US 20030197663A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2003/0197663 A1

Lee et al. (43) Pub. Date: Oct. 23, 2003

(54) ELECTROLUMINESCENT DISPLAY PANEL AND METHOD FOR OPERATING THE SAME

(76) Inventors: **Han Sang Lee**, Kyonggi-do (KR); **Myung Ho Lee**, Kyonggi-do (KR); **Joon Kyu Park**, Seoul (KR)

Correspondence Address:
MCKENNA LONG & ALDRIDGE LLP
Song K. Jung
1900 K Street, N.W.
Washington, DC 20006 (US)

(21) Appl. No.: **10/329,473**

(22) Filed: **Dec. 27, 2002**

(30) **Foreign Application Priority Data**

Dec. 27, 2001 (KR) 2001-0086065
Dec. 29, 2001 (KR) 2001-0087831

Publication Classification

(51) **Int. Cl.**[7] **G09G 3/30**
(52) **U.S. Cl.** **345/76**

(57) **ABSTRACT**

Electroluminescent display panel and method for operating the same. The electroluminescent display panel having a plurality of unit pixels defined by a plurality of gatelines, and a plurality of sourcelines running perpendicular to each other, the unit pixel including a first switching device, a capacitor having a first terminal connected to an output terminal of the first switching device, and a second terminal connected to a power source voltage terminal, a second switching device connected to the power source voltage terminal, an electroluminescent part, and a light emission suppressing part connected to the one end of the capacitor for turning off the electroluminescent part for a preset period during a period before the present frame is operated, by receiving an enable signal that causes discharge of the capacitor and discharging a charge stored in the capacitor, thereby fabricating a high definition display.

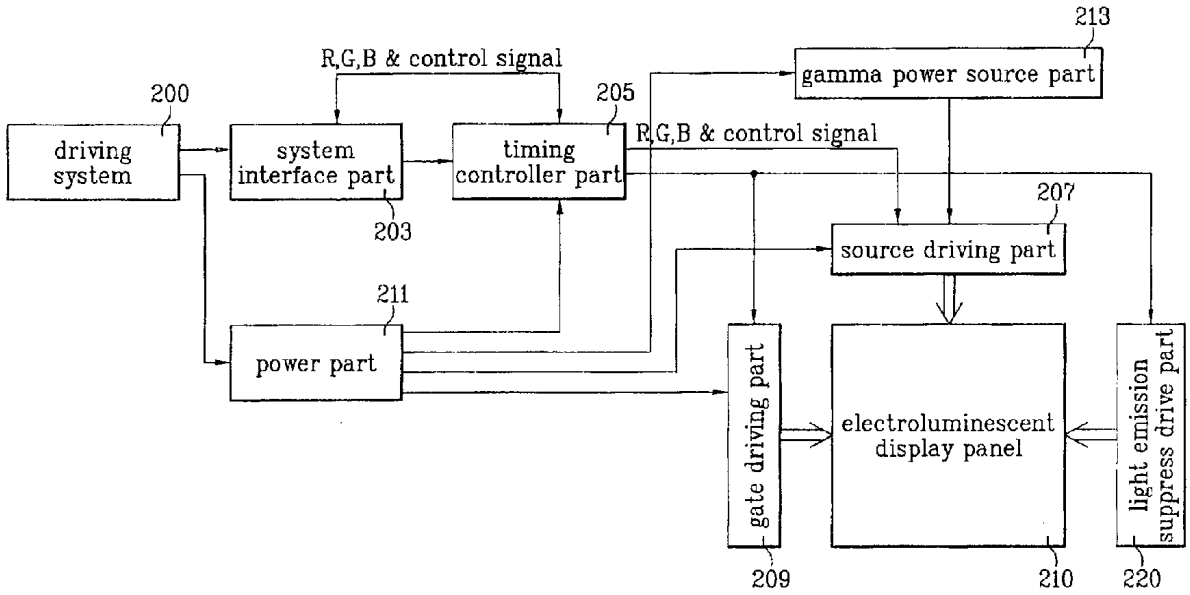


FIG. 1
Related Art

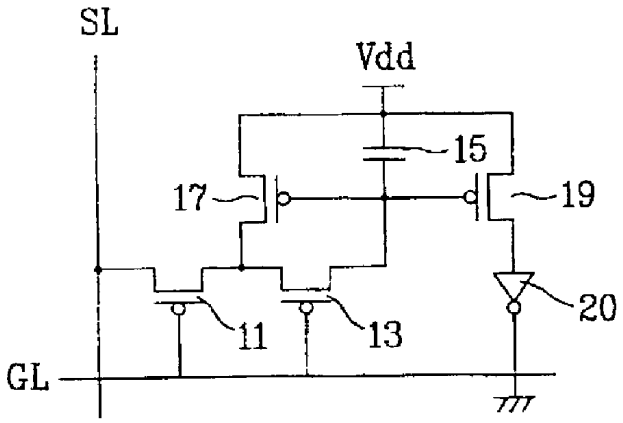


FIG. 2
Related Art

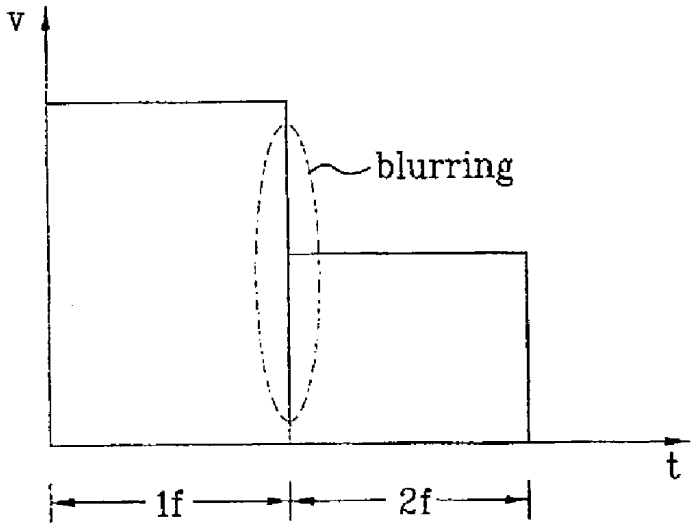


FIG. 3

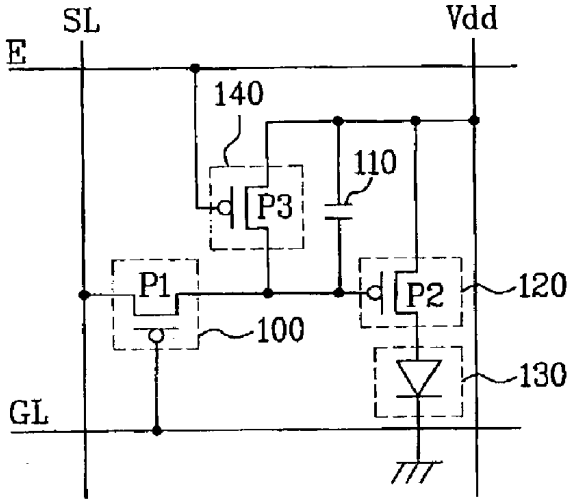


FIG. 4

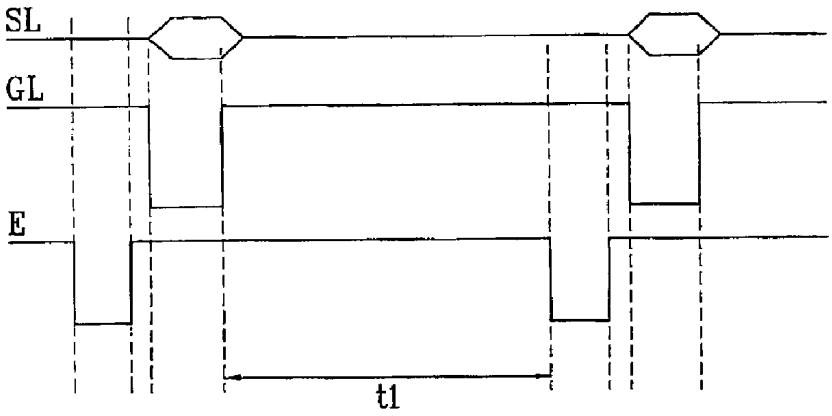


FIG. 5

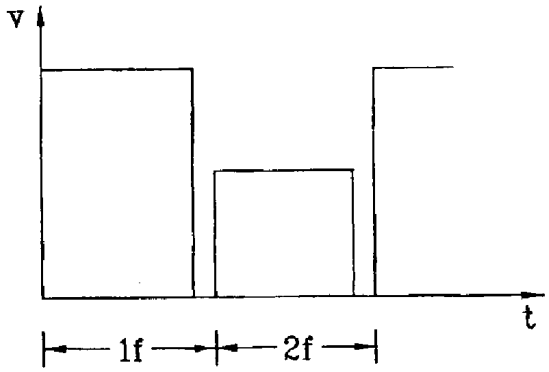


FIG. 6

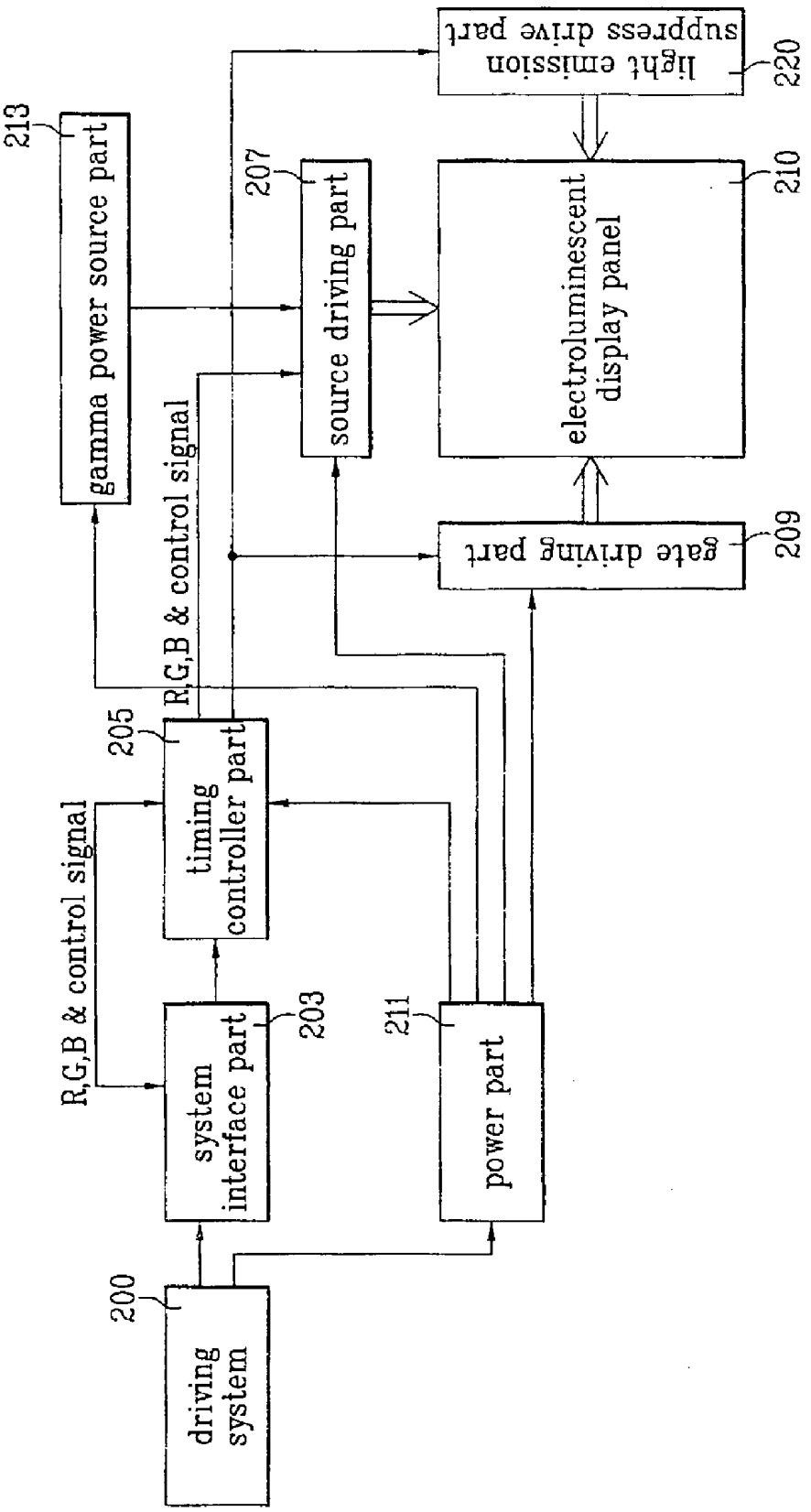

driving system
200
system interface part
203
timing controller part
205
R,G,B & control signal
R,G,B & control signal
gamma power source part
213
source driving part
207
power part
211
gate driving part
209
electroluminescent display panel
210
light emission suppress drive part
220

FIG. 7

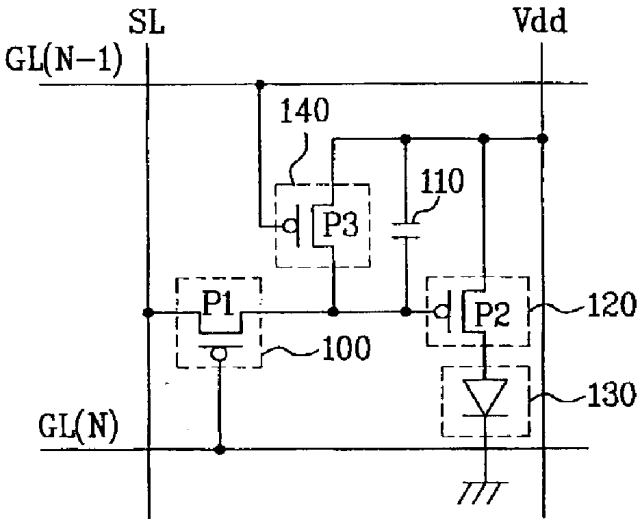


FIG. 8

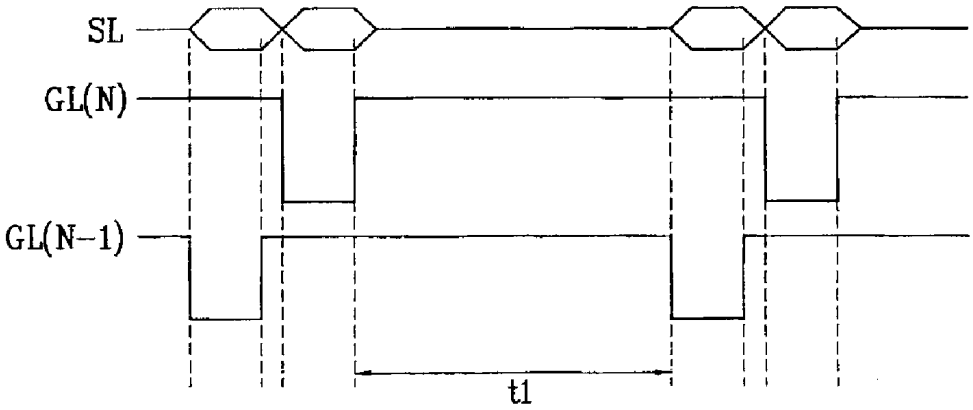


FIG. 9

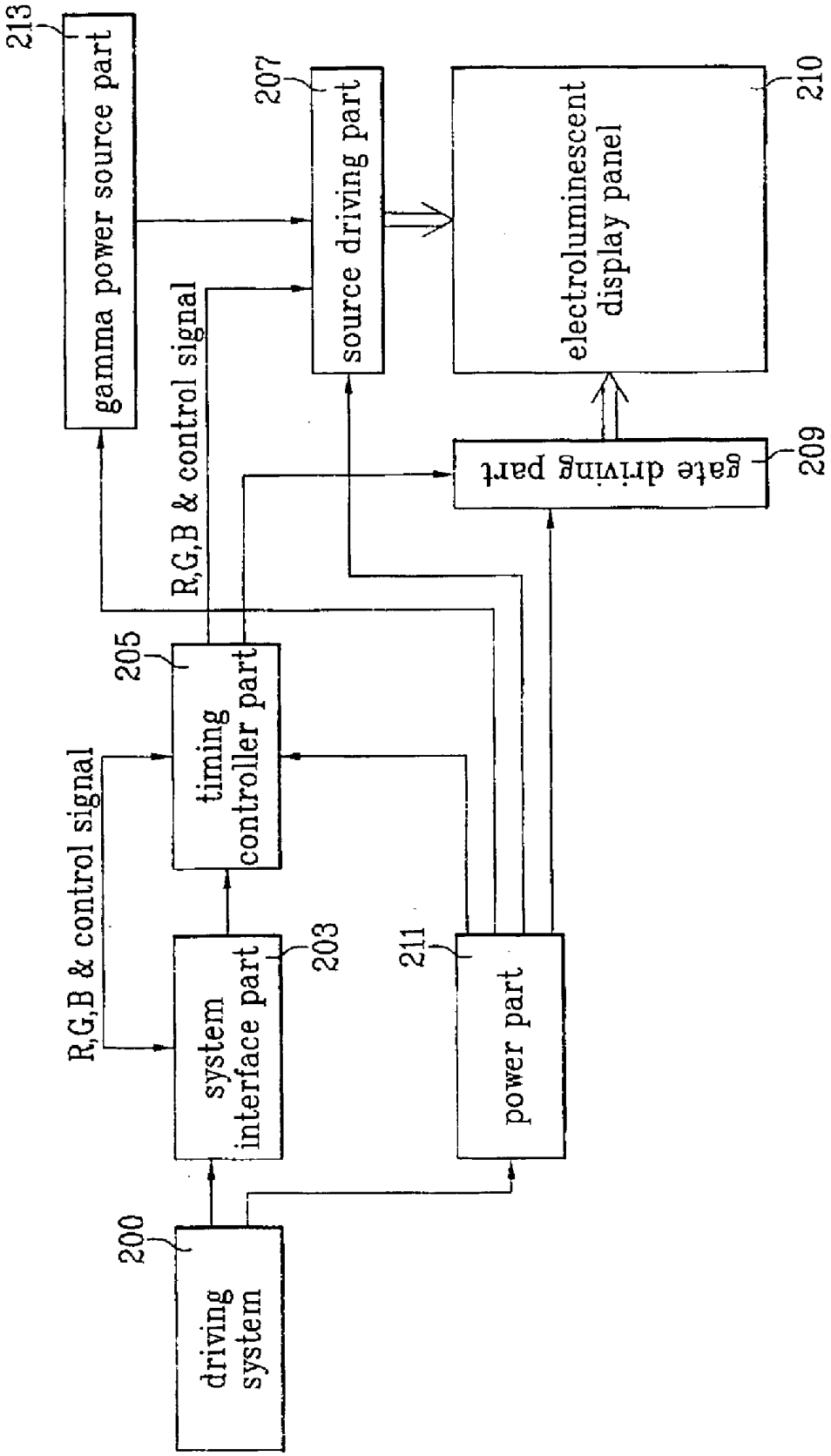

213
gamma power source part
207
source driving part
210
electroluminescent display panel
R,G,B & control signal
209
gate driving part
205
timing controller part
R,G,B & control signal
203
system interface part
211
power part
200
driving system

FIG. 10

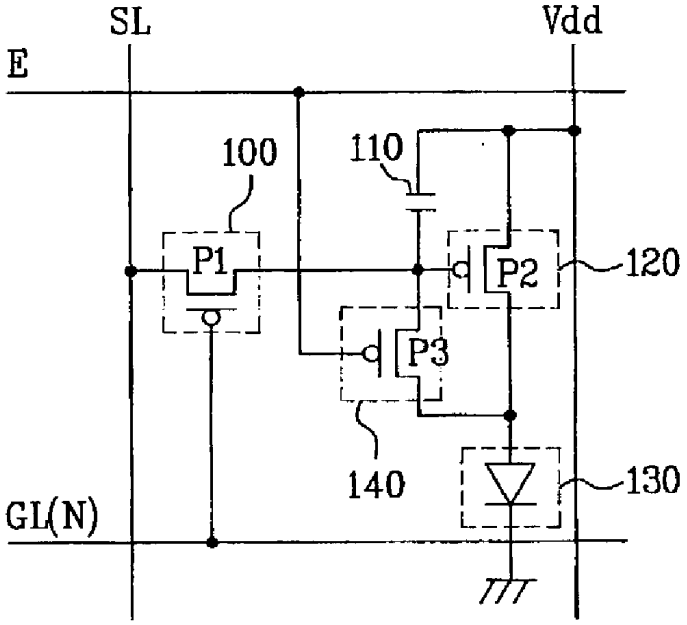

SL
Vdd
E
100
110
P1
P2
120
P3
140
130
GL(N)

FIG. 11

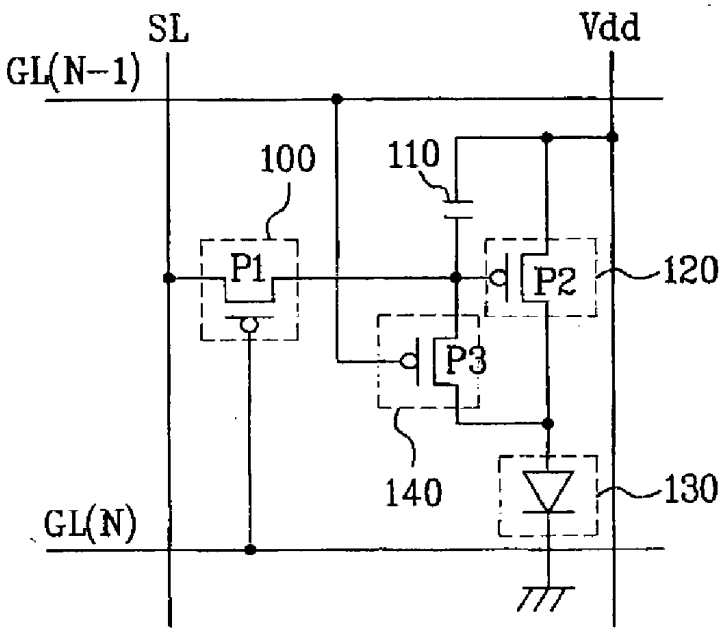

SL
Vdd
GL(N-1)
100
110
P1
P2
120
P3
140
130
GL(N)

FIG. 12

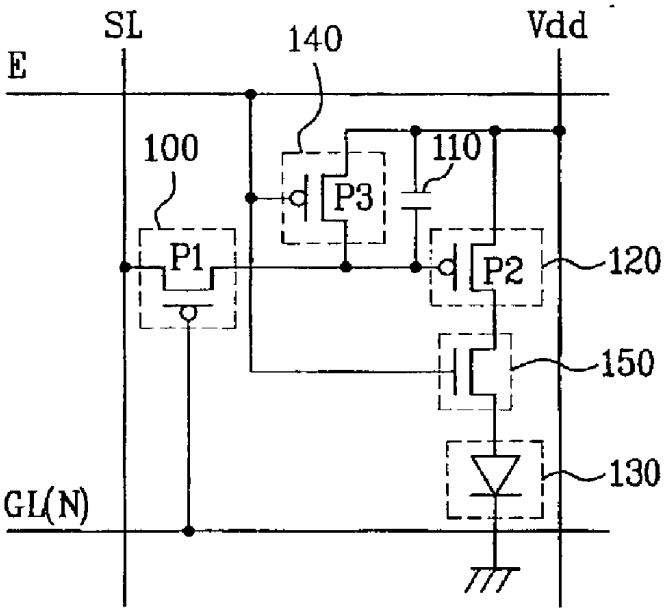

SL
140
Vdd
E
100
110
P3
P1
P2
120
150
130
GL(N)

FIG. 13

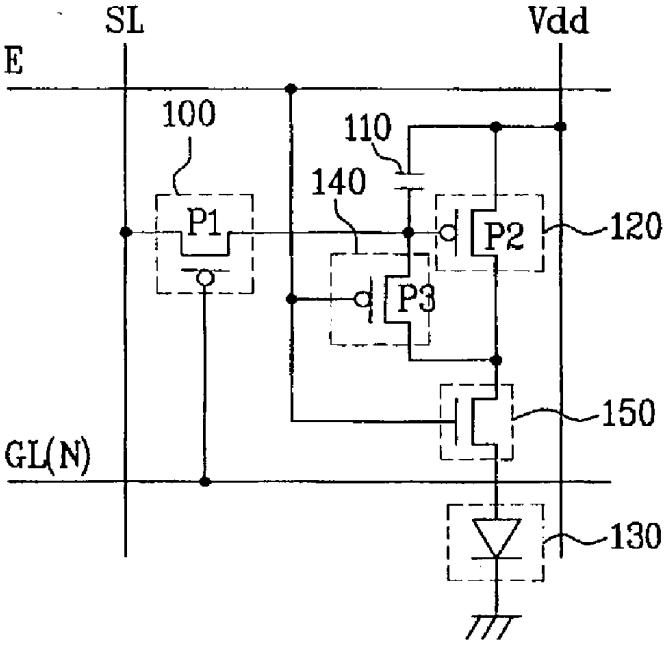

SL
Vdd
E
100
110
140
P1
P2
120
P3
150
GL(N)
130

FIG. 14

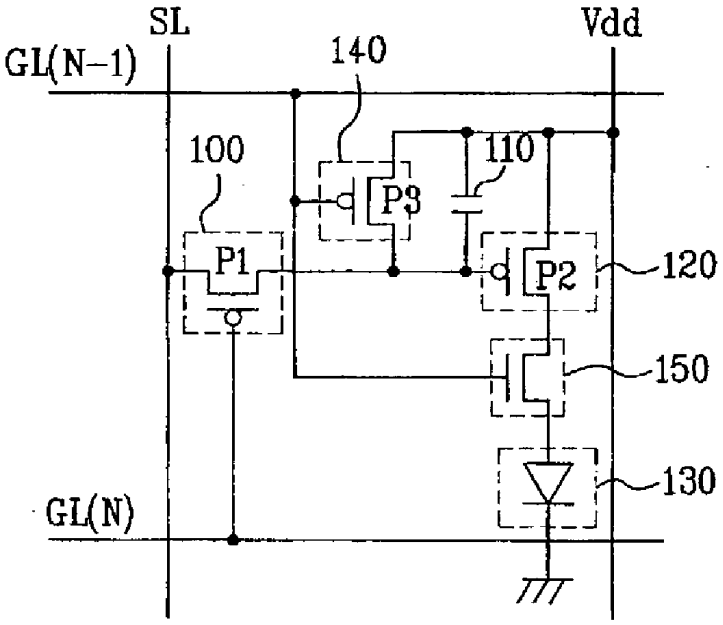

SL
Vdd
GL(N-1)
140
100
110
P3
P1
P2
120
150
130
GL(N)

FIG. 15

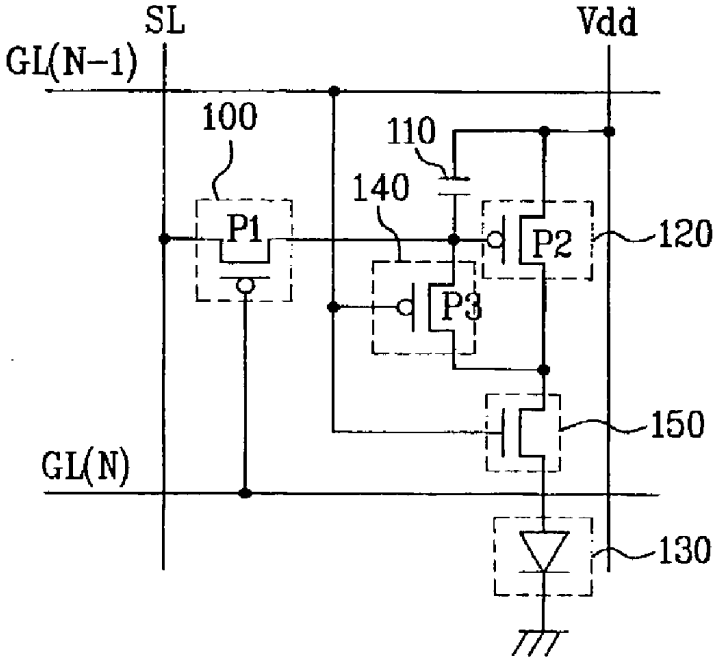

SL
Vdd
GL(N-1)
100
110
140
P1
P2
120
P3
150
GL(N)
130

FIG. 16

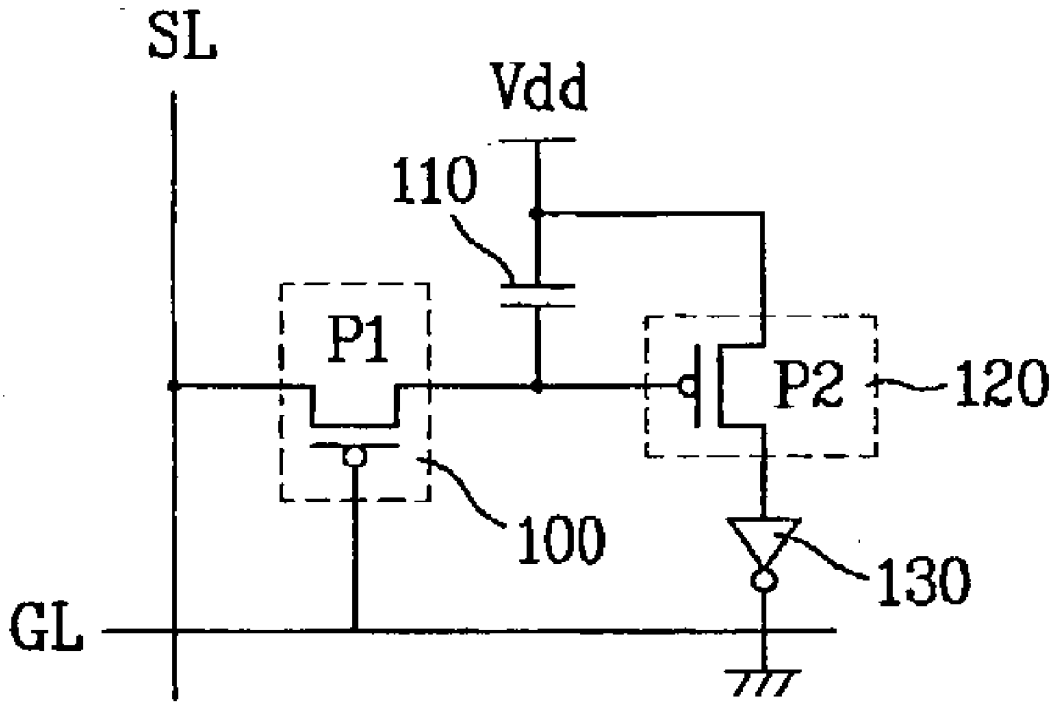
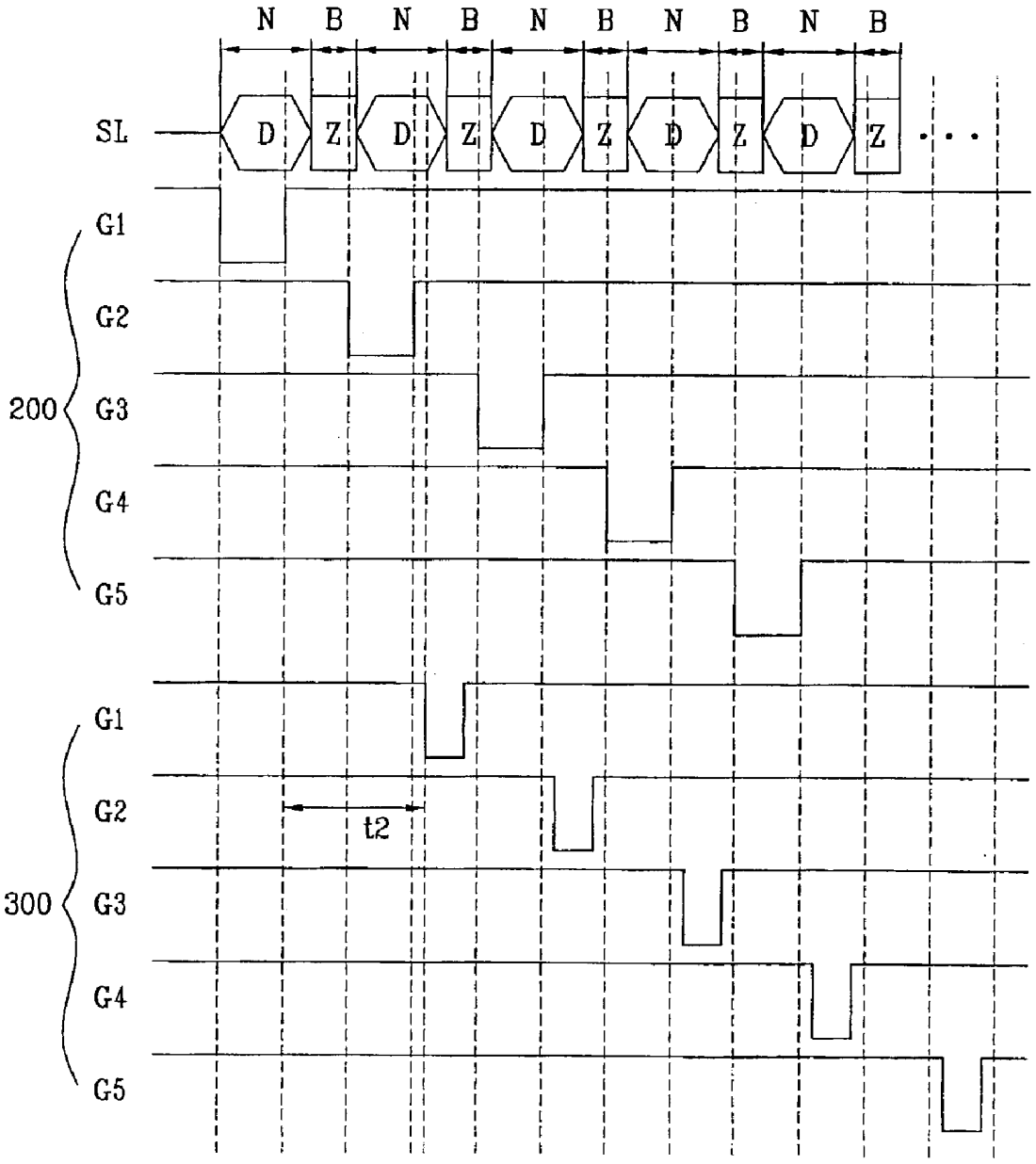


FIG. 17


N
B
N
B
N
B
N
B
N
B
SL
D
Z
D
Z
D
Z
D
Z
D
Z
G1
G2
200
G3
G4
G5
G1
G2
t2
300
G3
G4
G5

ELECTROLUMINESCENT DISPLAY PANEL AND METHOD FOR OPERATING THE SAME

[0001] This application claims the benefit of the Korean Application Nos. P2001-86065 filed on Dec. 27, 2001 and P2001-87831 filed on Dec. 29, 2001, which are hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an electroluminescent device, and more particularly, to an electroluminescent display panel, in which an operation of an electroluminescent device is controlled, for fabricating a high definition display; and a method for operating the same.

[0004] 2. Background of the Related Art

[0005] The electroluminescent device has been given attention as a next generation flat display because in comparison with a passive device which requires reception of light for displaying a picture, the electroluminescent device has advantages of a fast response speed, an excellent luminance as it is an active device, a simple structure permitting easy fabrication, light weight, and a thin and compact size.

[0006] The electroluminescent device has a wide variety of applications, such as liquid crystal display (LCD_ back lights, mobile stations, car navigation systems (CNS), notebook computers, and wall mounting type television (TV) sets.

[0007] In the electroluminescent device, there are inorganic electroluminescent devices, and organic electroluminescent devices according to a material of the electroluminescent device.

[0008] The organic electroluminescent device is a device in which a charge is injected into an organic thin layer between an electron injected electrode and a hole injected electrode, to form one pair of an electron and a hole, which collapse to emit light. The inorganic electroluminescent device is a device in which an electron accelerated by a strong field is collided with a luminescent material, to excite the luminescent material, and to make the luminescent material luminescent as the luminescent material drops down to a base state.

[0009] A related art electroluminescent display panel will be explained. **FIG. 1** illustrates a circuit of unit pixel of a related art electroluminescent display panel.

[0010] Referring to **FIG. 1**, the unit pixel is provided with first and second switching devices **11** and **13** connected to a sourceline SL in series for switching a data signal in response to a signal applied to a gateline GL, a capacitor **15** having a first terminal connected to an output terminal of the second switching device **13**, a second terminal connected to a power source terminal Vdd, for having a data voltage received through the first and second switching devices **11** and **13** charged thereto, a third switching device **17** connected between an output terminal of the first switching device **11** and the second terminal of the capacitor **15**, to be controllable by the voltage induced at the first terminal of the capacitor **15**, and a fourth switching device **19** connected between the power source terminal Vdd and a electroluminescent device **20**, to be switchable by a voltage induced at the first terminal. The first to fourth switching devices **11**, **13**, **17**, and **19** are PMOS transistors.

[0011] The operation of the related art electroluminescent display panel will be explained.

[0012] When an enable signal is provided to the gateline GL, and a sink current is provided to the sourceline SL, a data voltage pertinent to the signal is charged to the capacitor **15** through first and second switching devices **11** and **13**.

[0013] Next, a current pertinent to the current through the third switching device **17** is provided to the electroluminescent device **20** through the fourth switching device **19**, to make the electroluminescent device luminescent for a certain time period.

[0014] Thereafter, even if the gate signal that controls the first and second switching devices **11** and **13** is cut, the electroluminescent device remains luminescent as the data voltage stored in the capacitor is discharged.

[0015] However, the related art electroluminescent display panel has the following problems.

[0016] Pixel sourcelines running throughout the entire region of the electroluminescent display panel have resistance components, and there are parasitic capacitors between the gatelines and the sourcelines, resulting in requiring a long time for storing the data voltage to the capacitor **15** if a weak sink current flows to the sourceline SL to provide a data voltage pertinent to the weak sink current, in the present frame after a prior frame is finished. Accordingly, as shown in **FIG. 2**, blurring of the picture occurs in the present frame ***2f*** after the prior frame is finished, which hinders fabrication of high definition of the electroluminescent display panel.

SUMMARY OF THE INVENTION

[0017] Accordingly, the present invention is directed to an electroluminescent display panel, and a method for operating the same that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0018] An advantage of the present invention is to provide an electroluminescent display panel, and a method for operating the same, in which a data voltage can be charged to a capacitor quickly for displaying a high definition picture.

[0019] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0020] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the electroluminescent display panel having a plurality of unit pixels defined by a plurality of gatelines, and a plurality of sourcelines running perpendicular to each other, the unit pixel including a first switching device responsive to a signal applied to the

gateline for switching a data signal, a capacitor having a first terminal connected to an output terminal of the first switching device, and a second terminal connected to a power source voltage terminal, for having a data voltage provided thereto through the first switching device and charged thereto, a second switching device connected to the power source voltage terminal for being switched by a voltage induced at the first terminal of the capacitor, an electroluminescent part for emitting a light by the power source voltage provided through the second switching device, and a light emission suppressing part connected to the one end of the capacitor for turning off the electroluminescent part for a preset period during a period before the present frame is operated, by receiving an enable signal that causes discharge of the capacitor and discharging a charge stored in the capacitor.

[0021] The first switching device, the second switching device, or the light emission suppressing part includes a PMOS transistor.

[0022] The light emission suppressing part is connected in parallel with the capacitor.

[0023] The light emission suppressing part may be connected between a first terminal and a second terminal of the capacitor, or between an output terminal of the first switching device and an output terminal of the second switching device.

[0024] The enable signal is provided from the light emission suppress drive part which makes to provide a low level pulse to the plurality of gatelines before application of the enable signal.

[0025] The enable signal is a signal enabled by a front end gateline of the plurality of gatelines.

[0026] The electroluminescent display panel further including a third switching device between the second switching device and the electroluminescent part operative in response to the enable signal.

[0027] The third switching device includes an NMOS transistor.

[0028] In another aspect of the present invention, there is provided a method for operating an electroluminescent display panel having a plurality of unit pixels each defined by gatelines and sourcelines, both arranged to cross each other, first and second switching devices, a capacitor, an electroluminescent part, and a light emission suppressing part, including providing an erase signal to the light emission suppressing part for discharging a voltage charged in the capacitor of a prior frame before the present frame is operative, and applying an enable signal to the gateline, and applying a data voltage to the sourceline, for charging the data voltage to the capacitor through the first switching device, and turning on the second switching device to provide a power source voltage to the electroluminescent part to make the electroluminescent part to emit a light for a time period.

[0029] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

[0031] In the drawings:

[0032] **FIG. 1** illustrates a circuit of unit pixel of a related art electroluminescent display panel;

[0033] **FIG. 2** illustrates a timing diagram for explaining a problem of the related art electroluminescent display panel;

[0034] **FIG. 3** illustrates a circuit of an electroluminescent display panel in accordance with a first referred embodiment of the present invention;

[0035] **FIGS. 4 and 5** illustrate operative time diagrams of **FIG. 3**;

[0036] **FIG. 6** illustrates a block diagram of an electroluminescent display panel inclusive of the unit pixel in **FIG. 3**;

[0037] **FIG. 7** illustrates a circuit in accordance with a second embodiment of the present invention;

[0038] **FIG. 8** illustrates an operative time diagram of **FIG. 7**;

[0039] **FIG. 9** illustrates a block diagram of an electroluminescent display panel inclusive of the unit pixel in **FIG. 7**;

[0040] FIGS. **10~15** illustrate circuits in accordance with one of a third to eighth embodiments of the present invention;

[0041] **FIG. 16** illustrates a circuit for applying an operating method in accordance with another embodiment of the present invention; and

[0042] **FIG. 17** illustrates an operative timing diagram for explaining a method for operating an electroluminescent display panel by using the circuit in **FIG. 16** in accordance with the present invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0043] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0044] First Embodiment

[0045] **FIG. 3** illustrates a circuit of an electroluminescent display panel in accordance with a first embodiment of the present invention. **FIGS. 4 and 5** illustrate operative time diagrams of **FIG. 3**. **FIG. 6** illustrates a block diagram of an electroluminescent display panel inclusive of the unit pixel in **FIG. 3**.

[0046] Referring to **FIG. 3, a** plurality of unit pixels are provided, which are defined at every crossing part of a plurality of gatelines GL and sourcelines SL running perpendicular to the gatelines. Only one unit cell is shown in the drawing.

[0047] The unit cell of the electroluminescent display panel in accordance with a first embodiment of the present invention includes a first switching device **100** for switching

a data signal in response to a signal provided to the gateline GL, a capacitor **110** having a first terminal connected to an output terminal of the first switching device **100**, and a second terminal connected to a power source terminal Vdd for having a data voltage received through the first switching device **100** charged thereto, a second switching device **120** connected to the power source terminal for being switched by a voltage induced at the first terminal of the capacitor, an electroluminescent part **130** for emitting light by a voltage from the power source through the second switching device **120**, and a light emission suppressing part **140** for turning off the electroluminescent part **130** for a preset time period by receiving an enable signal E' which makes the capacitor **110** to discharge for a preset time period before the present frame and making a charge stored in the capacitor of a prior frame discharged.

[**0048**] The first and second switching devices **100** and **120**, and the light emission suppressing part **140** include PMOS transistors P1, P2, and P3, respectively.

[**0049**] The light emission suppressing part **140** is connected between the first terminal and the second terminal of the capacitor **110** in parallel with the capacitor **110**. The light emission suppressing part **140** prevents a discharge voltage of the capacitor **110** from transmitting to the electroluminescent part **130** in response to an enable signal generated by the light emission suppress drive part (not shown) which provides a fixed low level pulse before an enable signal is provided to each of the plurality of gatelines.

[**0050**] The light emission suppressing part **140** is applicable to the related art electroluminescent display panel with four thin film transistors (TFTs) also, i.e., the light emission suppressing part **140** is connected between the first and second terminals of the capacitor **15** (see **FIG. 15**) and a separate enable signal E is applied to the light emission suppressing part **140** for driving the light emission driving part **140**.

[**0051**] The operation of the electroluminescent display panel having the foregoing unit pixel will be explained, with reference to a timing diagram.

[**0052**] Referring to **FIGS. 4 and 5**, before operation of the present frame, i.e., before the gate signal is enabled, if the light emission suppress drive part (not shown) provides an erase signal E to the light emission suppressing part **140** on both sides of the capacitor **110**, a voltage charged in the capacitor **110** in a prior frame is discharged fully, such that the electroluminescent part **130** does not emit any more light from the light emission suppressing part **140**.

[**0053**] Then, when the present frame is operated, i.e., when an enable signal is provided to the gateline GL, and a data voltage is provided to the sourceline SL, the data voltage is charged in the capacitor **110** through the first switching device **100** and turns on the second switching device **120**, such that a power is provided from the power source terminal Vdd to the electroluminescent part **130**, to make the electroluminescent part **130** luminescent.

[**0054**] Referring to **FIG. 5**, according to above operation, the data voltage stored in the capacitor **110** in the prior frame If is discharged fully during a certain period after operation of the prior frame If, but before operation of the present frame *2f*, to prevent the electroluminescent part **130** from emitting light, thereby suppressing the blurring of the picture, to improve the picture quality.

[**0055**] When it is assumed that a time period from a time point the electroluminescent part **130** starts to emit light to a time point the erase signal E is provided before the next frame is t1, adjustment of luminance can be made by adjusting t1 which in turn adjusts a light emission period of the electroluminescent part **130**.

[**0056**] Moreover, when it is required to drive the electroluminescent part **130** in a low power mode, t1 is made short, for an effective low power mode operation which matching an overall gray balance.

[**0057**] An entire system of the electroluminescent display panel of the foregoing unit pixel will be explained.

[**0058**] Referring to **FIG. 6**, the electroluminescent display panel includes a system interface part **203** for inducing application of red, green, blue (R, G, B) signals, data signals from a driving system **200**, to the electroluminescent display panel **210**, a timing controller part **205** for receiving the data signal from the system interface part **203** and producing different control signals and data for stable operation of the electroluminescent display panel **210**, a source driving part **207** for converting the data signal from the timing controller part **205** into analog signal, and applying the data signal to the sourcelines SL of the electroluminescent display panel **210**, a gate driving part **209** for receiving a display control signal from the timing controller part **205**, and applying a pulse voltage to the gatelines, a power part **211** for receiving a power from the driving system **200** and applying required power to respective parts, a gamma power source part **213** for receiving a power branched from the power part **211** for producing a reference voltage required for the digital/analog conversion of the source driving part **207**, and a light emission suppress drive part **220** for controlling the light emission suppressing part **140** which turns off the electroluminescent part **130** in the foregoing unit pixel for a preset time period under the control of the timing controller part **205**.

[**0059**] Second Embodiment

[**0060**] **FIG. 7** illustrates a circuit in accordance with a second embodiment of the present invention. **FIG. 8** illustrates an operative time diagram of **FIG. 7**. **FIG. 9** illustrates a block diagram of an electroluminescent display panel inclusive of the unit pixel in **FIG. 7**.

[**0061**] The second embodiment of the present invention is characterized in that an erase signal E, an enable signal of the light emission suppressing part **140**, is enabled by a front gateline GL(N−1) of a plurality of gatelines GL(N). That is, the light emission suppress drive part **220** is not required for controlling the light emission suppressing part **140**, but the light emission suppress part **140** is controlled for itself in initializing the capacitor **110**.

[**0062**] The light emission suppressing part **140** in the second embodiment is applicable to the related art electroluminescent display panel with four TFTs also, i.e., the light emission suppressing part **140** is connected between the first and second terminals of the capacitor **15** (see **FIG. 15**) and a separate enable signal E is applied to the light emission suppressing part **140** for driving the light emission driving part **140**.

[0063] The operation of the electroluminescent display panel of the present invention will be explained, with reference to **FIG. 8**.

[0064] Referring to **FIG. 8**, when a gateline GL(N−1) of a prior stage is enabled, a video signal is stored in a pixel connected to the gateline GL(N−1).

[0065] Then, referring to **FIG. 8**, the pixel connected to the gateline GL(N) drives the light emission suppressing part **140**, to discharge the voltage stored in the capacitor **110** of a prior frame fully, to initialize the capacitor **110**.

[0066] Then, when the gateline GL(N) is enabled and the data voltage is provided to the sourceline SL, the data voltage is charged to the capacitor **110** through the first switching device **100**, and, at the same time, turns on the second switching device **120** such that the electroluminescent part **130** emits light for a time period as a power is provided thereto from the power source terminal VDD.

[0067] **FIG. 9** illustrates a block diagram of an electroluminescent display panel of the unit pixel in **FIG. 7**, wherefrom the light emission suppress drive part **220** in **FIG. 6** is omitted. That is, the erase signal 'E', an enable signal form the light emission suppressing part **140**, is enabled by a front end gateline GL(N−1) of the plurality of gatelines GL(N), the light emission suppress drive part **220** shown in **FIG. 6** is not required.

[0068] Third Embodiment

[0069] **FIG. 10** illustrates a circuit in accordance with a third embodiment of the present invention, of which timing diagram is the same with **FIG. 4**.

[0070] Referring to **FIG. 10**, the electroluminescent display panel in accordance with a third embodiment of the present invention is identical to the first embodiment, except that the light emission suppressing part **140** is connected between an output terminal of the first switching device **100** and an output terminal of the second switching device **120**.

[0071] In the electroluminescent display panel, before the present frame is operated, i.e., before the gate signal is enabled, if the light emission suppress drive part (not shown) provides an erase signal E to the light emission suppressing part **140**, the light emission drive part **140** comes into operation, to initialize a data voltage stored in the capacitor **110** of a prior frame to a value in the vicinity of a threshold voltage of the second switching device **120**, thereby suppressing the light emission of the electroluminescent part **130**.

[0072] Then, when the present frame is operated, i.e., when the gateline GL is enabled and a data voltage, for an example, a video signal with a low luminance, is provided to the sourceline SL, though the charging to the capacitor takes a long time period in the related art, the data voltage can be charged to the capacitor **110** quickly in the embodiment of the present invention, thereby permitting fabrication of a high definition electroluminescent display panel.

[0073] The electroluminescent suppressing part **140** in accordance with a third embodiment of the present invention is applicable to the related art electroluminescent display panel having 4-TFT structure.

[0074] Fourth Embodiment

[0075] **FIG. 11** illustrates a circuit in accordance with a fourth embodiment of the present invention, of which timing diagram is the same with **FIG. 8**.

[0076] Referring to **FIG. 11**, the fourth embodiment is a combination of the embodiments explained in association with **FIGS. 7 and 10**.

[0077] That is, the light emission suppressing part **140** is connected between an output terminal of the first switching device **100** and an output terminal of the second switching device **120**, and the erase signal E, an enable signal from the light emission suppressing part **140**, is enabled by a front end gateline GL(N−1) of a plurality of gatelines GL(N).

[0078] The light emission suppressing part **140** in the fourth embodiment is applicable to the related art electroluminescent display panel with four TFTs, also.

[0079] Fifth to Eighth Embodiments

[0080] FIGS. **12~15** illustrate circuit diagrams in accordance with fifth to eighth embodiments of the present invention, respectively.

[0081] The electroluminescent display panel in accordance with fifth to eighth embodiments of the present invention further include third switching device to the electroluminescent display panel in accordance with first to fourth embodiments of the present invention, respectively.

[0082] The third switching device **150** is driven in response to a signal 'E' or GL(N−1)' the same with the light emission suppressing part **140**, and fitted between the second switching device **120** and the electroluminescent part **130**.

[0083] The third switching device **150** is an NMOS transistor, for being turned off when the light emission suppressing part is driven, and for being turned on when the light emission suppressing part **140** is not driven, for more effective control of the electroluminescent part **130**.

[0084] The light emission suppressing part **140** and the third switching device in one of the fifth to eight embodiments is applicable to the related art electroluminescent display panel with four TFTs, also.

[0085] Another Embodiment of the Operating Method

[0086] **FIG. 16** illustrates a circuit for applying an operating method in accordance with another embodiment of the present invention. **FIG. 17** illustrates an operative timing diagram for explaining a method for operating an electroluminescent display panel by using the circuit in **FIG. 16** in accordance with the present invention.

[0087] Referring to **FIG. 16**, the electroluminescent display panel for applying the another embodiment operating method of the present invention includes a matrix of a plurality of unit pixels defined by a plurality of gatelines GL running in a horizontal direction and a plurality of sourcelines SL running in a vertical direction to cross the gatelines GL.

[0088] Only one unit pixel is shown in the drawing. Though not shown, there are a gate driving part at a side of the electroluminescent display panel for enabling the gatelines GL, a data driving part on the panel for enabling the

datalines SL, and a timing controller part for providing signals for enabling the gate driving part and the data driving part.

[0089] The electroluminescent display panel includes a first switching device **100** for switching the data signal in response to a signal provided to the gateline GL in the unit pixel, a capacitor **110** having a first terminal connected to an output terminal of the first switching device **100**, and a second terminal connected to a power source terminal Vdd, for being charged by a data voltage received through the first switching device **100**, a second switching device **120** connected to the power source terminal for being switched by a voltage induced at the first terminal of the capacitor **110**, and an electroluminescent part **130** for emitting a light by a voltage through the second switching device **120**.

[0090] The first, and second switching devices **100** and **200** are PMOS transistors P1 and P2, respectively.

[0091] A method for operating an electroluminescent display panel of the present invention explained hereafter is by using a circuit in **FIG. 16** which has no separate light suppressing part. Operation of the electroluminescent display panel having a unit pixel as shown in **FIG. 16** will be explained, with reference to a timing diagram.

[0092] Referring to **FIG. 17**, in application of a data voltage, i.e., a video picture signal to the sourceline SL, a normal period 'N' and a black data period 'B' are designated, and a real data voltage 'D' is applied to the normal period 'N', and a black data voltage 'Z' is applied to the black data period 'B'.

[0093] The normal period 'N' and the black data period 'B' may be set up by timing control of the timing controller (not shown) which provides signals required for the gate driving part and the data driving part.

[0094] The black data voltage 'Z', for turning off the second switching device **120**, is a voltage that can discharge the capacitor **110** at fixed intervals, preferably in a range from (a power source voltage—a threshold voltage of the second switching device) to (the power source voltage).

[0095] The operation will be explained in more detail. The gate driving part provides gate signals G**1**~G**5** to the plurality of gatelines GL progressively for turning on the first switching devices **100**, and the data driving part provides a real data signal 'D' to the electroluminescent display panel through the first switching devices **100** driven by the gate signals G**1**~G**5**. Then, as a charge for the real data signal D is charged to the capacitor **110**, the second switching device **120** is turned on, to make the electroluminescent part **130** to emit a light for a time period.

[0096] In the method for operating an electroluminescent display panel in accordance with a preferred embodiment of the present invention, every frame is divided into a normal period 'N' and a black data period 'B', to which a real data voltage 'D' and a black data voltage 'Z' are applied.

[0097] Each of the gate signals G**1**~G**5** is divided into a first gate signal **200** and a second gate signal **300**, and loaded on the gateline GL, and the first gate signal **200** is applied to the normal period 'N' and the second gate signal **300** is applied to the black data period 'B'.

[0098] The real data voltage D is applied to the sourceline in the normal period N and the black data voltage Z is applied to the sourceline in the black data period B. The electroluminescent display panel displays a picture while turning off the electroluminescent part **130** repeatedly at fixed intervals.

[0099] When it is assumed that a time period from a time point the electroluminescent part **130** starts to emit a light, i.e., a time point the first gate signal **200** is applied, to a time point the electroluminescent part **130** is turned off, i.e., the second gate signal is applied, is t2, a luminance control is possible by controlling the time period t2, that in turn controls a light emitting time period of the electroluminescent part **130**.

[0100] When it is required to drive the electroluminescent part **130** in a low power mode, the t2 time period is controlled to be short, for making an effective low power mode driving while matching an overall gray scale balance.

[0101] As has been explained, the electroluminescent display panel, and a method for operating the same of the present invention have the following advantages.

[0102] First, by preventing light emission of the electroluminescent part **130** by full discharge of the data voltage stored in the capacitor **110** of a prior frame during a period after operation of the prior frame **1***f*, but before the operation of the present frame **2***f*, blurring on the screen can be suppressed, thereby improving a picture quality.

[0103] Second, the controlling of a light emission period of the electroluminescent part **130** by controlling a time period t1 until an erase signal E is provided before the next frame permits control of a luminance.

[0104] Third, when a low power mode driver of the electroluminescent part **130** is required, the t1 time period is controlled to be short, for making an effective low power mode drive while matching an overall gray scale balance.

[0105] A high definition electroluminescent display panel can be fabricated, which can make the capacitor charges a data voltage quickly and display if a video signal with a low luminance is provided in the present frame.

[0106] It will be apparent to those skilled in the art that various modifications and variations can be made in the device for controlling spreading of liquid crystal, and method for fabricating an LCD of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An electroluminescent display panel having a plurality of unit pixels defined by a plurality of gatelines, and a plurality of sourcelines running perpendicular to each other, the unit pixel comprising:

a first switching device responsive to a signal applied to the gateline for switching a data signal;

a capacitor having a first terminal connected to an output terminal of the first switching device, and a second terminal connected to a power source voltage terminal, for having a data voltage provided thereto through the first switching device and charged thereto;

a second switching device connected to the power source voltage terminal for being switched by a voltage induced at the first terminal of the capacitor;

an electroluminescent part for emitting a light by the power source voltage provided through the second switching device; and

a light emission suppressing part connected to the one end of the capacitor for turning off the electroluminescent part for a preset period during a period before the present frame is operated, by receiving an enable signal that causes discharge of the capacitor and discharging a charge stored in the capacitor.

2. An electroluminescent display panel as claimed in claim 1, wherein the first switching device, the second switching device, and the light emission suppressing part includes a first type transistor.

3. An electroluminescent display panel as claimed in claim 2, wherein the first type transistor is a PMOS transistor.

4. An electroluminescent display panel as claimed in claim 1, wherein the light emission suppressing part is connected in parallel with the capacitor.

5. An electroluminescent display panel as claimed in claim 1, wherein the light emission suppressing part is connected between a first terminal and a second terminal of the capacitor.

6. An electroluminescent display panel as claimed in claim 1, wherein the light emission suppressing part is connected between an output terminal of the first switching device and an output terminal of the second switching device.

7. An electroluminescent display panel as claimed in claim 1, wherein the enable signal is provided from the light emission suppress drive part which provides a low level pulse to the plurality of gatelines before application of the enable signal.

8. An electroluminescent display panel as claimed in claim 1, wherein the enable signal is a signal enabled by a front end gateline of the plurality of gatelines.

9. An electroluminescent display panel as claimed in claim 1, further comprising a third switching device between the second switching device and the electroluminescent part operative in response to the enable signal.

10. An electroluminescent display panel as claimed in claim 9, wherein the third switching device includes a second type transistor.

11. An electroluminescent display panel as claimed in claim 10, wherein the second type transistor is an NMOS transistor.

11. A method for operating an electroluminescent display panel having a plurality of unit pixels each defined by gatelines and sourcelines, both arranged to cross each other, first and second switching devices, a capacitor, an electroluminescent part, and a light emission suppressing part, the method comprising:

providing an erase signal to the light emission suppressing part for discharging a voltage charged in the capacitor of a prior frame before the present frame is operative; and

applying an enable signal to the gateline and applying a data voltage to the sourceline, for charging the data voltage to the capacitor through the first switching device, and turning on the second switching device to provide a power source voltage to the electroluminescent part to make the electroluminescent part to emit a light for a time period.

12. A method as claimed in claim 11, wherein the first and second switching devices are PMOS transistors.

13. A method for operating an electroluminescent display panel having a plurality of unit pixels, gatelines and sourcelines, both arranged to cross each other, a first switching device for switching a data signal in response to a signal provided to the gateline, a capacitor for having a data voltage provided through the first switching device and charged thereto, a second switching device connected to a power source voltage terminal for being switched by a voltage induced at the capacitor, an electroluminescent part for emitting a light by a power source voltage provided through the second switching device, the method comprising:

applying a data voltage to the sourceline, dividing each frame into a normal period and a black period, and applying a real data in the normal period and applying a black data voltage in the black data period;

enabling gatelines of the plurality of unit pixels progressively in the normal period and the black data period; and

in the enabling of the gatelines, applying the black data voltage to the gatelines in the black data period, for displaying a picture while turning off the electroluminescent part repeatedly at fixed intervals.

14. A method as claimed in claim 13, wherein the gate signal is loaded on the gateline, with the gate signal divided into a first gate signal and a second gate signal.

15. as claimed in claim 13, wherein the first gate signal is applied to the normal period, and the second gate signal is applied to the black data period.

16. A method as claimed in claim 13, wherein the black data voltage is a voltage for turning off the second switching device.

17. A method as claimed in claim 16, wherein the black data voltage is a voltage ranging from one of the power source voltage, to a threshold voltage of the second switching device, and to the power source voltage.

* * * * *

专利名称(译)	电致发光显示面板及其操作方法		
公开(公告)号	US20030197663A1	公开(公告)日	2003-10-23
申请号	US10/329473	申请日	2002-12-27
[标]申请(专利权)人(译)	李晗唱的 李明博HO PARK JOON KYU		
申请(专利权)人(译)	李晗唱的 李明博HO PARK JOON KYU		
当前申请(专利权)人(译)	李晗唱的 李明博HO PARK JOON KYU		
[标]发明人	LEE HAN SANG LEE MYUNG HO PARK JOON KYU		
发明人	LEE, HAN SANG LEE, MYUNG HO PARK, JOON KYU		
IPC分类号	G09G3/32 G09G3/30		
CPC分类号	G09G3/3233 G09G2300/0819 G09G2300/0842 G09G2320/043 G09G2310/0251 G09G2320/0261 G09G2300/0861		
优先权	1020010086065 2001-12-27 KR 1020010087831 2001-12-29 KR		
其他公开文献	US7324074		
外部链接	Espacenet USPTO		

摘要(译)

电致发光显示面板及其操作方法。电致发光显示面板具有由多个栅极线限定的多个单位像素，以及彼此垂直延伸的多个源极线，单位像素包括第一开关装置，电容器具有连接到第一开关装置的输出端子的第一端子。第一开关装置，连接到电源电压端子的第二端子，连接到电源电压端子的第二开关装置，电致发光部分，以及连接到电容器一端的发光抑制部分，用于关闭电源电压端子通过接收使电容器放电并释放存储在电容器中的电荷的使能信号，在操作当前帧之前的时段期间的预设时段内的电致发光部分，从而制造高清晰度显示器。