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(54) Organic light emitting display and method of driving the same

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Description

BACKGROUND

1. Field

[0001] Embodiments relate to an organic light emitting display and a method of driving the same. More particularly, embodiments relate to an organic light emitting display and a method of driving such an organic light emitting display capable of uniformly maintaining brightness and color coordinates so that a user cannot recognize a change in a frame frequency.

2. Description of the Related Art

[0002] Recently, various flat panel displays (FPD) that are lower in weight and smaller in volume than comparable cathode ray tubes (CRT) have been developed. FPDs generally include liquid crystal displays (LCD), field emission displays (FED), plasma display panels (PDP), and organic light emitting displays.

[0003] Among the FPDs, organic light emitting displays may display images using organic light emitting diodes (OLED) that generate light by the re-combination of electrons and holes. Organic light emitting displays generally have characteristics such as relatively high response speeds and lower power consumption.

[0004] In general, organic light emitting displays include pixels arranged in a matrix. Each of the pixels may include at least two transistors and at least one capacitor and organic light emitting diode (OLED).

[0005] The pixels may display an image with predetermined brightness by respectively supplying currents corresponding to voltages charged in the capacitors to the OLEDs via driving transistors. The capacitors may be charged with voltages corresponding to data signals, respectively, during a period when scan signals are supplied.

[0006] Organic light emitting displays may be adapted to be driving in a common driving mode with a first frame frequency and a low-power driving mode with a second frame frequency that is lower than the first frame frequency. Organic light emitting displays that are adapted to maintain brightness and/or color characteristics irrespective of changes in frame frequency are desired. Furthermore, European patent application EP 1 580 721 A2 discloses a method of driving a self-luminous display apparatus in which the frame frequency is determined according to a distance between the first and second scanning lines of the display panel in order to reduce image flickering. European patent application EP 1 840 866 A2 discloses an OLED device according to the generic term of claim 1.

SUMMARY

[0007] Embodiments are therefore directed to organic light emitting displays and methods of driving such organic light emitting displays, which substantially overcome one or more of the problems due to the limitations and disadvantages of the related art.

[0008] It is therefore a feature of an embodiment to provide an organic light emitting display capable of uniformly maintaining brightness and color coordinates so that a user does not recognize a change in a frame frequency.

[0009] It is therefore a separate feature of an embodiment to provide a method of driving an organic light emitting display capable of uniformly maintaining brightness and color coordinates so that a user does not recognize a change in a frame frequency.

[0010] It is therefore a separate feature of an embodiment to provide an organic light emitting display that supplies scan signals having a same pulse width irrespective of a frame frequency and/or driving mode.

[0011] It is therefore a separate feature of an embodiment to provide a method of driving an organic light emitting display that supplies scan signals having a same pulse width irrespective of a frame frequency and/or driving mode.

[0012] At least one of the above and other features and advantages may be realized by providing an organic light emitting display according to claim 1.

[0013] The scan driver may be adapted to control a distance between a previously supplied scan signal and a scan signal to be currently supplied based on the change in the frame frequency.

[0014] The mode determining unit may be adapted to supply a low power control signal corresponding to the low power driving mode to the timing controller when the operation control signal is not supplied during a predetermined period of time and to supply a common control signal to the timing controller corresponding to the common driving mode at other times.

[0015] When the mode determining unit determines that the operation control signal has not been supplied during the predetermined period of time, the mode determining unit may additionally determine whether an image currently displayed is a still image or a moving picture, and may be adapted to supply the low power control signal to the timing controller only when the image is determined as the still image.

[0016] The timing controller may be adapted to control the scan driver and the data driver to be driven at a first frame frequency when the common driving mode control signal is supplied and to be driven at a second frame frequency when the low power driving mode control signal is supplied.

[0017] The first frame frequency may be higher than the second frame frequency.

[0018] The pixels each include an organic light emitting diode (OLED), and a driving transistor adapted to control an amount of current supplied to the OLED.

[0019] Each of the pixels further includes a plurality of transistors and a storage capacitor adapted to compensate for a threshold voltage of the driving transistor.

[0020] At least one of the above and other features and advantages may be separately realized by providing a method of driving an organic light emitting display according to claim 5.

[0021] Uniformly maintaining the width of scan signals regardless of the frame frequency may include controlling a time period between scan pulses of subsequent ones of the scan signals based on the frame frequency.

[0022] The driving method may further include controlling emission and non-emission states of emission control signals to be supplied to emission control lines based on the time periods between respective scan pulses.

[0023] Changing the frame frequency based on the externally supplied operation control signal may include determining whether the organic light emitting display is in a common driving mode or in a low power driving mode based on the operation control signal, and setting the frame frequency as a first frame frequency for the common driving mode and setting the frame frequency as a second frame frequency for the low power driving mode.

[0024] The first frame frequency may be higher than the second frame frequency.

[0025] Changing the frame frequency based on the externally supplied operation control signal may include determining that the organic light emitting display is in the low power mode when the operation control signal has not been input for a predetermined period of time.

[0026] Changing the frame frequency based on the externally supplied operation control signal may include determining that the operation control signal has not been input for a predetermined period of time, determining whether an image being displayed during the predetermined time is a still image or a moving picture, determining that the organic light emitting display is in the low power mode when the image displayed is determined to be a still image and when the operation control signal has not been input during the predetermined period of time, and determining that the organic light emitting display is in the common driving mode when the image displayed is determined to be a moving picture.

[0027] The method may further include generating light with predetermined brightness in pixels of the display based on the supplied data signals.

[0028] At least one of the above and other features and advantages may be realized by providing an organic light emitting display according to claim 1.

[0029] The first driving mode may be a common driving mode and the second driving mode may be a low power driving mode, and the first frame frequency may be higher than the second frame frequency.

[0030] The first time period may correspond to a time period between an ending edge of a $(n-1)^{th}$ scan pulse and a beginning edge of an n^{th} scan pulse.

[0031] The scan driver may be further adapted to control emission and non-emission states of emission control lines based on whether the display is in the first driving mode or the second driving mode such that non-emission time of the emission control signals associated with the first driving mode is different from the non-emission time of the emission control signals associated with the second driving mode by an integer multiple of a difference in time between the first time period and the second time period.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] The above and other features and advantages will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments with reference to the attached drawings, in which:

FIG. 1 illustrates a schematic diagram of an exemplary organic light emitting display;

FIGS. 2A and 2B illustrate exemplary waveform diagrams of exemplary scan signals employable during a first driving mode having a first frame frequency and a second driving mode having a second frame frequency, respectively, for maintaining brightness and/or color characteristics of the pixels being driven;

FIG. 3 illustrates a schematic diagram of an exemplary embodiment of a pixel structure employable with the display FIG. 1; and

FIG. 4 illustrates an exemplary waveform diagram of signals employable by an exemplary embodiment of a method of driving a pixel.

DETAILED DESCRIPTION

[0033] Exemplary embodiments will now be described more fully hereinafter with reference to the accompanying drawings; however, aspects may be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0034] In the following description, it will be understood that when a first element is described as being coupled to a second element, the first element may be directly coupled to the second element but may also be indirectly coupled to the second element via one or more other elements. 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 the specification.

[0035] FIG. 1 illustrates a schematic diagram of an exemplary organic light emitting display 100.

[0036] Referring to FIG. 1, the organic light emitting display 100 may include a pixel unit 130, including pixels 140 coupled to scan lines S1 to Sn and data lines D 1 to Dm, a scan driver 110 for driving the scan lines S1 to Sn and emission control lines E1 to En, a data driver 120 for driving the data lines D1 to Dm, a timing controller 150 for controlling the scan driver 110 and the data driver

120, and a mode determining unit 160 for determining a driving mode.

[0037] The mode determining unit 160 may determine a driving mode based on an externally supplied operation control signal and may supply a control signal corresponding to the determined driving mode to the timing controller 150. The operation control signal may be, e.g., a signal input to a key board, movement of a mouse, etc. Driving modes may include, e.g., a common driving mode, a low-power driving mode, etc. The mode determining unit 160 may also receive external data Data. The mode determining unit 160 may determine an image to be displayed by the pixel unit 130 and may determine the driving mode corresponding to the determined image.

[0038] For example, the mode determining unit 160 may determine that the display 100 is to be driven in a low power driving mode when an operation control signal, e.g., a signal input by a keyboard, has not been input during a predetermined period of time and may supply a low power control signal to the timing controller 150. Further, e.g., the mode determining unit 160 may determine that the display 100 is to be driven in a common driving mode when an operation control signal, e.g., has been input during the predetermined period of time, and may supply a common control signal to the timing controller 150.

[0039] More particularly, e.g., when an operation control signal has not been input during the predetermined period, the mode determining unit 160 may determine the image to be displayed by the pixel unit 130 based on externally supplied data Data. In some cases, e.g., when an operation control signal has not been input during the predetermined period, the image to be displayed may be a still image. In such cases, e.g., when the determined image is a still image, and it is determined that an operation control signal has not been input during the predetermined period, the mode determining unit 160 may supply the low power control signal to the timing controller 150. On the other hand, in some embodiments, if the mode determining unit 160 determines that the current image to be displayed is a moving picture, the mode determining unit 160 may supply the common control signal to the timing controller 150 even when it is determined that the operation control signal has not been input during the predetermined time.

[0040] The predetermined period of time during which it may determined whether an operation control signal has/has not been input, may be set based, e.g., on user preferences, default settings, etc. That is, embodiments are not limited to specific predetermined periods of time. For example, the predetermined period of time may be experimentally determined based on an environment in which a monitor is to be provided.

[0041] The timing controller 150 may generate data driving control signals DCS and scan driving control signals SCS based on externally supplied synchronizing signals/data Data. The data driving control signals DCS may be supplied to the data driver 120 and the scan driving control signals SCS may be supplied to the scan driver 110. The timing controller 150 may supply the externally supplied data Data to the data driver 120.

[0042] The timing controller 150 may supply a first frame control signal to the scan driver 110 and the data driver 120 when the common control signal is input. The timing controller 150 may supply a second frame control signal to the scan driver 110 and the data driver 120 when the low power control signal is input. The first frame control signal and the second frame control signal are included in the scan driving control signal SCS and the data driving control signal DCS.

[0043] The scan driver 110 may receive the scan driving control signals SCS from the timing controller 150. After receiving the scan driving control signals SCS, the scan driver 110 may generate scan signals and may sequentially supply the generated scan signals to the scan lines S1 to Sn. In addition, the scan driver 110 may generate emission control signals in response to the scan driving control signals SCS. The scan driver 110 may sequentially supply the generated emission control signals to the emission control lines E1 to En. A width of the emission control signals may be equal to or larger than a width of the scan signals.

[0044] The scan driver 110 may control a distance or time period between scan pulses of sequentially generated scan signals based on whether the first frame control signal or the second frame control signal was supplied to the scan driver 110. FIGS. 2A and 2B illustrate exemplary waveform diagrams of exemplary scan signals employable during a first driving mode having a first frame frequency, and a second driving mode having a second frame frequency, respectively. More particularly, FIG. 2A illustrates exemplary scan signals that may be supplied according to the first frame frequency, e.g., corresponding to the common driving mode when the common control signal may have been supplied to the scan driver 110, and FIG. 2B illustrates exemplary scan signals that may be supplied according to the second frame frequency, e.g., corresponding to a lower frequency of the low power driving mode when the low power control signal may have been supplied to the scan driver 110. For example, the first frame frequency during the common driving mode may be 60 Hz and the second frame frequency during the low power driving mode may be 40 Hz.

[0045] Referring to FIG. 2A, according to the first frame frequency, e.g., the scan driver 110 may respectively supply scan signals including pulses according to a first time period T1 to the scan lines S1 to Sn and a distance between an end of the scan pulse of scan signal of the $(n-1)^{th}$ scan line Sn-1 and a start of the scan pulse of the scan signal of the n^{th} scan line Sn may correspond to a second time period T2. Referring to FIG. 2B, according to the second frame frequency, e.g., the scan driver may respectively supply scan signals including pulses according to the first time period T1 to the scan lines S1 to Sn and a distance between an end of the scan pulse of the scan signal of the $(n-1)^{th}$ scan line Sn-1 and a start of the scan pulse of the scan signal of the nth scan line Sn may correspond to a third time period T3.

[0046] As shown in FIGS. 2A and 2B, widths of the scan pulses may correspond to the first time period T1 irrespective of whether the first frame control signal or the second frame control signal was supplied to the scan driver 110. Thus, e.g., during the common driving mode and the low power driving mode, widths of the scan pulses of the respective scan signals applied to the scan lines S1-Sn may be the same. On the other hand, based on whether the first frame control signal or the second frame control signal was supplied to the scan driver 110, e.g., whether the pixel unit 130 is to be driven under the common driving mode or the low power driving mode, time periods between scan pulses of subsequent ones of the scan signals, e.g., the $(n-1)^{th}$ and n^{th} scan signals, may be controlled to correspond to the second time period T2 for the first frame frequency and to correspond to the third time period T3 for the second frame frequency. In such embodiments, the second time period T2 may be different from, e.g., shorter than, the third time period T3. That is, e.g., in the low power mode, more time may elapse between scan pulses of subsequent ones of the scan signals in accordance with a slower frame frequency.

[0047] The scan driver 110 may control on/off times of the emission control signals based on the scan signals. More particularly, the scan driver 110 may control emission/non-emission time periods of the emission control signals based on the frame frequency. For example, with reference to FIG. 2A, in the exemplary case of two scan signals being supplied to the $(n-1)^{th}$ and n^{th} scan lines S(n-1) and Sn, the scan driver 110 may controllably supply emission control signals that may overlap the first time period T1 of the scan pulse supplied to $(n-1)^{th}$ scan line S(n-1), the first time period T1 of the scan pulse supplied to the n^{th} scan signal Sn, and the second time period T2 corresponding to the time between the respective pulses being driven according to the first frame frequency. Further, with reference to FIG. 2B, e.g., in the exemplary case of two scan signals being supplied to the $(n-1)^{th}$ and n^{th} scan lines S(n-1) and Sn, the scan driver 110 may controllably supply emission control signals that may overlap the first time period T1 of the scan pulse supplied to $(n-1)^{th}$ scan line S(n-1), the first time period T1 of the scan pulse supplied to the n^{th} scan signal Sn, and the third time period T3 corresponding to the time between the respective pulses being driven according to the second frame frequency. More particularly, referring to FIGS. 2A and 2B, the emission control signals supplied to the n^{th} emission control line En may be "high" or in a "non-emission state" while the respective scan pulses are supplied to the $(n-1)^{th}$ and the n^{th} scan lines S(n-1) and Sn as well as the second time period T2 (shown in FIG. 2A corresponding to the first frame frequency) or the third time period T3 (shown in FIG. 2B corresponding to the second frame frequency) lapsing between the two subsequent scan signals.

[0048] The scan driver 110 may supply scan signals including scan pulses having a first width corresponding to the first time period T1 regardless of a change in frame frequency. Accordingly, embodiments may enable storage capacitors included in pixels, e.g., the pixels 140 of FIG. 1, to have a uniform charge period irrespective of a change in frame frequency. Embodiments may be advantageous by enabling brightness and/or color characteristics of pixels to be desensitized at least to changes in frame frequency. That is, e.g., embodiments may enable brightness and/or color characteristics of pixels to be uniformly maintained at least irrespectively of changes in frame frequency.

[0049] The data driver 120 may receive the data driving control signals DCS from the timing controller 150. After receiving the data driving control signals DCS, the data driver 120 may generate data signals and supply the generated data signals to the data lines D1 to Dm in synchronization with the scan signals.

[0050] The pixel unit 130 may receive a voltage of a first external power source ELVDD and a voltage of a second external power source ELVSS and may supply the received first and second power source ELVDD and ELVSS voltages to the pixels 140. Using the received first and second power source ELVDD and ELVSS voltages, the pixels 140 may generate light components corresponding to the data signals. More particularly, e.g., the pixels 140 positioned along an i^{th} (i is a natural number) horizontal line of a matrix pattern may initialize gate electrodes of driving transistors during a period where a respective scan signal is supplied to the $(i-1)^{th}$ scan line S(i-1) and may charge voltages corresponding to the data signals and the threshold voltages of the driving transistors during a period where the scan signal is supplied to the i^{th} scan line Si.

[0051] As described above, embodiments may enable pixel structures as defined in the claims that charge voltages corresponding to respective data signals when respective scan signals are supplied, etc., to uniformly maintain brightness and/or color characteristics thereof irrespectively of changes in frame frequency by maintaining a charge time of the storage capacitor associated therewith.

[0052] FIG. 3 illustrates a schematic diagram of an exemplary embodiment of a pixel 140nm employable with the display 100 FIG. 1 and with which one or more features described herein may be applied. It is understood by persons of ordinary skill in the art that the pixel structure of the pixels 140nm may be adapted to compensate for a threshold voltage of a driving transistor of the pixel.

[0053] For description purposes, the exemplary pixels 140nm illustrated in FIG. 3 is coupled to the m^{th} data line Dm, the nth scan line Sn, the (n-1)th scan line Sn-1, and the nth emission control line En. Embodiments are not limited thereto. For example, the pixel 140nm of FIG. 3 may be used as one, some or all of the pixels 140 of the display 100 of FIG. 1.

[0054] Referring to FIG. 3, the pixel 140nm may include a pixel circuit 142 coupled to an OLED, the data line Dm, the scan lines Sn-1 and Sn, and the emission control line En. The pixel circuit 142 may control an amount of current supplied to the OLED.

[0055] An anode electrode of the OLED may be coupled to the pixel circuit 142 and a cathode electrode of the OLED may be coupled to the second power source ELVSS. A voltage value of the second power source ELVSS may be set to be lower than a voltage value of the first power source ELVDD. The OLED may generate light with predetermined brightness corresponding to an amount of current supplied from the pixel circuit 142.

[0056] The pixel circuit 142 may control the amount of current supplied to the OLED corresponding to the data signal supplied to the data line Dm when the scan signal is supplied to the scan line Sn. More particularly, the pixel circuit 142 may include first to sixth transistors M1 to M6 and a storage capacitor Cst.

[0057] A first electrode of the second transistor M2 may be coupled to the data line Dm and the second electrode of the second transistor M2 may be coupled to a first node N1. A gate electrode of the second transistor M2 may be coupled to the n^{th} scan line Sn. The second transistor M2 may be turned on when the scan signal is supplied to the n^{th} scan line Sn and, when the second transistor M2 is turned on, it may enable the data signal supplied to the data line Dm to be supplied the first node N1.

[0058] A first electrode of the first transistor M1 may be coupled to the first node N 1 and a second electrode of the first transistor M 1 may be coupled to the first electrode of the sixth transistor M6. A gate electrode of the first transistor M1 may be coupled to a first terminal of the storage capacitor Cst. The first transistor M1 may supply a current corresponding to a voltage charged in the storage capacitor Cst to the OLED.

[0059] A first electrode of the third transistor M3 may be coupled to the second electrode of the first transistor M1 and a second electrode of the third transistor M3 may be coupled to the gate electrode of the first transistor M1. A gate electrode of the third transistor M3 may be coupled to the nth scan line Sn. The third transistor M3 may be turned on when the scan signal is supplied to the nth scan line Sn, and, when the third transistor M3 is turned on, may cause the first transistor M1 to be in a diode-connected state.

[0060] A gate electrode of the fourth transistor M4 may be coupled to the (n-1)th scan line Sn-1 and a first electrode of the fourth transistor M4 may be coupled to the first terminal of the storage capacitor Cst and the gate electrode of the first transistor M1. A second electrode of the fourth transistor M4 may be coupled to an initialization power source Vint. The fourth transistor M4 may be turned on when the scan signal is supplied to the $(n-1)^{th}$ scan line Sn-1 and, when the fourth transistor M4 is turned on, a voltage of the first terminal of the storage capacitor Cst and the gate electrode of the first transistor M1 may change corresponding to the voltage of the initialization power source Vint.

[0061] A first electrode of the fifth transistor M5 may be coupled to the first power source ELVDD and the second electrode of the fifth transistor M5 may be coupled to the first node N1. A gate electrode of the fifth transistor M5 may be coupled to the emission control line En. The fifth transistor M5 may be turned on when the emission control signal is not supplied, e.g. in an emission state (low voltage), from the emission control line En so that the first power source ELVDD may be electrically coupled to the first node N1.

[0062] A first electrode of the sixth transistor M6 may be coupled to the second electrode of the first transistor M 1 and a second electrode of the sixth transistor M6 may be coupled to the anode electrode of the OLED. A gate electrode of the sixth transistor M6 may be coupled to the emission control line En. The sixth transistor M6 may be turned on when the emission control signal is not supplied, e.g. emission state (low voltage), to supply the current supplied from the first transistor M1 to the OLED.

[0063] FIG. 4 illustrates an exemplary waveform diagram of signals employable by an exemplary embodiment of a method of driving the pixel 140nm of FIG. 3.

[0064] Referring to FIGS. 3 and 4, first, the scan signal may be supplied to the $(n-1)^{th}$ scan line Sn-1 so that the fourth transistor M4 may be turned on. When the fourth transistor M4 is turned on, a voltage of the initialization power source Vint may be supplied to the first terminal of the storage capacitor Cst and the gate terminal of the first transistor M1. That is, when the fourth transistor M4 is turned on, the voltages at the first terminal of the storage capacitor C and the gate terminal of the first transistor M1 may be initialized to the voltage of the initialization power source Vint. The voltage value of the initialization power source Vint may be set to be smaller than the voltage value of the data signal.

[0065] Then, the scan signal may be supplied to the n^{th} scan line Sn. When the scan signal is supplied to the n^{th} scan line Sn, the second transistor M2 and the third transistor M3 may be turned on. When the third transistor M3 is turned on, the first transistor M1 may be coupled in the form of a diode. When the second transistor M2 is turned on, the data signal supplied to the data line Dm may be supplied to the first node N1 via the second transistor M2. At this time, because the voltage of the gate terminal of first transistor M1 may be set at the voltage of the initialization power source Vint (that is, set to be smaller than the voltage of the data signal supplied to the first node N1), the first transistor M1 may be turned on.

[0066] When the first transistor M1 is turned on, the data signal applied to the first node N1 may be supplied to the first terminal of the storage capacitor Cst via the first transistor M1 and the third transistor M3. Since the data signal is supplied to the storage capacitor Cst via the first transistor M1 in the diode-connected state, the data signal and the voltage corresponding to the threshold voltage of the first transistor M1 may be charged in the storage capacitor Cst.

[0067] After the voltages corresponding to the data signal and the threshold voltage of the first transistor M1 are charged in the storage capacitor Cst, the emission control signals EMI may be changed from a non-emission state, e.g., high level, to an emission state, e.g., low level, so that the fifth transistor M5 and the sixth transistor M6 may be turned on. When the fifth transistor M5 and the sixth transistor M6 are turned on, a current path from the first power source ELVDD to the OLED is formed. In this case, the first transistor M1 may control an amount of current that flows from the first power source ELVDD to the OLED corresponding to the voltage charged in the storage capacitor Cst.

[0068] Here, since the voltage corresponding to the threshold voltage of the first transistor M1 as well as the data signal may be additionally charged in the storage capacitor Cst included in the pixel 140, an amount of current that flows to the OLED may be controlled regardless of the threshold voltage of the first transistor M1.

[0069] More importantly, in the driving waveforms of FIG. 4, for driving the pixel 140nm according to any frame frequency, e.g., a first frame frequency, second frame frequency, etc., only a time period T4 between scan pulses of subsequent scan signals, e.g., scan signals applied to the (n-1)th and the nth scan lines S(n-1), may be changed based on a frame frequency of a current driving mode. That is, in embodiments, irrespective of a frame frequency of a current driving mode, a time period T1 corresponding to a pulse width of respective scan signals may remain constant. More particularly, in embodiments, irrespective of a frame frequency of a current driving mode, a charge time of a storage capacitor Cst may remain constant. Referring to TABLE 1, an effect on brightness corresponding to a change in a width of a scan pulse of a scan signal, as applied to the pixel 140nm of FIG. 3.

[TABLE 1]

Frame Frequency	60 Hz	40 Hz	60 Hz
Width (μs) of Scan Signal	26	39	26
Brightness (cd/m^2)	560	525	561

[0070] Referring to TABLE 1, when the width of the scan pulse corresponding to the time T1 is changed, i.e., not maintained as constant, based on a respective frame frequency, the brightness changes. More particularly, when the width of the scan pulse is changed from 26μs for a frame frequency of 60 Hz to 39μs for a frame frequency of 40 Hz, the brightness changes from about 560 cd/m^2 to about 525 cd/m^2. Thus, in such cases, a charge time of the storage capacitor changes corresponding to the change in the pulse width of the scan signals such that the brightness changes.

[0071] As described above, however, embodiments may be advantageous by providing an organic light emitting display and/or a driving method for driving an organic light emitting display that may maintain a time period of scan pulses at a predetermined constant value irrespective of a frame frequency and/or driving mode. Embodiments may separately enable a charge time of a storage capacitor of a pixel to be maintained constant irrespective of a frame frequency and/or driving mode. Embodiments may separately enable brightness and/or color characteristics of pixels to be desensitized to changes in frame frequency and/or driving modes, e.g., brightness and/or color characteristics may be uniformly maintained irrespective of frame frequency.

[0072] Exemplary embodiments have been disclosed herein, and although specific terms are employed, they are used and are to be interpreted in a generic and descriptive sense only and not for purpose of limitation. Accordingly, it will be understood by those of ordinary skill in the art that various changes in form and details may be made without departing from the scope of the present invention as set forth in the following claims.

Claims

1. An organic light emitting display, comprising:

a scan driver (110) adapted to sequentially supply scan signals to scan lines (S1, S2, Sn);
a data driver (120) adapted to supply data signals to data lines (D1, D2, Dm) in synchronization with the scan signals;
pixels (140) arranged at intersections of the scan lines (S1, S2, Sn) and the data lines (d1, D2, Dm); and
a timing controller (150) adapted to control the scan driver (110) and the data driver (120),
wherein each of the pixels (140) comprises:
an organic light emitting diode (OLED), wherein a cathode electrode of the organic light emitting diode (OLED) is coupled to a second power source (ELVSS);
a first transistor (M1) adapted to control an amount of current supplied to the organic light emitting diode (OLED);
a plurality of transistors comprising at least a second transistor (M2), a third transistor (M3), a fourth transistor (M4), a fifth transistor (M5) and a sixth transistor (M6); and
a storage capacitor (Cst) for compensating for a threshold voltage of the first transistor (M1),
wherein a first electrode of the first transistor (M1) is coupled to a first node (N1) and a second electrode of the first transistor (M1) is coupled to a first electrode of the sixth transistor (M6), a second electrode of the sixth transistor (M6) being coupled to an anode electrode of the organic light emitting diode (OLED),
wherein a first electrode of the second transistor (M2) is coupled to one of the plurality of data lines (D1, D2, Dm), a second electrode of the second transistor (M2) is coupled to the first

node (N1) and a gate electrode of the second transistor (M2) is coupled to one scan line (Sn) of the plurality of scan lines (S1, S2, Sn),
wherein a first electrode of the third transistor (M3) is coupled to the second electrode of the first transistor (M1), a second electrode of the third transistor (M3) is coupled to the gate electrode of the first transistor (M1) and a gate electrode of the third transistor (M3) is coupled to the one scan line (Sn),
wherein a first electrode of the fifth transistor (M5) is coupled to a first power source (ELVDD), the second electrode of the fifth transistor (M5) is coupled to the first node (N1) and a gate electrode of the fifth transistor (M5) is coupled to an emission control line (En),
wherein the storage capacitor (Cst) is adapted to be charged with the voltages corresponding to the data signal and a threshold voltage of the first transistor (M1) when the scan signal is supplied to the one scan line (Sn), and
characterized in that
a mode determining unit (160) is adapted to determine whether the organic light emitting display is in a low power driving mode or a common driving mode based on an operation control signal and to generate a control signal corresponding to the determined mode;
the timing controller (150) is adapted to control the scan driver (110) and the data driver (120) so that a frame frequency changes based on whether a control signal corresponding to the low power driving mode or a control signal corresponding to the common driving mode is supplied from the mode determining unit (160),
the scan driver (110) is adapted to uniformly maintain a pulse width (T1) of the scan signals regardless of a change in the frame frequency,
the storage capacitor (Cst) is coupled to a gate electrode of the first transistor (M1) by a first terminal and to the first power source (ELVDD) by a second terminal,
a gate electrode of the fourth transistor (M4) is coupled to another scan line (Sn-1) of the plurality of scan lines (S1, S2, Sn), a first electrode of the fourth transistor (M4) is coupled to the first terminal of the storage capacitor (Cst) and the gate electrode of the first transistor (M1) and a second electrode of the fourth transistor (M4) is coupled to an initialization power source (Vint), so that
the storage capacitor (Cst) is adapted to be charged during a first period (T1) corresponding to the pulse width (T1) of the scan signals applied to the another scan line (Sn-1) coupled to the gate electrode of the fourth transistor (M4),
wherein the scan driver (110) is adapted to control a time interval (T2, T3, T4) between a previously supplied scan signal and a scan signal to be currently supplied based on the change in the frame frequency.

2. The organic light emitting display as claimed in claim 1, wherein the mode determining unit (160) is adapted to supply the control signal corresponding to the low power driving mode to the timing controller (150) when the operation control signal is not supplied during a predetermined period of time and to supply, to the timing controller (150), the control signal corresponding to the common driving mode at other times.

3. The organic light emitting display as claimed in claim 2, wherein, when the mode determining unit (160) determines that the operation control signal has not been supplied during the predetermined period of time, the mode determining unit (160) is additionally adapted to determine whether an image currently displayed is a still image or a moving picture, and is adapted to supply the control signal corresponding to the low power driving mode to the timing controller (150) only when the image is determined as the still image.

4. The organic light emitting display as claimed in one of the previous claims,
wherein the timing controller (150) is adapted to control the scan driver (110) and the data driver (120) to be driven at a first frame frequency when the control signal corresponding to the common power driving mode is supplied and to be driven at a second frame frequency when the control signal corresponding to the low power driving mode is supplied,
wherein the first frame frequency is higher than the second frame frequency.

5. A method of driving an organic light emitting display according to one of
claims 1 through 4, **characterized by** comprising:

changing the frame frequency based on the externally supplied operation control signal;
uniformly maintaining the pulse width (T1) of scan signals regardless of the frame frequency, wherein the storage capacitor (Cst) is charged during the first period (T1) corresponding to the pulse width (T1) of the scan signals applied to the another scan line (Sn-1) and wherein the storage capacitor (Cst) is charged with the voltages corresponding to the data signal and a threshold voltage of the first transistor 1(M1) when the scan signal is supplied to the one scan line (Sn); and
supplying data signals in synchronization with the scan signals, wherein uniformly maintaining the width (T1) of scan signals regardless of the frame frequency includes controlling the time in-

terval (T2, T3, T4) between scan pulses of subsequent ones of the scan signals based on the frame frequency.

6. The method as claimed in claim 5, further comprising:

controlling emission and non-emission states of emission control signals to be supplied to emission control lines (E1, E2, En) based on the time periods (T2, T3, T4) between respective scan pulses.

7. The method as claimed in one of claims 5 to 6, wherein changing the frame frequency based on the externally supplied operation control signal includes:

determining whether the organic light emitting display is in the common driving mode or in the low power driving mode based on the operation control signal; and
setting the frame frequency as a first frame frequency for the common driving mode and setting the frame frequency as a second frame frequency for the low power driving mode,
wherein the first frame frequency is higher than the second frame frequency.

8. The method as claimed in claim 7, wherein changing the frame frequency based on the externally supplied operation control signal includes:

determining that the organic light emitting display is in the low power mode when the operation control signal has not been input for a predetermined period of time.

9. The method as claimed in claim 7, wherein changing the frame frequency based on the externally supplied operation control signal includes:

determining that the operation control signal has not been input for a predetermined period of time,
determining whether an image being displayed during the predetermined time is a still image or a moving picture,
determining that the organic light emitting display is in the low power mode when the image displayed is determined to be a still image and when the operation control signal has not been input during the predetermined period of time, and
determining that the organic light emitting display is in the common driving mode when the image displayed is determined to be a moving picture.

10. The method as claimed in claim 9, further comprising generating light with predetermined brightness in pixels (140) of the display based on the supplied data signals.

Patentansprüche

1. Organische lichtemittierende Anzeige, aufweisend:

einen Ansteuertreiber (110), der angepasst ist, um Ansteuerleitungen (S1, S2, Sn) sequenziell Ansteuersignale zuzuführen;
einen Datentreiber (120), der angepasst ist, um Datenleitungen (D1, D2, Dm) Datensignale in Synchronisation mit den Ansteuersignalen zuzuführen;
Pixel (140), die an Schnittpunkten der Ansteuerleitungen (S1, S2, Sn) und der Datenleitungen (D1, D2, Dm) angeordnet sind; und
eine Zeitsteuervorrichtung (150), die angepasst ist, den Ansteuertreiber (110) und den Datentreiber (120) zu steuern,
wobei jeder der Pixel (140) aufweist:

eine organische lichtemittierende Diode (OLED), wobei eine Kathodenelektrode der organischen lichtemittierenden Diode (OLED) mit einer zweiten Energiequelle (ELVSS) gekoppelt ist;
einen ersten Transistor (M1), der angepasst ist, um eine Strommenge, mit dem die organische lichtemittierende Diode (OLED) versorgt wird, zu steuern;
eine Vielzahl von Transistoren, die zumindest einen zweiten Transistor (M2), einen dritten Transistor (M3), einen vierten Transistor (M4), einen fünften Transistor (M5) und einen sechsten Transistor (M6) aufweist; und
einen Speicherkondensator (Cst) zur Kompensation einer Schwellenspannung des ersten Transistors (M1),
wobei eine erste Elektrode des ersten Transistors (M1) mit einem ersten Knoten (N1) gekoppelt ist und eine zweite Elektrode des ersten Transistors (M1) mit einer ersten Elektrode des sechsten Transistors (M6) gekoppelt ist, wobei eine zweite Elektrode des sechsten Transistors (M6) mit einer Anodenelektrode der organischen lichtemittierenden Diode (OLED) gekoppelt ist,
wobei eine erste Elektrode des zweiten Transistors (M2) mit einer aus der Vielzahl der Datenleitungen (D1, D2, Dm) gekoppelt ist, eine zweite Elektrode des zweiten Transistors (M2) mit dem ersten Knoten (N1) gekoppelt ist und eine Gate-Elektrode des

zweiten Transistors (M2) mit einer Ansteuerleitung (Sn) aus der Vielzahl der Ansteuerleitungen (S1, S2, Sn) gekoppelt ist,
wobei eine erste Elektrode des dritten Transistors (M3) mit der zweiten Elektrode des ersten Transistors (M1) gekoppelt ist, eine zweite Elektrode des dritten Transistors (M3) mit der Gate-Elektrode des ersten Transistors (M1) gekoppelt ist und eine Gate-Elektrode des dritten Transistors (M3) mit der einen Ansteuerleitung (Sn) gekoppelt ist,
wobei eine erste Elektrode des fünften Transistors (M5) mit einer ersten Energiequelle (ELVDD) gekoppelt ist, die zweite Elektrode des fünften Transistors (M5) mit dem ersten Knoten (N1) gekoppelt ist und eine Gate-Elektrode des fünften Transistors (M5) mit einer Emissionskontrollleitung (En) gekoppelt ist,
wobei der Speicherkondensator (Cst) angepasst ist, um mit den Spannungen entsprechend dem Datensignal und einer Schwellenspannung des ersten Transistors (M1) geladen zu werden, wenn das Ansteuersignal der einen Ansteuerleitung (Sn) zugeführt wird, und
dadurch gekennzeichnet, dass
eine Modus-Bestimmungseinheit (160) angepasst ist, um basierend auf einem Betriebssteuersignal zu bestimmen, ob die organische lichtemittierende Anzeige in einem Antriebsmodus mit niedriger Energie oder einem allgemeinen Antriebsmodus ist, und ein Steuersignal entsprechend dem bestimmten Modus zu erzeugen;
die Zeitsteuervorrichtung (150) angepasst ist, um den Ansteuertreiber (110) und den Datentreiber (120) zu steuern, so dass sich eine Bildfrequenz auf Grundlage dessen, ob ein Steuersignal entsprechend dem Antriebsmodus mit niedriger Energie oder ein Steuersignal entsprechend dem allgemeinen Antriebsmodus von der Modus-Bestimmungseinheit (160) zugeführt wird, ändert,
der Ansteuertreiber (110) angepasst ist, um eine Pulsbreite (T1) der Ansteuersignale unabhängig von einer Änderung der Bildfrequenz gleichmäßig aufrechtzuerhalten,
der Speicherkondensator (Cst) über einen ersten Anschluss mit einer Gate-Elektrode des ersten Transistors (M1) und über einen zweiten Anschluss mit der ersten Energiequelle (ELVDD) gekoppelt ist,
eine Gate-Elektrode des vierten Transistors (M4) mit einer weiteren Ansteuerleitung (Sn-1) aus der Vielzahl der Ansteuerleitungen (S1, S2, Sn) gekoppelt ist, eine erste Elektrode des vierten Transistors (M4) mit dem ersten Anschluss des Speicherkondensators (Cst) und der Gate-Elektrode des ersten Transistors (M1) gekoppelt ist und eine zweite Elektrode des vierten Transistors (M4) mit einer Initialisierungsenergiequelle (Vint) gekoppelt ist, so dass
der Speicherkondensator (Cst) angepasst ist, um während einer ersten Periode (T1) entsprechend der Pulsbreite (T1) der Ansteuersignale geladen zu werden, die an der weiteren Ansteuerleitung (Sn-1) anliegen, die mit der Gate-Elektrode des vierten Transistors (M4) gekoppelt ist, wobei der Ansteuertreiber (110) angepasst ist, um basierend auf der Änderung der Bildfrequenz ein Zeitintervall (T2, T3, T4) zwischen einem zuletzt zugeführten Ansteuersignal und einem aktuell zuzuführenden Ansteuersignal zu steuern.

2. Organische lichtemittierende Anzeige nach Anspruch 1, wobei die Modus-Bestimmungseinheit (160) angepasst ist, um der Zeitsteuervorrichtung (150) das Steuersignal entsprechend dem Antriebsmodus mit niedriger Energie zuzuführen, wenn das Betriebssteuersignal während einer vorbestimmten Zeitperiode nicht zugeführt wird, und zu anderen Zeiten der Zeitsteuervorrichtung (150) das Steuersignal entsprechend dem allgemeinen Antriebsmodus zuzuführen.

3. Organische lichtemittierende Anzeige nach Anspruch 2, wobei, wenn die Modus-Bestimmungseinheit (160) bestimmt, dass das Betriebssteuersignal während der vorbestimmten Zeitperiode nicht zugeführt wurde, die Modus-Bestimmungseinheit (160) zusätzlich angepasst ist, um zu bestimmen, ob ein aktuell angezeigtes Bild ein Standbild oder ein Bewegtbild ist, und angepasst ist, um der Zeitsteuervorrichtung (150) das Steuersignal entsprechend dem Antriebsmodus mit niedriger Energie nur dann zuzuführen, wenn das Bild als Standbild bestimmt wird.

4. Organische lichtemittierende Anzeige nach einem der vorhergehenden Ansprüche, wobei die Zeitsteuervorrichtung (150) angepasst ist, um den Ansteuertreiber (110) und den Datentreiber (120) zu steuern, so dass sie bei einer ersten Bildfrequenz angesteuert werden, wenn das Steuersignal entsprechend dem allgemeinen Energieantriebsmodus zugeführt wird, und bei einer zweiten Bildfrequenz angesteuert werden, wenn das Steuersignal entsprechend dem Antriebsmodus mit niedriger Energie zugeführt wird,
wobei die erste Bildfrequenz höher als die zweite Bildfrequenz ist.

5. Verfahren zum Antrieb einer organischen lichtemittierenden Anzeige nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** das Verfahren aufweist:

Ändern der Bildfrequenz basierend auf dem extern zugeführten Betriebssteuersignal;
gleichmäßiges Aufrechterhalten der Pulsbreite (T1) von Ansteuersignalen unabhängig von der Bildfrequenz, wobei der Speicherkondensator (Cst) während der ersten Periode (T1) entsprechend der Pulsbreite (T1) der an der weiteren Ansteuerleitung (Sn-1) anliegenden Ansteuersignale geladen wird und wobei der Speicherkondensator (Cst) mit den Spannungen entsprechend dem Datensignal und einer Schwellenspannung des ersten Transistors (M1) geladen wird, wenn das Ansteuersignal der einen Ansteuerleitung (Sn) zugeführt wird; und
Zuführen von Datensignalen in Synchronisation mit den Ansteuersignalen, wobei das gleichmäßige Aufrechterhalten der Breite (T1) der Ansteuersignale unabhängig von der Bildfrequenz das Steuern des Zeitintervalls (T2, T3, T4) zwischen Ansteuerpulsen von nachfolgenden der Ansteuersignale basierend auf der Bildfrequenz umfasst.

6. Verfahren nach Anspruch 5, weiterhin aufweisend:

Steuern von Emissions- und Nicht-Emissions-Zuständen von Emissionskontrollsignalen, die Emissionskontrollleitungen (E1, E2, En) zugeführt werden sollen, basierend auf den Zeitperioden (T2, T3, T4) zwischen jeweiligen Ansteuerpulsen.

7. Verfahren nach einem der Ansprüche 5 bis 6, wobei das Ändern der Bildfrequenz basierend auf dem extern zugeführten Betriebssteuersignal umfasst:

Bestimmen, ob die organische lichtemittierende Anzeige im allgemeinen Antriebsmodus oder im Antriebsmodus mit niedriger Energie ist, basierend auf dem Betriebssteuersignal; und
Festlegen der Bildfrequenz als erste Bildfrequenz für den allgemeinen Antriebsmodus und Festlegen der Bildfrequenz als zweite Bildfrequenz für den Antriebsmodus mit niedriger Energie,
wobei die erste Bildfrequenz höher als die zweite Bildfrequenz ist.

8. Verfahren nach Anspruch 7, wobei das Ändern der Bildfrequenz basierend auf dem extern zugeführten Betriebssteuersignal umfasst:

Bestimmen, dass die organische lichtemittierende Anzeige im Antriebsmodus mit niedriger Energie ist, wenn das Betriebssteuersignal während einer vorbestimmte Zeitperiode nicht eingegeben wurde.

9. Verfahren nach Anspruch 7, wobei das Ändern der Bildfrequenz basierend auf dem extern zugeführten Betriebssteuersignal umfasst:

Bestimmen, dass das Betriebssteuersignal während einer vorbestimmten Zeitperiode nicht eingegeben wurde,
Bestimmen, ob ein Bild, das während der vorbestimmten Zeit angezeigt wird, ein Standbild oder ein Bewegtbild ist,
Bestimmen, dass die organische lichtemittierende Anzeige im Modus mit niedriger Energie ist, wenn das angezeigte Bild als Standbild bestimmt wird und wenn das Betriebssteuersignal während der vorbestimmten Zeitperiode nicht eingegeben wurde, und
Bestimmen, dass die organische lichtemittierende Anzeige im allgemeinen Antriebsmodus ist, wenn das angezeigte Bild als Bewegtbild bestimmt wird.

10. Verfahren nach Anspruch 9, weiterhin aufweisend die Erzeugung von Licht mit vorbestimmter Helligkeit in Pixeln (140) der Anzeige basierend auf den zugeführten Datensignalen.

Revendications

1. Dispositif d'affichage électroluminescent organique, comprenant :

un pilote de balayage (110) adapté pour fournir de façon séquentielle des signaux de balayage à des lignes de balayage (S1, S2, Sn) ;
un pilote de données (120) adapté pour fournir des signaux de données à des lignes de données (D1, D2, Dm) en synchronisation avec les signaux de balayage ;
des pixels (140) agencés au niveau des intersections des lignes de balayage (S1, S2, Sn) et des lignes de données (D1, D2, Dm) ; et
un contrôleur de temporisation (150) adapté pour commander le pilote de balayage (110) et le pilote de données (120),
dans lequel chacun des pixels (140) comprend :

une diode électroluminescente organique (OLED), où une électrode de cathode de la diode électroluminescente organique (OLED) est couplée à une deuxième source d'alimentation (ELVSS) ;
un premier transistor (M1) adapté pour

commander une quantité de courant fournie à la diode électroluminescente organique (OLED) ;

une pluralité de transistors comprenant au moins un deuxième transistor (M2), un troisième transistor (M3), un quatrième transistor (M4), un cinquième transistor (M5) et un sixième transistor (M6) ;

et

un condensateur de stockage (Cst) pour compenser une tension seuil du premier transistor (M1),

dans lequel une première électrode du premier transistor (M1) est couplée à un premier noeud (N1) et une deuxième électrode du premier transistor (M1) est couplée à une première électrode du sixième transistor (M6), une deuxième électrode du sixième transistor (M6) étant couplée à une électrode d'anode de la diode électroluminescente organique (OLED).

dans lequel une première électrode du deuxième transistor (M2) est couplée à l'une de la pluralité de lignes de données (D1, D2, Dm), une deuxième électrode du deuxième transistor (M2) est couplée au premier noeud (N1) et une électrode de grille du deuxième transistor (M2) est couplée à une ligne de balayage (Sn) de la pluralité de lignes de balayage (S1, S2, Sn),

dans lequel une première électrode du troisième transistor (M3) est couplée à la deuxième électrode du premier transistor (M1), une deuxième électrode du troisième transistor (M3) est couplée à l'électrode de grille du premier transistor (M1) et une électrode de grille du troisième transistor (M3) est couplée à la ligne de balayage (Sn),

dans lequel une première électrode du cinquième transistor (M5) est couplée à une première source d'alimentation (ELVDD), la deuxième électrode du cinquième transistor (M5) est couplée au premier noeud (N1) et une électrode de grille du cinquième transistor (M5) est couplée à une ligne de commande d'émission (En),

dans lequel le condensateur de stockage (Cst) est adapté pour être chargé avec les tensions correspondant au signal de données et à une tension seuil du premier transistor (M1) lorsque le signal de balayage est fourni à la ligne de balayage (Sn), et

caractérisé en ce que

une unité de détermination de mode (160) est adaptée pour déterminer si le dispositif d'affichage électroluminescent organique se trouve dans un mode de pilotage à faible puissance ou un mode de pilotage commun sur la base d'un signal de commande de fonctionnement et pour générer un signal de commande correspondant au mode déterminé ;

le contrôleur de temporisation (150) est adapté pour commander le pilote de balayage (110) et le pilote des données (120) de sorte qu'une fréquence de trame soit changée sur la base du fait qu'un signal de commande correspondant à un mode de pilotage à faible puissance ou qu'un signal de commande correspondant au mode de pilotage commun est fourni par l'unité de détermination de mode (160),

le pilote de balayage (110) est adapté pour maintenir uniformément une largeur d'impulsion (T1) des signaux de balayage indépendamment d'un changement de la fréquence de trame,

le condensateur de stockage (Cst) est couplé à une électrode de grille du premier transistor (M1) par une première borne et à la première source d'alimentation (ELVDD) par une deuxième borne,

une électrode de grille du quatrième transistor (M4) est couplée à une autre ligne de balayage (Sn-1) de la pluralité de lignes de balayage (S1, S2, Sn), une première électrode du quatrième transistor (M4) est couplée à la première borne du condensateur de stockage (Cst) et à l'électrode de grille du premier transistor (M1) et une deuxième électrode du quatrième transistor (M4) est couplée à une source d'alimentation d'initialisation (Vint), de sorte que

le condensateur de stockage (Cst) est adapté pour être chargé pendant une première période (T1) correspondant à la largeur d'impulsion (T1) des signaux de balayage appliqués à l'autre ligne de balayage (Sn-1) couplée à l'électrode de grille du quatrième transistor (M4), où le pilote de balayage (110) est adapté pour commander un intervalle de temps (T2, T3, T4) entre un signal de balayage préalablement fourni et un signal de balayage devant être actuellement fourni sur la base du changement de la fréquence de trame.

2. Dispositif d'affichage électroluminescent organique tel que revendiqué dans la revendication 1, dans lequel l'unité de détermination de mode (160) est adaptée pour fournir le signal de commande correspondant au mode de pilotage à faible puissance au contrôleur de temporisation (150) lorsque le signal de commande de fonctionnement n'est pas fourni pendant une durée prédéterminée et pour fournir, au contrôleur de temporisation (150), le signal de commande correspondant au mode de pilotage commun à d'autres moments.

3. Dispositif d'affichage électroluminescent organique tel que revendiqué dans la revendication 2, dans lequel, lorsque l'unité de détermination de mode (160) détermine que le signal de commande de fonctionnement n'a pas été fourni pendant la durée prédéterminée, l'unité de détermination de mode (160) est en outre adaptée pour déterminer si une image actuellement affichée est une image fixe ou une image animée, et est adaptée pour fournir le signal de commande correspondant au mode de pilotage à faible puissance au contrôleur de temporisation (150) seulement lorsque l'image est déterminée comme étant l'image fixe.

4. Dispositif d'affichage électroluminescent organique tel que revendiqué dans l'une des revendications précédentes, dans lequel le contrôleur de temporisation (150) est adapté pour commander le pilote de balayage (110) et le pilote de données (120) pour être pilotés à une première fréquence de trame lorsque le signal de commande correspondant au mode de pilotage commun est fourni et pour être pilotés à une deuxième fréquence de trame lorsque le signal de commande correspondant au mode de pilotage à faible puissance est fourni, où la première fréquence de trame est supérieure à la deuxième fréquence de trame.

5. Procédé de pilotage d'un dispositif d'affichage électroluminescent organique selon l'une des revendications 1 à 4, **caractérisé en ce qu'**il comprend le fait de :

changer la fréquence de trame sur la base du signal de commande de fonctionnement fourni de l'extérieur ;
maintenir uniformément la largeur d'impulsion (T1) des signaux de balayage indépendamment de la fréquence de trame, où le condensateur de stockage (Cst) est chargé pendant la première période (T1) correspondant à la largeur d'impulsion (T1) des signaux de balayage appliqués à l'autre ligne de balayage (Sn-1) et où le condensateur de stockage (Cst) est chargé avec les tensions correspondant au signal de données et à la tension seuil du premier transistor (M1) lorsque le signal de balayage est fourni à la ligne de balayage (Sn) ; et
fournir des signaux de données en synchronisation avec les signaux de balayage, où le fait de maintenir uniformément la largeur (T1) des signaux de balayage indépendamment de la fréquence de trame comporte le fait de commander l'intervalle de temps (T2, T3, T4) entre les impulsions de balayage de signaux suivants parmi les signaux de balayage sur la base de la fréquence de trame.

6. Procédé tel que revendiqué dans la revendication 5, comprenant en outre le fait de :

commander les états d'émission et de non-émission des signaux de commande d'émission à alimenter aux lignes de commande d'émission (E1, E2, En) sur la base des durées (T2, T3, T4) entre des impulsions de balayage respectives.

7. Procédé tel que revendiqué dans l'une des revendications 5 et 6, dans lequel le changement de la fréquence de trame sur la base du signal de commande de fonctionnement fourni de l'extérieur comporte le fait de :

déterminer si le dispositif d'affichage électroluminescent organique se trouve dans le mode de pilotage commun ou dans le mode de pilotage à faible puissance sur la base du signal de commande de fonctionnement ; et
régler la fréquence de trame en tant que première fréquence de trame pour le mode de pilotage commun et régler la fréquence de trame en tant que deuxième fréquence de trame pour le mode de pilotage à faible puissance,
où la première fréquence de trame est supérieure à la deuxième fréquence de trame.

8. Procédé tel que revendiqué dans la revendication 7, dans lequel le changement de la fréquence de trame sur la base du signal de commande de fonctionnement fourni de l'extérieur comporte le fait de :

déterminer que le dispositif d'affichage électroluminescent organique se trouve dans le mode à faible puissance lorsque le signal de commande de fonctionnement n'a pas été entré pendant une durée prédéterminée.

9. Procédé tel que revendiqué dans la revendication 7, dans lequel le changement de la fréquence de trame sur la base du signal de commande de fonctionnement fourni de l'extérieur comporte le fait de :

déterminer que le signal de commande de fonctionnement n'a pas été entré pendant une durée prédéterminée,
déterminer si une image étant affichée pendant le temps prédéterminé est une image fixe ou une image animée,
déterminer que le dispositif d'affichage électroluminescent organique se trouve dans le mode à faible puissance lorsque l'image affichée est déterminée comme étant une image fixe et lorsque le signal de commande de fonctionnement

n’a pas été entré pendant la durée prédéterminée, et
déterminer que le dispositif d’affichage électroluminescent organique se trouve dans le mode de pilotage commun lorsque l’image affichée est déterminée comme étant une image animée.

10. Procédé tel que revendiqué dans la revendication 9, comprenant en outre le fait de générer de la lumière avec une luminosité prédéterminée en pixels (140) du dispositif d’affichage sur la base des signaux de données fournis.

FIG. 1

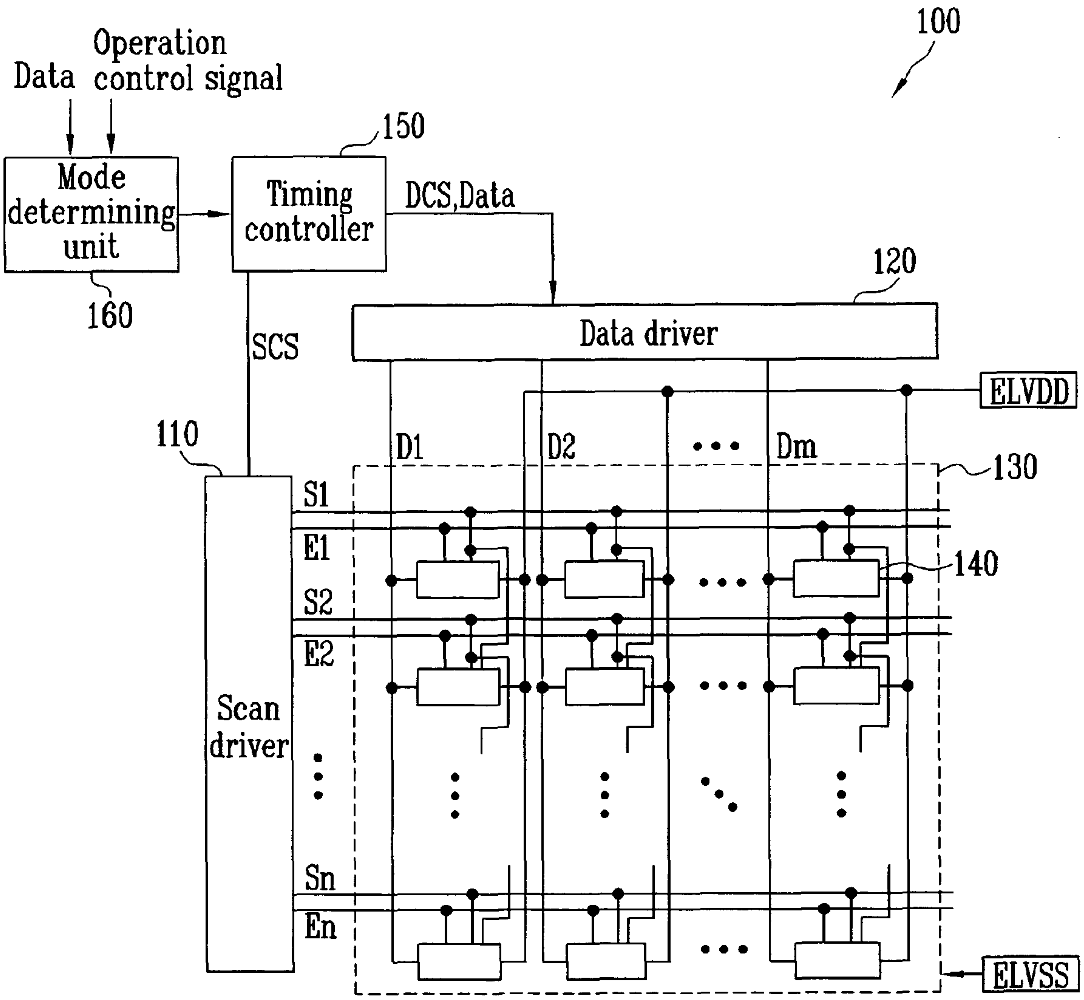

100
Data
Operation control signal
Mode determining unit
160
Timing controller
150
DCS,Data
SCS
120
Data driver
ELVDD
110
D1
D2
Dm
130
S1
E1
S2
E2
140
Scan driver
Sn
En
ELVSS

FIG. 2A

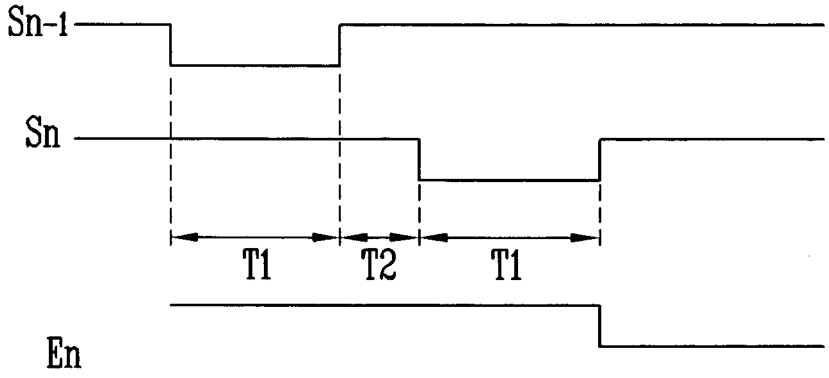


FIG. 2B

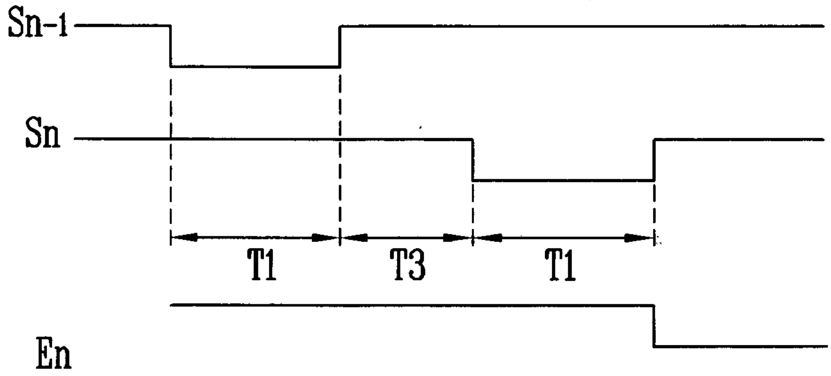


FIG. 3

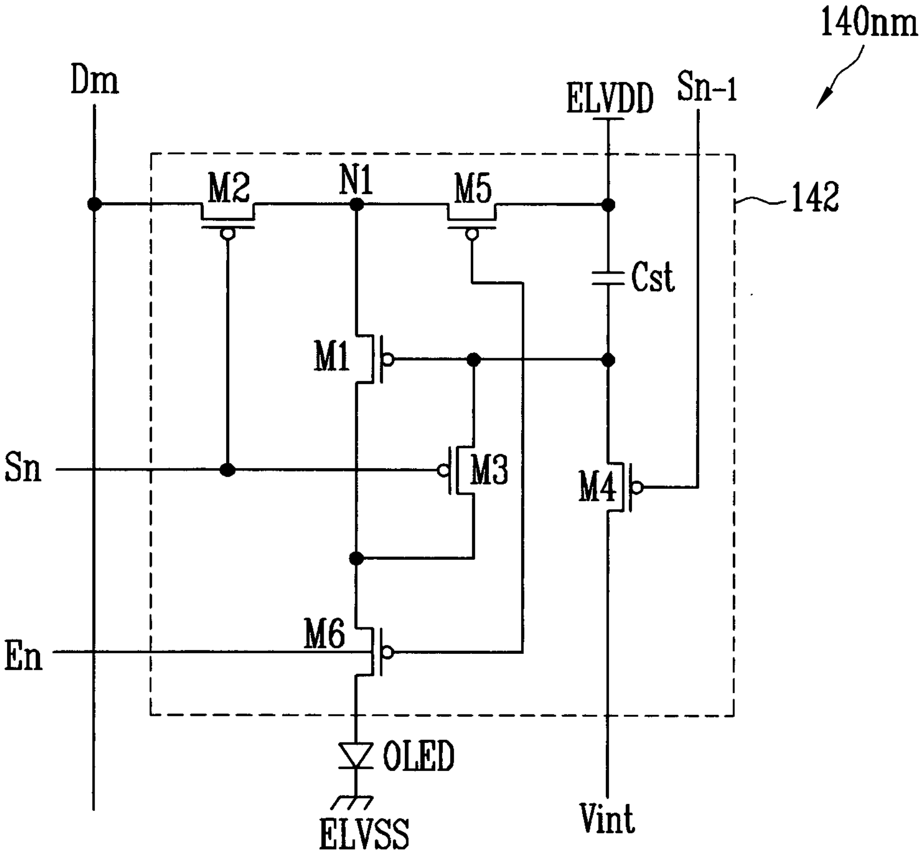
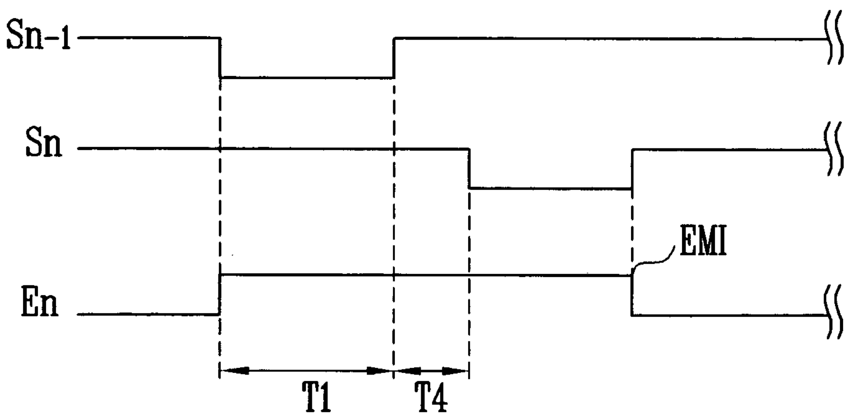

140nm
Dm
ELVDD
Sn-1
M2
N1
M5
142
Cst
M1
Sn
M3
M4
En
M6
OLED
ELVSS
Vint

FIG. 4


Sn-1
Sn
EMI
En
T1
T4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1580721 A2 **[0006]**
- EP 1840866 A2 **[0006]**

专利名称(译)	有机发光显示器及其驱动方法		
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摘要(译)

有机发光显示器包括模式确定单元（160），其适于基于操作控制信号确定显示器是处于低功率还是共用驱动模式，并且产生与所确定的模式相对应的控制信号，扫描驱动器（ 110）适于顺序地向扫描线（S1，S2，Sn）提供扫描信号，数据驱动器（120）适于与扫描信号同步地向数据线（D1，D2，Dm）提供数据信号，像素（140））,布置在扫描线（S1，S2，Sn）和数据线（D1，D2，Dm）的交叉点处，以及适于控制扫描驱动器（110）和数据驱动器（120）的定时控制器（150）因此，帧频率基于从模式确定单元（160）提供低功率驱动模式还是公共驱动模式控制信号而改变，其中扫描驱动器（110）适于均匀地保持脉冲宽度（T1）无论帧频如何变化，扫描信号都是如此。

FIG. 1