[0063] **FIG. 2** is a plan view showing a display portion **10** of the organic EL display device of top emission type of a first embodiment of the invention. A plurality of TFT formation regions PTr of the pixels P, that is, a plurality of regions where the driving TFT **61**A, the pixel selecting TFT **71**A, and the storage capacitor Cs are formed, is formed in a rectangular shape and disposed in a stripe array on the display portion **10**. Emissive regions **R1**, **G1** and **B1** of the organic EL element **11**A respectively forming each of the pixels P are formed in a rectangular shape with same size, and placed in a delta array over the adjacent TFT formation regions PTr.

[0064] **FIG. 3** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a second embodiment. A plurality of TFT formation regions PTr is formed in a rectangular shape and disposed in a delta array on the display portion **10**. Emissive regions **R1**, **G1**, and **B1** are respectively formed in a rectangular shape with the same size and disposed in a stripe array, lying over the adjacent TFT formation regions PTr in the alternate rows where the TFT formation regions PTr are shifted.

[0065] **FIG. 4** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a third embodiment. A plurality of TFT formation regions PTr is formed in a rectangular shape and disposed in a stripe array on the display portion **10**. Emissive regions **R1**, **G1** and **B1** respectively form a rectangular shape having size different from each other, and are placed in a stripe array over the adjacent TFT formation regions PTr (for example, extending in a first (row) direction over the pixels P arrayed in a matrix).

[0066] **FIG. 5** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a fourth embodiment. A plurality of TFT formation regions PTr forms a rectangular shape and placed in a delta array on the display portion **10**, being shifted in a row direction in alternate rows. Emissive regions **R1**, **G1** and **B1** respectively form a rectangular shape having different sizes, and are placed in a delta array over the adjacent TFT formation regions PTr (for example, extending in a first (row) direction over the pixels P arrayed in a matrix).

[0067] **FIG. 6** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a fifth embodiment. A plurality of TFT formation regions PTr is formed in a rectangular shape and placed in a stripe array on the display portion **10**. In each of the TFT formation regions PTr, a plurality (e.g. two) of emissive regions i.e. emissive regions **R1***a* and **R1***b*, **G1***a* and **G1***b*, and **B1***a* and **B1***b* is respectively formed and disposed in a stripe array, providing redundancy in the emissive regions. For example, the two emissive regions **R1***a* and **R1***b* are formed being isolated as an island, and commonly connected with the driving TFT **61**A (not shown). This can secure emission of corresponding color light even when any one of the emissive regions becomes unusable.

[0068] **FIG. 7** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a sixth embodiment. A plurality of TFT formation regions PTr forms a rectangular shape and placed in a stripe array on the display portion **10**. Some of emissive regions R**1**, G**1**, and B**1** respectively form a shape different from others and are disposed in a stripe array over the adjacent TFT formation regions PTr.

[0069] **FIG. 8** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a seventh embodiment. A plurality of TFT formation regions PTr forms a rectangular shape and placed in a delta array on the display portion **10**. Emissive regions R**1**, G**1**, and B**1** form a shape (e.g. circle) other than a rectangular shape and are placed in a delta array over the adjacent TFT formation regions PTr.

[0070] **FIG. 9** is a plan view showing a display portion **10** of an organic EL display device of top emission type of an eighth embodiment. A plurality of TFT formation regions PTr forms a rectangular shape and disposed in a delta array on the display portion **10**. Emissive regions R**1**, G**1**, and B**1** respectively form various shapes other than rectangular shapes and are disposed in a delta array over the adjacent TFT formation regions PTr.

[0071] **FIG. 10** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a ninth embodiment. A plurality of TFT formation regions PTr forms a rectangular shape and placed in a stripe array on the display portion **10**. Emissive regions R**1**, G**1** and B**1** respectively form a rectangular shape and are disposed in a stripe array over the adjacent TFT formation regions PTr, being turned by 90 degrees based on sides of first (row) or second (column) direction of the pixels P arrayed in a matrix.

[0072] **FIG. 11** is a plan view showing a display portion **10** of an organic EL display device of top emission type of a tenth embodiment. A plurality of TFT formation regions PTr forms a rectangular shape and is disposed in a delta array on the display portion **10**. Emissive regions R**1**, G**1** and B**1** respectively form a rectangular shape and are disposed in a delta array over the adjacent TFT formation regions PTr, being turned by 90 degrees based on sides of first (row) or second (column) direction of the pixels P arrayed in a matrix.

[0073] With the array patterns shown in **FIGS. 10 and 11**, only the array directions of the emissive regions R**1**, G**1**, and B**1** may be changed, for example, for a display panel which is vertically long and a display panel which is horizontally long, by changing the array patterns of the driving TFT **61**A and the pixel selecting TFT **71**A. This provides an advantage of minimizing design alternation.

[0074] **FIG. 12** is a plan view showing a display portion **10** of an organic EL display device of top emission type of an eleventh embodiment. Emissive regions R**1**, G**1** and B**1** are disposed in a stripe array on the display portion **10**. The driving TFTs and the pixel selecting TFTs in TFT formation regions PTr respectively corresponding to each of a plurality of the emissive regions R**1**, G**1**, and B**1** are collectively placed in specific regions S to make room for the organic EL **11**A formation regions in the TFT formation regions PTr on the display portion **10**. This can increase an area of the emissive regions.

[0075] As described above, the emissive regions R**1**, G**1** and B**1** of the organic EL element **11**A can be freely arrayed without limitation of the TFT formation regions PTr on the display pixel P, so that various array patterns of the emissive regions can be realized. Various array patterns of the emissive regions are possible on the glass substrates **40**A arrayed with respect to the TFT formation regions PTr.

[0076] Furthermore, the two emissive regions R**1**_a_ and R**1**_b_, G**1**_a_ and G**1**_b_, and B**1**_a_ and B**1**_b_ may be separately formed in each of the TFT formation regions PTr, thereby providing redundancy in the emissive regions. Therefore, even if one of the two emissive regions becomes unusable, light emission of corresponding color light can be secured.

[0077] Furthermore, the driving TFTs and the pixel selecting TFTs in the TFT formation regions PTr are collectively provided in the specific regions S on the display portion **10** so that the area of the emissive regions can increase.

[0078] Furthermore, in the third to fourth embodiments and the sixth to eighth embodiments, the emissive regions. R**1**, G**1**, and B**1** respectively corresponding to each of the colors are formed having different areas. This enables minimization of influence (variance in luminance or life cycle) caused by differences in characteristics (light emission efficiency, life cycle, etc) between emissive materials (organic material forming the emissive layers **13**A, etc) of different colors by adjusting the areas of the emissive regions R**1**, G**1** and B**1**.

What is claimed is:

1. An organic electroluminescent display device of top emission type, comprising:

a substrate;

a plurality of organic electroluminescent elements disposed on the substrate;

a plurality of driving transistors driving the organic electroluminescent elements and disposed on the substrate;

a plurality of pixel selecting transistors selecting the organic electroluminescent elements and disposed on the substrate;

a plurality of divisions of the substrate each having a driving transistor and a pixel selecting transistor formed thereon, the divisions being arranged in a stripe array; and

a plurality of emissive regions of the organic electroluminescent elements arranged in a delta array.

2. The organic electroluminescent display device of top emission type of claim 1, wherein the emissive regions have a same size.

3. The organic electroluminescent display device of top emission type of claim 1, wherein the emissive regions corresponding to one color have a size different from the emissive regions corresponding to other colors.

4. The organic electroluminescent display device of top emission type of claim 1, wherein a longitudinal direction of the emissive regions is approximately normal to a longitudinal direction of the divisions.

5. The organic electroluminescent display device of top emission type of claim 1, wherein at least two emissive regions are formed in some of the divisions

6. The organic electroluminescent display device of top emission type of claim 1, wherein the emissive region occupies part of a corresponding division that is not occupied by corresponding driving and pixel selecting transistors at least in some of the divisions.

7. An organic electroluminescent display device of top emission type, comprising:

a substrate;

a plurality of organic electroluminescent elements disposed on the substrate;

a plurality of driving transistors driving the organic electroluminescent elements and disposed on the substrate;

a plurality of pixel selecting transistors selecting the organic electroluminescent elements and disposed on the substrate;

a plurality of divisions of the substrate each having a driving transistor and a pixel selecting transistor formed thereon, the divisions being arranged in a delta array; and

a plurality of emissive regions of the organic electroluminescent elements arranged in a stripe array.

8. The organic electroluminescent display device of top emission type of claim 7, wherein the emissive regions have a same size.

9. The organic electroluminescent display device of top emission type of claim 7, wherein the emissive regions corresponding to one color have a size different from the emissive regions corresponding to other colors.

10. The organic electroluminescent display device of top emission type of claim 7, wherein a longitudinal direction of the emissive regions is approximately normal to a longitudinal direction of the divisions.

11. The organic electroluminescent display device of top emission type of claim 7, wherein at least two emissive regions are formed in some of the divisions

12. The organic electroluminescent display device of top emission type of claim 7, wherein the emissive region occupies part of a corresponding division that is not occupied by corresponding driving and pixel selecting transistors at least in some of the divisions.

13. An organic electroluminescent display device of top emission type, comprising:

a substrate;

a plurality of organic electroluminescent elements disposed on the substrate;

a plurality of driving transistors driving the organic electroluminescent elements and disposed on the substrate;

a plurality of pixel selecting transistors selecting the organic electroluminescent elements and disposed on the substrate;

a plurality of divisions of the substrate each having a driving transistor and a pixel selecting transistor formed thereon, the divisions being arranged in a stripe array; and

a plurality of emissive regions of the organic electroluminescent elements arranged in a stripe array, wherein

one of the emissive regions extends through three consecutive divisions in a row.

14. The organic electroluminescent display device of top emission type of claim 13, wherein the emissive regions have a same size.

15. The organic electroluminescent display device of top emission type of claim 13, wherein the emissive regions corresponding to one color have a size different from the emissive regions corresponding to other colors.

16. The organic electroluminescent display device of top emission type of claim 13, wherein a longitudinal direction of the emissive regions is approximately normal to a longitudinal direction of the divisions.

17. The organic electroluminescent display device of top emission type of claim 13, wherein at least two emissive regions are formed in some of the divisions

18. The organic electroluminescent display device of top emission type of claim 13, wherein the emissive region occupies part of a corresponding division that is not occupied by corresponding driving and pixel selecting transistors at least in some of the divisions.

19. An organic electroluminescent display device of top emission type, comprising:

a substrate;

a plurality of organic electroluminescent elements disposed on the substrate;

a plurality of driving transistors driving the organic electroluminescent elements and disposed on the substrate;

a plurality of pixel selecting transistors selecting the organic electroluminescent elements and disposed on the substrate;

a plurality of divisions of the substrate each having a driving transistor and a pixel selecting transistor formed thereon, the divisions being arranged in a delta array; and

a plurality of emissive regions of the organic electroluminescent elements arranged in a delta array.

20. The organic electroluminescent display device of top emission type of claim 19, wherein the emissive regions have a same size.

21. The organic electroluminescent display device of top emission type of claim 19, wherein the emissive regions corresponding to one color have a size different from the emissive regions corresponding to other colors.

22. The organic electroluminescent display device of top emission type of claim 19, wherein a longitudinal direction of the emissive regions is approximately normal to a longitudinal direction of the divisions.

23. The organic electroluminescent display device of top emission type of claim 19, wherein at least two emissive regions are formed in some of the divisions

24. The organic electroluminescent display device of top emission type of claim 19, wherein the emissive region occupies part of a corresponding division that is not occupied by corresponding driving and pixel selecting transistors at least in some of the divisions.

* * * * *

专利名称(译)	顶部发光型有机电致发光显示装置		
公开(公告)号	US20050087740A1	公开(公告)日	2005-04-28
申请号	US10/941075	申请日	2004-09-15
[标]申请(专利权)人(译)	三洋电机株式会社		
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IPC分类号	H05B33/12 G09F9/30 G09G3/30 H01L27/32 H01L29/04 H01L51/50 H05B33/00 H05B33/14		
CPC分类号	H01L27/3211 H01L2251/5315 H01L27/3244 G09G3/3208 G09G2300/0452 H01L27/3216 H01L27/3218		
优先权	2003330929 2003-09-24 JP		
外部链接	Espacenet USPTO		

摘要(译)

在有机EL显示装置中，发光区域以各种图案排列，而不依赖于TFT形成区域的阵列图案等。像素P的多个TFT形成区域PTr在显示部分上以条带阵列形成。发射红光的有机EL元件11A的发光区域R1，发射绿光的有机EL元件11A的发光区域G1和发射蓝光的有机EL元件11A的发光区域B1排列在这些TFT形成区域PTr上。发光区域R1，G1和B1在相邻的TFT形成区域PTr上方以三角形阵列设置。