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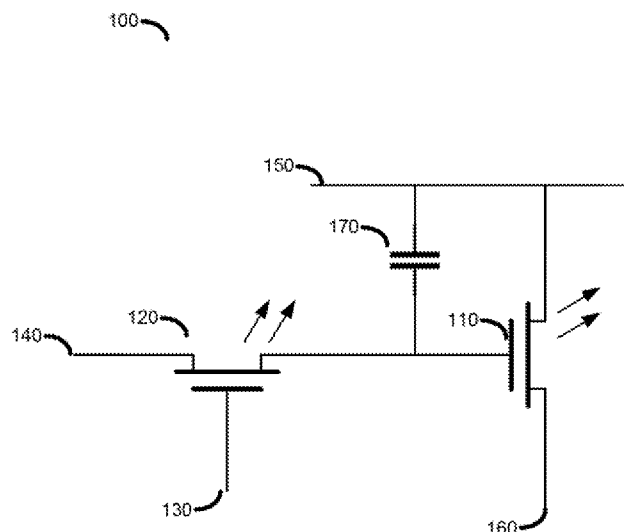


Fig. 1

(57) Abstract: An example light emitting circuit includes an emission organic light emitting transistor (OLET). The emission OLET has a gate electrode. The light emitting circuit also includes a switching OLET operatively coupled to the gate electrode of the emission OLET. The switching OLET is to control the operation state of the emission OLET.



ORGANIC LIGHT EMITTING TRANSISTOR PIXELS

BACKGROUND

5 [0001] An organic light-emitting transistor (OLET) is a form of transistor that emits light. OLETs provide light sources that can be integrated in substrates like silicon, glass, and paper in manufacturing. These OLETs may be employed in digital displays.

BRIEF DESCRIPTION OF THE DRAWINGS

10 [0002] Examples will now be described, by way of non-limiting example, with reference to the accompanying drawings, in which:

[0003] Figure 1 is an example circuit diagram including an OLET according to an example;

[0004] Figure 2 is a timing diagram showing driving of an OLET according to an example;

15 [0005] Figure 3 is an example circuit diagram including an OLET according to an example;

[0006] Figure 4 is a timing diagram showing driving of an OLET according to an example; and

20 [0007] Figure 5 is a block diagram showing an example display including OLETs according to an example.

DETAILED DESCRIPTION

25 [0008] Organic light emitting transistors (OLETs) provide selective light emission in response to an applied voltage. Rather than a current driven device, OLETs provide the functionality of a transistor as well as the light emission characteristics of an organic light emitting device (OLED). Described herein are configurations for driving an emission OLET using a switching OLET.

30 [0009] OLETs include an organic semiconductor layer which acts as an active layer when the OLET is activated. OLETs also include source, drain, and gate electrodes. When a voltage higher than a threshold voltage is applied to the gate terminal, the OLET is activated. When the OLET is activated and a suitable source voltage is applied to the source electrode, it injects holes into the active layer. When the OLET is activated and suitable drain voltage is applied to the drain electrode, it injects electrons into the active layer. These electrons and

holes recombine and release energy in the form of photons. The amount of light emitted by the OLET may be determined based on the amount of voltage applied to the gate electrode as well as the potential difference between the source and drain electrodes in view of the architecture and materials that make up the OLET.

[0010] Conventional OLET or OLED driving schemes may use a switching thin film transistor to drive an emission device. In an OLET, the emission device and thin film transistor may be connected to a scan line, a data line, a high voltage source, and a low voltage source. The thin film transistor may provide a data signal to the emission device. Depending on the data voltage, the emission device emits corresponding level of light. However, this driving scheme uses multiple types of devices (the emission device and the thin film transistor). Accordingly, producing the circuit uses additional the fabrication processes and costs associated with each of the devices.

[0011] Driving an emission OLET using a switching OLET rather than a thin film transistor reduces circuit complexity and the number of components that are used. Furthermore, the driving scheme provides simplified fabrication processes because there are fewer processing steps and fabrication costs to build multiple of the same OLET instead of using a different component, such as a thin film transistor, to drive the emission OLET. For example, the switching OLET and the emission OLET may be fabricated with the same materials in the same steps rather than separate fabrication processes for the emission OLET and a switching thin film transistor.

[0012] In some examples, a light emitting circuit using an emission OLET includes a first OLET as a switching device and a second OLET as an emitting device. The switching OLET controls the operation state of the emission OLET based on a data signal. The switching OLET and emission OLET are connecting to a scan line, a data line, a high voltage source, and a low voltage source. The operation of the light emitting circuit can be divided into two periods. In the first period of time, called herein the charging period, a scan signal is provided on the scan line to activate the switching OLET. When activated, the switching OLET provides a data signal from the data line to the gate electrode of the emission OLET to control the operation state of the emission OLET. Because the scan line is active, the switching OLET may emit

light during the charging period based on a difference between the voltage of the data signal and a voltage at the gate electrode of the emission OLET. During a second period, called herein the emission period, the emission OLET may be activated by the data signal provided by the switching OLET. When in an active operation state the emission OLET emits light at an intensity based on the voltage of the data signal and the potential difference between the high voltage source and the low voltage source.

[0013] In some examples, a light emitting circuit using an emission OLET includes a first OLET as a switching device, a second OLET as an emitting device, and a third OLET as a reset device. The switching OLET controls the operation state of the emission OLET based on a data signal and the reset OLET resets the gate electrode of the emission OLET between emission periods. The OLETs are connecting to a scan line, a data line, a reset line, a high voltage source, and a low voltage source as shown and described below.

The operation of the light emitting circuit can be divided into three periods. In the first period of time, called herein the charging period, a scan signal is provided to scan line to activate the switching OLET. When the switching OLET is activated it provides a data signal from the data line to the gate electrode of the emission OLET. Because the scan line is active, the switching OLET may emit light during the charging period based on a difference between the voltage of the data signal and a voltage at the gate electrode of the emission OLET. During a second period, called herein the emission period, the emission OLET is activated by the data signal provided by the switching OLET and the scan signal is no longer applied to the scan line. When in an active operation state the emission OLET emits light at an intensity based on the voltage of the data signal and the potential difference between the high voltage source and the low voltage source. In the third period of time, called herein the reset period, a reset signal is provided on the reset line activating the reset OLET while the scan line is not active. The reset OLET provides the low voltage data source to the gate electrode of the emission OLET, in effect resetting the emission OLET. During the reset period, the reset OLET may emit light because it is active based on a potential difference between the low voltage data source and the voltage of the data signal in the preceding emission period.

[0014] The light emitting circuits as described herein may be used to implement pixels or subpixels in a display screen. For example, there may be an array of light emitting circuits connected to associated data lines to control each of the light emitting circuits. A display driver may take input data and provide the signals on data lines to corresponding circuits. A pixel may provide a point of light in a display while subpixels may provide light for one color of a pixel in a display. For example, a pixel may include 3 subpixels, one for red, one for green, and one for blue

[0015] The circuits described herein are generally illustrated using p-type OLETs. In various example implementations, n-type OLETs or a combination of n-type and p-type OLETs may be used to implement various components. Furthermore, the circuits shown may be simplified and various examples may include fewer or additional components than shown. For example, in some implementations, various resistive elements may be present to control voltage levels at various sources and electrodes.

[0016] Figure 1 illustrates an example circuit diagram of a light emission circuit 100 including an emission OLET 110 as an emission device. The emission OLET 110 is electrically coupled between a low voltage source 150 and a high voltage source 160. The emission OLET 110 emits light as a function of a signal received at a gate electrode of the emission OLET 110 as current is enabled to flow from the high voltage source 160 to the low voltage source 150.

[0017] The signal to the emission OLET 110 is controlled by a switching OLET 120. The gate electrode of switching OLET 120 receives a scan signal on scan line 130. The scan signal triggers the switching OLET 120 to pass a data signal from data line 140 to the gate electrode of emission OLET 110. During this charging period, the switching OLET 120 may emit some light because it is activated by the scan line 130. In response to receiving the data signal at its gate electrode, the emission OLET 110 emits a corresponding amount of light. For example, the data signal causes the emission OLET 110 to enable a certain amount of current to pass from the high voltage source 160 to the low voltage source 150, which generates light in an organic layer of the transistor.

[0018] Figure 2 illustrates an example timing diagram 200 showing various signals within the example electrical circuit 100 as described with reference to Figure 1. The timing diagram 200 has a charging period 210 during which time

the emission OLET 110 is charged and an emission period 220 during which time the emission OLET 110 emits light according to a data signal on the gate electrode of the emission OLET 110.

[0019] The scan voltage represents the voltage on the scan line 130 electrically coupled to the gate electrode of switching OLET 120. The scan signal may be provided to the switching OLET 120 at regular intervals based on a clock signal. As shown, the scan signal is a lower voltage to activate the switching OLET 120. Although shown as a signal with a higher voltage for off and lower voltage for on, the scan signal may be opposite depending on the type of switching OLET 120 that is implemented.

[0020] The data voltage represents the voltage of a data signal on the data line 140 that is provided to the switching OLET 120. The data voltage may be provided at a frequency that is synchronized with the scan voltage. When the scan voltage activates the switching OLET 120, the switching OLET 120 provides the voltage of the data signal to the gate electrode of the emission OLET 110. The gate voltage shows the change in the gate voltage of the emission OLET 110 during the charging period 210. After the charging period 210, the gate voltage is charged to the voltage of the data signal.

[0021] The switching OLET output and emission OLET output show the amount of light emitted by the respective OLETs. The switching OLET 120 is activated during the charging period 210. Based on the starting voltage at the gate electrode of the emission OLET 110, there may be a potential difference across the switching OLET 120. Accordingly, the switching OLET 120 may emit some light as the gate electrode of the emission OLET 110 is charging. The amount of light emitted is a function of the difference from an initial voltage of the emission OLET 110 gate electrode and the voltage of the data signal.

[0022] As shown, the emission OLET 110 is charged during the charging period 210. As the gate electrode is charged to the voltage of the data signal, light begins to be emitted by the emission OLET 110 as shown by the emission OLET output in timing diagram 200. After the charging period 210, the switching OLET 120 is deactivated, and the charge at the gate electrode is held by a capacitor 170. Note that depending on a previous state of the emission OLET 110, the emission OLET 110 may be increasing or decreasing voltage during the charging period 210. The charging period 210 is designed to be long

enough to enable charging the gate electrode of the emission OLET 110 from a previous state to a steady state set by the data signal. This begins the emission period 220 where the operation state of the emission OLET 110 is set by the data signal. In the emission period 220, the emission OLET 110 is activated and emits light based on the voltage of the data signal. The emission OLET 110 continues to emit light during the emission period 220 until a new emission cycle begins with another scan voltage applied to the switching OLET gate electrode.

[0023] As can be seen from the amount of light emitted by the switching OLET 120 and the emission OLET 110, as the gate electrode of the emission OLET 110 is charged, both OLETs emit light. Accordingly, the switching OLET 120 may provide some light outside of an emission period 220 as shown by switching OLET output in timing diagram 200. The emission OLET 110 may also emit light some light during this charging period 210 as the gate electrode is charged to the voltage of the data signal. This provides additional light and may improve the consistency of light provided between the emission period and the charging period.

[0024] Figure 3 illustrates an example circuit diagram of a light emission circuit 300 including an emission OLET 310 as an emission device. The light emission circuit 300 is similar to the light emission circuit 100 discussed with reference to Figure 1 with the addition of a reset OLET 380 to reset the state of the emission OLET 310 prior to each charging period. In some examples, the emission OLET 310, the switching OLET 320, and the reset OLET 380 are fabricated in the same manner as one another. This may provide simpler manufacturing with fewer steps and fewer consumed materials.

[0025] The emission OLET 310 is electrically coupled between a low voltage source 350 and a high voltage source 360. The emission OLET 310 emits light in an operation state according to a signal received at a gate electrode of the emission OLET 310 as current is enabled to flow from the high voltage source 360 to the low voltage source 350. The emission OLET 310 is also electrically coupled to the reset OLET 380 to reset the voltage at the gate electrode of the emission OLET 310.

[0026] The operation state of the emission OLET 310 is controlled by a switching OLET 320. The gate electrode of switching OLET 320 receives a

scan signal on scan line 330. The scan signal triggers the switching OLET 320 to pass a data signal from data line 340 to the gate electrode of emission OLET 310. During this charging period, the switching OLET 320 may emit some light because it is activated by the scan line 330 and there may be a potential difference between the gate electrode of the emission OLET and the data signal on the data line 340. In response to receiving the data signal at its gate electrode, the emission OLET 310 emits a corresponding amount of light. For example, the data signal causes the emission OLET 310 to enter an operation state to enable a certain amount of current to pass from the high voltage source 360 to the low voltage source 350, which generates light in an organic layer of the transistor.

[0027] Reset OLET 380 is controlled by signals on reset line 390. When a reset signal is applied to the reset line 390, the reset OLET 380 electrically couples the gate electrode of the emission OLET 310 with the low voltage source 350.

The reset OLET 380 may be activated before the scan signal is applied to the scan line to activate the switching electrode 320 to read the data line 340. Therefore, the gate electrode of the emission OLET 310 is set to a known value (for example, the low voltage level) prior to reading the data line 340. This may improve consistency of response from the emission OLET 310 regardless of a prior state of the emission OLET 310 in a previous emission cycle.

[0028] Figure 4 illustrates an example timing diagram 400 showing various signals within the example electrical circuit 300 as described with reference to Figure 3. The timing diagram 400 has a charging period 410 during which time the gate electrode of the emission OLET 310 is charged, an emission period 420 during which time the emission OLET 310 emits light according to a data signal on its gate electrode, and a reset period 430 during which time the gate electrode of the emission OLET 310 is reset.

[0029] The scan voltage represents the voltage on the scan line 330 electrically coupled to the gate electrode of switching OLET 320. The scan voltage may be provided to the switching OLET 320 at regular intervals based on a clock signal. Although shown as a signal with a higher voltage for off and lower voltage for on, the signal may be opposite depending on the type of switching OLET 320 that is implemented. For example, the signals may be different depending on whether the OLETs are n-type or p-type transistors.

[0030] The data voltage represents the voltage of a data signal on the data line 340 that is provided to the switching OLET 320. The data signal may be provided at a frequency that is synchronized with the scan signal. When the scan signal activates the switching OLET 320, the switching OLET 320 provides
5 the data voltage to the gate electrode of the emission OLET 310.

[0031] The gate voltage represents the voltage at the gate electrode of the emission OLET 310. As shown the gate voltage of the emission OLET 310 charges to the voltage of the data signal based on the data voltage during charging period 410.

10 [0032] The reset voltage represents the voltage of a reset signal on the reset line 390 that is provided to the gate electrode of the reset OLET 380. In a reset period 430, the reset signal is provided to the gate electrode of the reset OLET 380. When the reset signal activates the reset OLET 380, the reset OLET 380 electrically couples the low voltage source 350 to the gate electrode of the
15 emission OLET 310. Thus, before a charging period 410, the gate voltage of the emission OLET 310 is set to a known level. Having the emission OLET 310 reset between emission periods 420 may provide more consistent and predictable response during the charging periods 410 and emission periods 420.

20 [0033] The switching OLET output, the emission OLET output, and the reset OLET output show the amount of light emitted by the respective OLETs. The reset OLET 380 is activated during the reset period 430. As shown by the reset OLET output in timing diagram 400, the reset OLET emits some light as the low voltage source 350 resets the gate electrode of the emission OLET 310. The
25 emitted light is based on the potential difference between the gate voltage of the emission OLET from the previous emission period 420 and the low voltage source 350. As shown, the reset OLET 380 begins emitting less light as the gate electrode of the emission OLET 310 is reset.

[0034] The switching OLET 320 is activated during the charging period 410.
30 Based on the reset voltage at the gate electrode of the emission OLET 310, there may be a potential difference across the switching OLET 320. Accordingly, the switching OLET 320 may emit some amount of light as the gate electrode of the emission OLET 310 is charged to the data voltage.

[0035] As shown, the emission OLET 310 is charged during the charging period 410. As the gate electrode is charged, light begins to be emitted by the emission OLET 310. After the charging period 410, the switching OLET 320 is deactivated, and the charge at the gate electrode is held by a capacitor 370.

5 This begins the emission period 420. In the emission period 420, the emission OLET 310 is activated and emits light based on the data voltage. The emission OLET 310 continues to emit light during the emission period 420 until a new cycle begins with another reset voltage applied to the gate electrode of the reset OLET 380.

10 [0036] As can be seen in Figure 4, light may be emitted by each of the switching OLET 320, the emission OLET 310, and the reset OLET 380, during different periods of an emission cycle. For example, in the reset period 430, the reset OLET 380 emits light as it resets the emission OLET 310. Depending on the state of the emission OLET 310 during the previous emission cycle, the
15 emission OLET 310 may also emit light during the reset period 430. For example, the emission OLET 310 starts the reset period emitting at the level of the emission period 420 and decreases the amount of light emitted as the gate electrode is reset.

[0037] During the charging period 410, the gate electrode of the emission OLET
20 310 is charged to the data voltage level causing an increase to the amount of light emitted until reaching the data voltage. Additionally, the switching OLET 320 begins the charging period 410 emitting light at a level based on the potential difference between the data voltage and the reset voltage. As the gate electrode of the emission OLET 310 is charged to the data voltage, that
25 potential difference approaches zero and the light emitted by the switching OLET 320 decreases accordingly.

[0038] Finally, during the emission period 420, the emission OLET 310 emits light while the switching OLET 320 and the reset OLET 380 do not. Accordingly, because each of the OLETs emit light during different periods, the total amount
30 of light emitted from the light emitting circuits provides consistent levels of emission compared to circuits that use thin film transistors or other driving mechanisms for driving an emission element.

[0039] Figure 5 is a block diagram showing an example display 500 including OLETs. The example display 500 may be used in smartphones, laptops,

monitors, televisions, tablets, kiosks, or other applications that provide display of electronic images. The example display 500 includes an array 510 of OLET circuits 550. The OLET circuits 550 may be organized in an array of pixels or sub-pixels. For example, each OLET circuits 550 may be used to provide light to each pixel in the display 500. The OLET circuits 550 may also be provided for each sub-pixel in an array of pixels. For example, each pixel may include three sub-pixels, each with a light emitting circuit to provide light in red, green, or blue. In various examples, there may be fewer or additional sub-pixels and the colors of the sub-pixels may be different. For example, a pixel may include a yellow, white, or cyan, sub-pixel in addition to red, green, and blue sub-pixels.

[0040] The array 510 of OLET circuits 550 may be addressed and controlled by a display driver 520 to generate images according to an input. For example, the display driver 520 may address the OLET circuit 550 with drive signal to generate a video stream on the display 500. For example, a 60Hz or 120Hz display may have the display driver 520 provide drive signals to each sub-pixel in an array 510 of OLET circuits 550 60 or 120 times per second. Other refresh rates may also be provided within the display 500. The drive signals provided by the display driver 520 may include the data signals, the scan signals, and/or reset signals discussed with reference to Figures 1-4 above according to a clock rate of 30Hz, 60Hz, 120Hz, 144Hz, or another refresh rate. In some examples, the scan and/or reset signals may be provided to the OLET circuits 550 by a different component than the display driver 520. For example, a separate clock circuit may provide a synchronized clock to the display driver 520 and the OLET circuits 550.

[0041] In some examples, the display driver 520 may be electrically coupled to the OLET circuits 550 through data lines 530. The data lines 530 may be organized into columns and rows to address OLET circuits 550 with drive signals. In some examples, the data lines 530 may provide data for multiple OLET circuits 550 with the data being provided to individual OLET circuits 550 by various intermediary circuits. For example, the display driver 520 may provide drive signals as serial data that is distributed to particular OLET circuits 550 by a corresponding distribution circuit. In examples with additional components, those may be considered part of the display driver 520.

[0042] In some examples, components of the display driver 520 may be implemented in a combination of hardware, software, or firmware. Any such software or firmware may be stored in the form of volatile or non-volatile storage such as, for example, a storage device like a ROM, whether erasable or rewritable or not, or in the form of memory such as, for example, RAM, memory chips, device or integrated circuits or on an optically or magnetically readable medium such as, for example, a CD, DVD, magnetic disk or magnetic tape. In various examples, other transitory or non-transitory computer-readable medium may store such instructions that are distinct from carrier signals. For example, the display driver 520 may include digital signal processors, image processing systems, or other hardware or software components.

[0043] The features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or the operations or processes of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or processes are mutually exclusive.

[0044] Each feature disclosed in this specification (including any accompanying claims, abstract, and drawings), may be replaced by features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is an example of a generic series of equivalent or similar features.

CLAIMS

1. A light emitting circuit comprising:
an emission organic light emitting transistor (OLET) comprising a gate
5 electrode; and
a switching OLET operatively coupled to the gate electrode of the
emission OLET to control an operation state of the emission OLET.
2. The light emitting circuit of claim 1, further comprising:
10 a data line operatively coupled to a source electrode of the switching
OLET; and
a scan line operatively coupled to a gate electrode of the switching
OLET,
wherein the switching OLET is to provide a data signal to the gate
15 electrode in response to a signal on the scan line.
3. The light emitting circuit of claim 1, further comprising a reset OLET
operatively coupled to the gate electrode of the emission OLET.
- 20 4. The light emitting circuit of claim 3, further comprising:
a data line operatively coupled to a source electrode of the switching
OLET;
a scan line operatively coupled to a gate electrode of the switching
OLET; and
25 a reset line operatively coupled to a gate electrode of the reset OLET,
wherein the switching OLET is to provide a data signal to the gate
electrode in response to a scan signal on the scan line and the reset OLET is
to operatively couple a reset voltage to the gate electrode of the emission
OLET in response to a reset signal.
- 30 5. The light emitting circuit of claim 3, further comprising a display driver to:
provide a reset signal to the reset OLET at a first time period; and
provide a scan signal and a data signal to the switching OLET at a
second time period,

wherein the emission OLET is to selectively emit light based on the data signal at a third time period.

6. The light emitting circuit of claim 5, wherein the switching OLET and the emission OLET are to emit light at the second time period in response to the data signal on a data line.

7. A device comprising:
an emission organic light emitting transistor (OLET) to selectively emit light; and
a switching OLET to control an operation state of the emission OLET.

8. The device of claim 7, wherein the switching OLET is operatively coupled to a data line and a scan line, wherein the scan line is to provide scan signal to cause the switching OLET to read the data line during a first time period.

9. The device of claim 8, wherein the emission OLET is to read the data line during the first time period and selectively emit light in a second time period in response to reading the data line.

10. The device of claim 7, further comprising a reset OLET to reset the operation state of the emission OLET.

11. The device of claim 10, wherein the switching OLET is operatively coupled to a data line and a scan line, wherein the scan line is to provide scan signal to cause the switching OLET to read the data line during a first time period.

12. The device of claim 10, wherein the switching OLET is to operatively couple a reset voltage to a gate electrode of the emission OLET in response to a reset signal.

13. A display comprising:
an array of light emitting circuits, wherein the light emitting circuits comprise:

an emission organic light emitting transistor (OLET) comprising
a gate electrode; and

a switching OLET operatively coupled to the gate electrode of
the emission OLET to control an operation state of the emission OLET;

5 and

a display driver to provide drive signals to the array of light emitting
circuits.

14. The display of claim 13, wherein the light emitting circuits further comprise
10 a reset OLET operatively coupled to the gate electrode of the emission OLET.

15. The display of claim 13, wherein the display driver comprises:

data lines operatively coupled to source electrodes of the switching
OLETs; and

15 scan lines operatively coupled to gate electrodes of the switching
OLETs.

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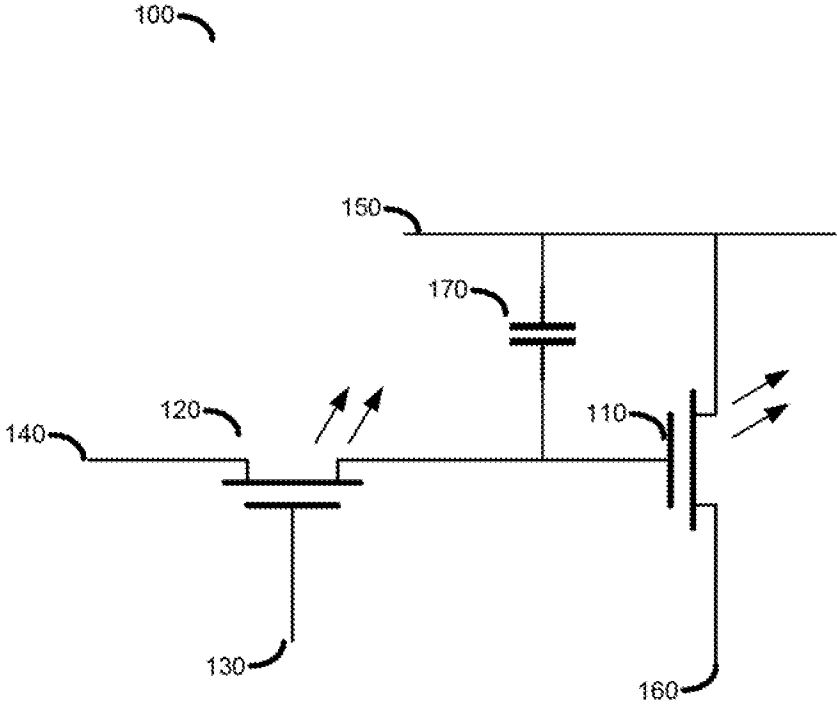
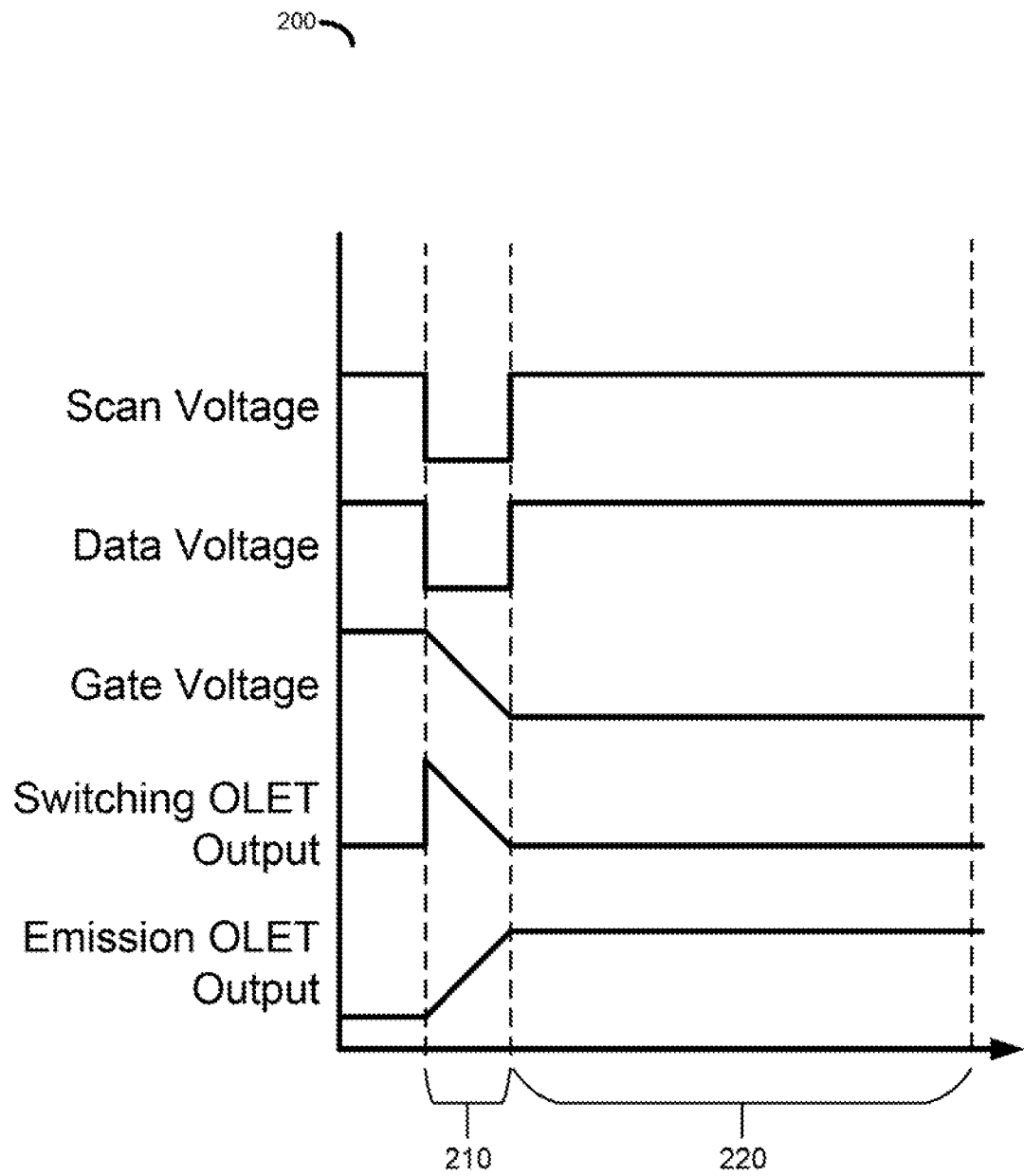
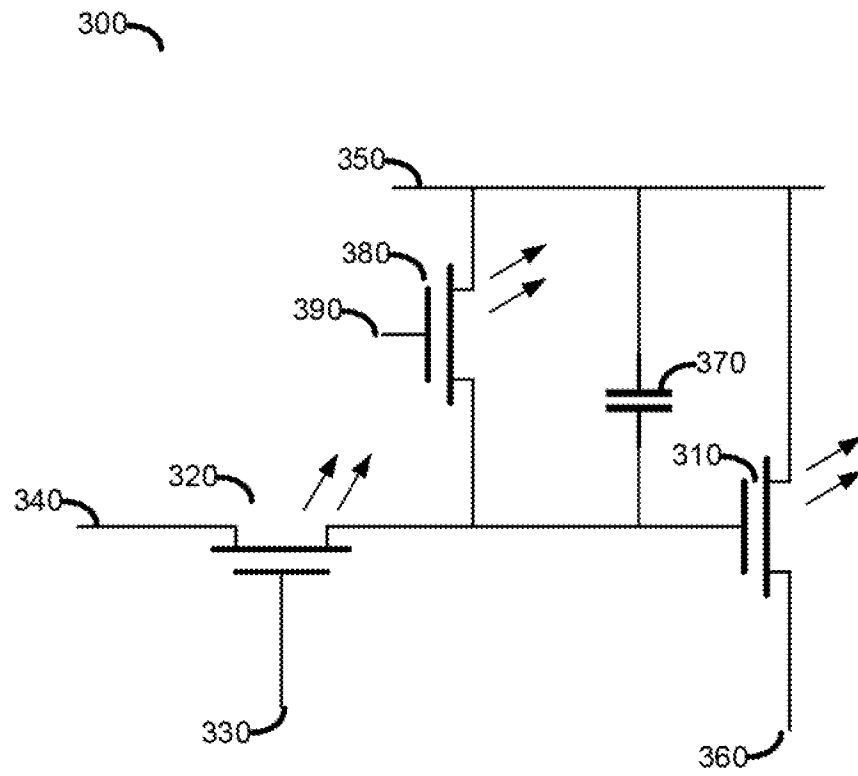


Fig. 1

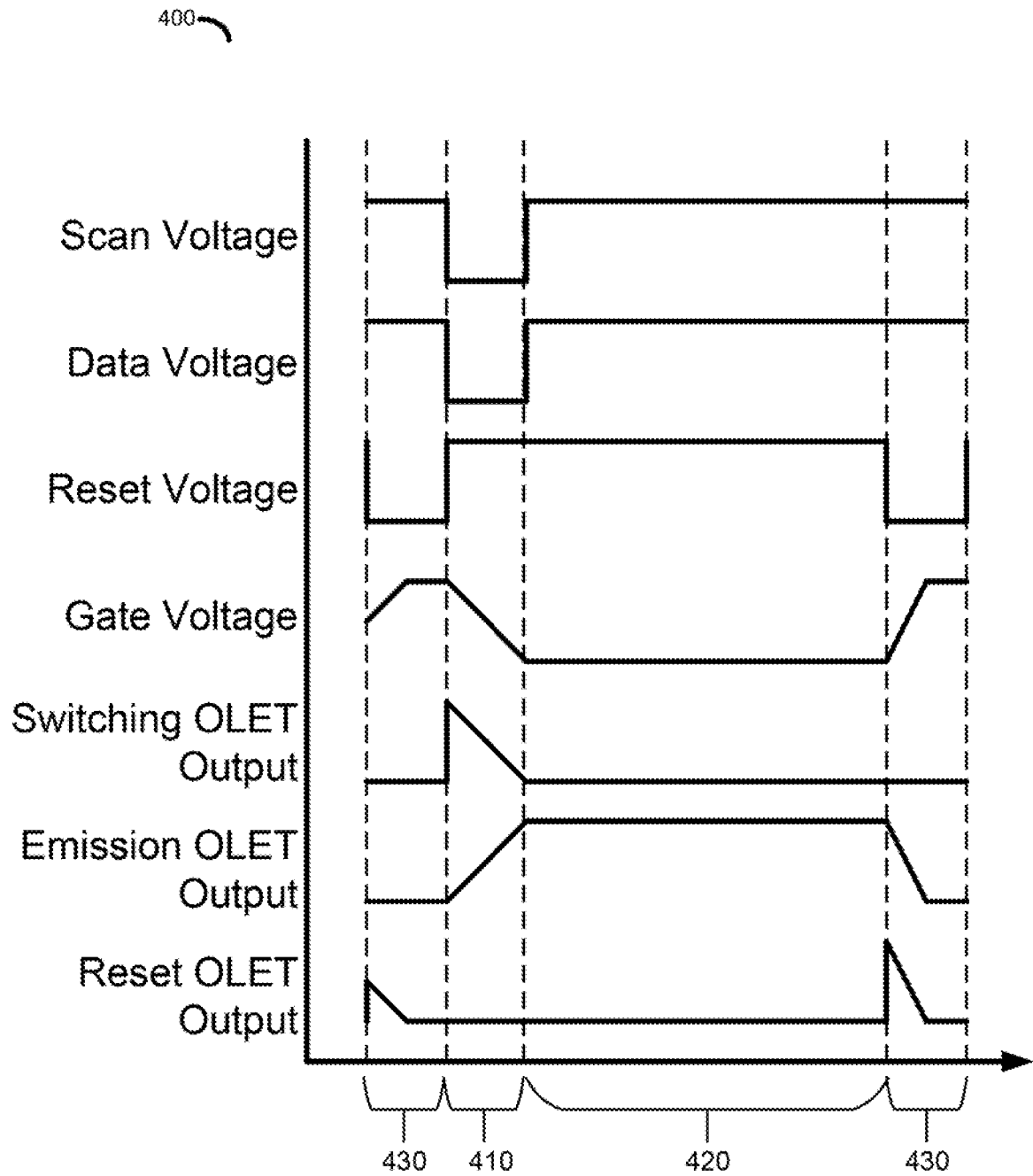
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**Fig. 2**

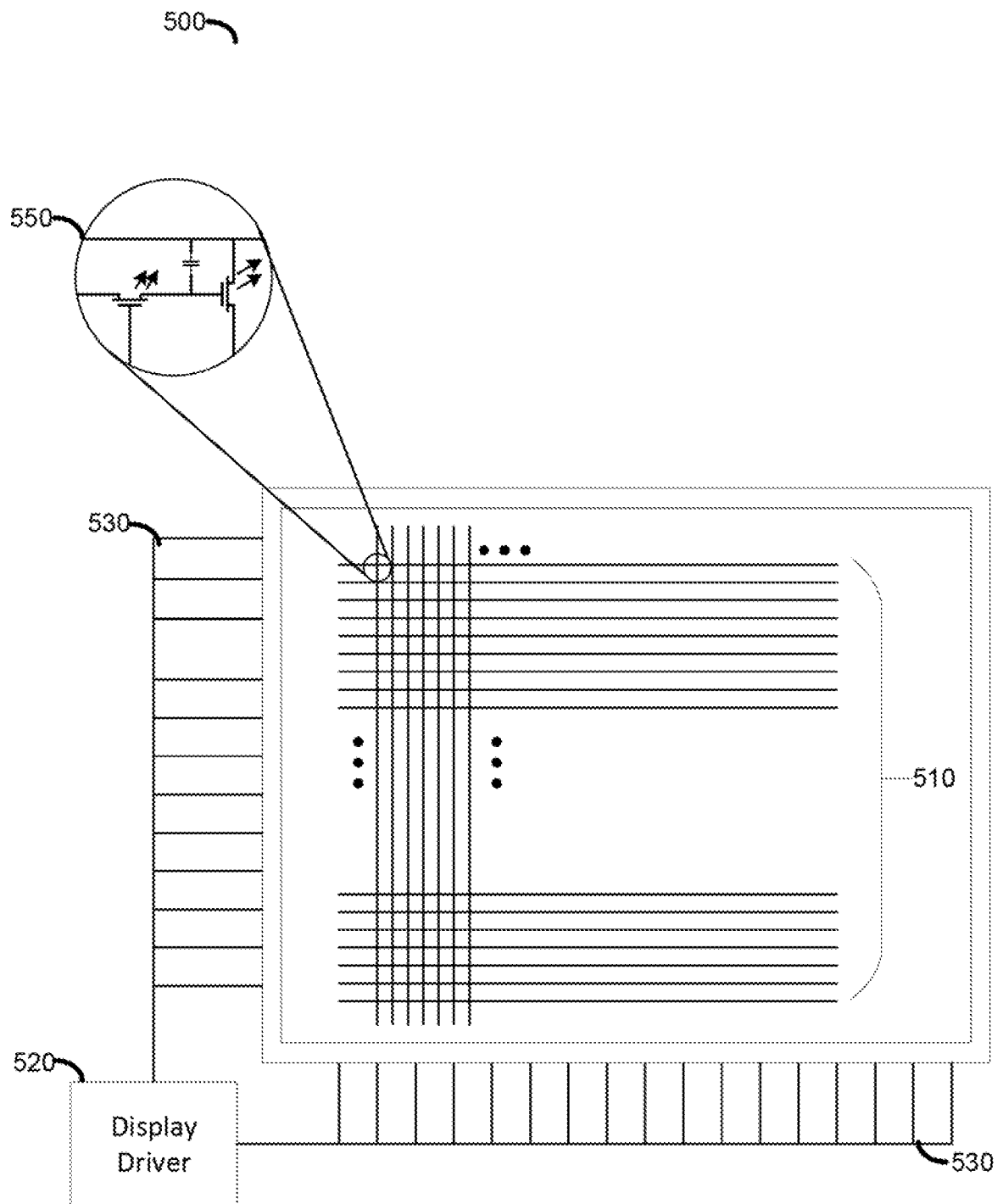
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**Fig. 3**

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**Fig. 4**

5/5

**Fig. 5**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2019/016358

A. CLASSIFICATION OF SUBJECT MATTER		
H01L 51/52 (2006.01) G09G 3/3208 (2016.01)		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
H01L G09G		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
PatSearch (RUPTO internal), USPTO, PAJ, K-PION, Esp@cenet, Information Retrieval System of FIPS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2016/0233459 A1 (JAPAN DISPLAY INC.) 11.08.2016, paragraphs [0009], [0028]-[0030], [0037]	1, 2, 7-9, 13, 15
Y		3-6, 10-12, 14
Y	US 2008/0143651 A1 (SANG-MOO CHOI et al.) 19.06.2008, paragraphs [0015]-[0017], [0035]-[0040], [0045], [0051], [0052]	3-6, 10-12, 14
A	US 2016/0155980 A1 (SAMSUNG DISPLAY CO., LTD.) 02.06.2016	1-15
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
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28 October 2019 (28.10.2019)		31 October 2019 (31.10.2019)
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37		Authorized officer I. Kryazhev Telephone No. (495) 531-65-15