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(54) **PIXEL CIRCUIT AND DISPLAY DEVICE**

PIXELSCHALTUNG UND ANZEIGEVORRICHTUNG

CIRCUIT DE PIXELS ET DISPOSITIF D’AFFICHAGE

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Description

TECHNICAL FIELD OF THE DISCLOSURE

[0001] The present disclosure relates to a pixel circuit and display apparatus.

BACKGROUND

[0002] Nowadays, organic light emitting displays (OLED) have become one of the hotspots in the study field of flat panel displays. Compared with liquid crystal displays, OLED has the advantages of low power consumption, low production cost, self light emitting, wide viewing angle and fast response and so on. Currently, OLED has begun to replace the traditional liquid crystal displays (LCD) in the display areas such as mobile-phones, PDAs and digital cameras. Pixel driving circuit design is the core technical content of OLED displays and has important meaning for the study.

[0003] OLED is current-driven and needs a stable current to control light emission, which is different from the TFT (Thin Film Transistor)-LCD that uses a stable voltage to control brightness.

[0004] Due to process technology, device aging and other reasons, in the original 2T1C driving circuit (comprising two thin film transistors and one capacitor), the threshold voltages of driving TFTs at each pixel are not uniform, which causes changes in the current flowing through the OLED at each pixel so that the display brightness are not uniform, thus affecting the display effect of the entire image.

[0005] In the known technology, one pixel circuit generally corresponds to one pixel. Each pixel circuit comprises at least one data voltage line, one operating voltage line and a plurality of scanning signal lines, which causes the corresponding production process more complicated, and not conducive to reducing the pixel pitch. Document JP2009204664 discloses an OLED pixel circuit comprising two subpixels that shares data line, emission line and one control line in order to increase aperture ratio. The structure of every subpixel is very different to the present application even if they share the same control lines and in consequence the driving of the control lines is also different.

[0006] Document CN103000134 discloses the same OLED pixel structure than each of the subpixels sharing a common pixel circuit in the present application. Sharing of control lines with adjacent pixel is not mentioned.

SUMMARY

[0007] The present disclosure can solve the problem of non-uniformity in the display brightness of a display apparatus, and reduce the number of signal lines for pixel circuits in the display apparatus as well as the IC costs, while increasing the pixel density of the display apparatus.

[0008] According to one aspect of the present disclosure, there is provided a pixel circuit comprising two sub-pixel circuits; each sub-pixel circuit comprises a first switch unit, a second switch unit, a third switch element, a fourth switch unit, a fifth switch unit, a driving unit, an energy storage unit, and an electroluminescent unit; a first terminal of the first switch unit is connected to an operating voltage line, a second terminal of the first switch unit is connected to an input of the driving unit, and the first switch unit is configured to provide an operating voltage to the driving unit under the control of a scanning signal line connected to a control terminal of the first switch unit; a first terminal of the second switch unit is connected to an output of the driving unit, a second terminal of the second switch unit is connected to the electroluminescent element, and the second switch unit is configured to introduce a driving current provided by the driving unit into the electroluminescent element under the control of a scanning signal line connected to a control terminal of the second switch unit; a first terminal of the third switch unit is connected to a data voltage line, a second terminal of the third switch unit is connected to the input of the driving unit, and the third switch unit is configured to connect the input of the driving unit to the data voltage line under the control of a scanning signal line connected to a control terminal of the third switch unit; a first terminal of the fourth switch unit is connected to the output of the driving unit, a second terminal of the fourth switch unit is connected to a first terminal of the energy storage unit and a control terminal of the driving unit, and the fourth switch unit is configured to make the output terminal of the driving unit and the control terminal of the driving unit conductive and charge the first terminal of the energy storage unit with the voltage at the output of the driving unit under the control of a scanning signal line connected to a control terminal of the fourth switch unit; a first terminal of the fifth switch unit is connected to the first terminal of the energy storage unit, a second terminal of the fifth switch unit is grounded, and the fifth switch unit is configured to set the voltage at the first terminal of the energy storage unit to zero under the control of a scanning signal line connected to a control terminal of the fifth switch unit; and in the two sub-pixel circuits, the first terminals of the third switch units are connected to the same data voltage line, the control terminals of the first switch units and the second switch units are all connected to a third scanning signal line, the control terminals of the fifth switch units are connected to a fourth scanning signal line; the control terminals of the third switch unit and the fourth switch unit in the first sub-pixel circuit are both connected to a first scanning signal line; and the control terminals of the third switch unit and the fourth switch unit in the second sub-pixel circuit are both connected to a second scanning signal line.

[0009] In some embodiments, each of the switch units and each of the driving units are thin film transistors. The control terminal of each switch unit is a gate of the thin film transistor, the first terminal of each switch unit is a

source of the thin film transistor, and the second terminal of each switch unit is a drain of the thin film transistor. The control terminal of each driving unit is a gate of the thin film transistor, the input of each driving unit is a source of the thin film transistor, and the output of each driving unit is a drain of the thin film transistor.

[0010] In some embodiments, each of the thin film transistors is of P-channel type.

[0011] In some embodiments, the energy storage unit is a capacitor.

[0012] In some embodiments, the electroluminescent unit is an organic light emitting diode.

[0013] The present disclosure also provides a display apparatus characterized in that it comprises the pixel circuit according to any one of the foregoing.

[0014] In some embodiments, the two sub-pixel circuits are positioned within two adjacent pixels respectively.

[0015] In some embodiments, the two adjacent pixels are positioned on both sides of the data voltage line respectively.

[0016] In some embodiments, the two adjacent pixels are positioned on the same side of the data voltage line.

[0017] In the pixel circuit provided by the present disclosure, the operating current flowing through the electroluminescent unit is not affected by the threshold voltage of the corresponding driving transistor, which completely solves the problem of non-uniformity in the display brightness due to drifting of the threshold voltage of the driving transistor. Meanwhile, in the present disclosure, one compensation circuit is used to drive two pixels, and two adjacent pixels share a plurality of signal lines, which can reduce the number of signal lines for pixel circuits in a display apparatus as well as the IC costs, decrease the pixel pitch, and increase the pixel density.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a schematic structural diagram of a pixel circuit provided by an embodiment of the present disclosure;

Figure 2 is a time sequence diagram of key signals in the pixel circuit provided by the embodiment of the present disclosure;

Figures 3 (a)-3 (d) are schematic diagrams of current flow directions and voltage values of the pixel circuit in the embodiment of the present disclosure at different timings;

Figure 4 is a schematic diagram of a positional relationship between pixel circuits and pixels in a display apparatus provided by an embodiment of the present disclosure;

Figure 5 is a schematic diagram of another positional relationship between pixel circuits and pixels in a display apparatus provided by an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0019] In the following, implementations of the present disclosure are further described in connection with figures and embodiments. The following embodiments are only for illustrating the technical solutions of the present disclosure more clearly, but not for limiting the protection scope of the present disclosure.

[0020] An embodiment of the present disclosure provides a pixel circuit. As shown in Fig.1 or Figs 3(a)-3(d), the pixel circuit comprises two sub-pixel circuits P1 and P2 of the same structure, and each of the sub-pixel circuit corresponds to one pixel. As P1 and P2 are of the same structure, in the following, descriptions on the two sub-pixel circuits will be made only in connection with the structure of P1.

[0021] P1 herein comprises five switch units T1, T2, T3, T4 and T5, one driving unit DT, one energy storage unit C and one electroluminescent unit L (in order to facilitate the distinction, in Fig.1 or Fig. 3, for P2, the five switch units are represented as T1', T2', T3', T4' and T5' respectively, the driving unit is represented as DT', the energy storage unit is represented as C' and the electroluminescent unit is represented as L', same below). In addition, control terminals of T1 and T2 are both connected to a third scanning signal line Scan[3]. A first terminal of T1 is connected to an operating voltage line Vdd, a second terminal of T1 is connected to an input of DT, and T1 is configured to provide an operating voltage to the driving unit DT under the control of the scanning signal line connected to the control terminal of T1; a first terminal of T2 is connected to an output of DT, a second terminal of T2 is connected to L, and T2 is configured to introduce a driving current provided by the driving unit DT into the electroluminescent element L under the control of a scanning signal line connected to the control terminal of T2; a first terminal of T3 is connected to a data voltage line Vdata, a second terminal of T3 is connected to the input of DT, and T3 is configured to connect the input of the driving unit to the data voltage line Vdata under the control of the scanning signal line connected to the control terminal of T3; a first terminal of T4 is connected to the output of DT, a second terminal of T4 is connected to a first terminal a1 of C and a control terminal of DT (for C', its first terminal is a2 and second terminal is b2), and T4 is configured to make the output terminal of the driving unit DT and the control terminal of the driving unit DT conductive and charge the first terminal of the energy storage unit C with the voltage at the output of the driving unit DT under the control of the scanning signal line connected to the control terminal of T4; a first terminal of T5 is connected to terminal a1 of C, a second terminal of T5 is connected to a second terminal b1 of C, and T5 is configured to set the voltage at the first terminal of the energy storage unit C to zero under the control of the scanning signal line connected to the control terminal of T5; and in the two sub-pixel circuits, the first terminals of T3 and T3' are connected to the same data voltage

line Vdata, the control terminals of the first switch units and the second switch units are all connected to a third scanning signal line Scan[3], the control terminals of the fifth switch units are connected to a fourth scanning signal line Em; the control terminals of the third switch unit and the fourth switch unit in the first sub-pixel circuit are both connected to a first scanning signal line Scan[1]; and the control terminals of the third switch unit and the fourth switch unit in the second sub-pixel circuit are both connected to a second scanning signal line Scan [2].

[0022] It will be appreciated that two switch units whose control terminals are connected to the same scanning signal line (such as T1 and T1', T3 and T4, T3' and T4', T5 and T5') should be switches of the same channel type, i.e., both turned on by a high voltage level or both turned on by a low voltage level, thus ensuring the turn-on or turn-off states of the two switch units connected to the same scanning signal line are identical.

[0023] In the pixel circuit provided by the embodiment of the present disclosure, the operating current flowing through the electroluminescent unit is not affected by the threshold voltage of the corresponding driving transistor, which completely solves the problem of non-uniformity in the display brightness due to drifting of the threshold voltage of the driving transistor. Meanwhile, in the embodiment of the present disclosure, one compensation circuit is used to drive two pixels, and two adjacent pixels share a plurality of signal lines, which can reduce the number of signal lines for pixel circuits in a display apparatus as well as the IC costs, decrease the pixel pitch, and increase the pixel density.

[0024] In some embodiments, each of the switch units and each of the driving units are thin film transistors. The control terminal of each switch unit is a gate of the thin film transistor, the first terminal of each switch unit is a source of the thin film transistor, and the second terminal of each switch unit is a drain of the thin film transistor. The control terminal of each driving unit is a gate of the thin film transistor, the input of each driving unit is a source of the thin film transistor, and the output of each driving unit is a drain of the thin film transistor.

[0025] Understandably, the transistors herein corresponding to the driving units and the switch units may be transistors whose source and drain are interchangeable, or depending on the type of conduction, the first terminals of each switch unit and each driving unit may be drains of the transistors and the second terminals thereof may be sources. Circuit structures made by the skilled in the art without creative work, which are obtained by reversing the sources and drains of respective transistors in the pixel circuit provided by the present disclosure and which can achieve the same or similar technical effects as the technical solutions provided by the present disclosure, should fall within the protection scope of the present disclosure.

[0026] Further, in the embodiments of the present disclosure, each of the thin film transistors is of P-channel type. By using the same type of transistors, it is possible

to unify production process, thereby improving the product yield. The skilled in the art will understand that, in practice, the types of respective transistors may not be identical. For example, T1 may be a N-channel transistor, while T2 may be a P-channel transistor. As long as the turn-on/turn-off states of the two switch units whose control terminals are connected to the same scanning signal line are identical, the technical solution provided by the present application can be realized. The exemplary embodiments of the present disclosure should not be construed as limiting the protection scope of the present disclosure.

[0027] In some embodiments, the energy storage unit C is a capacitor. Of course, in practice, other elements with energy storage function can also be adopted according to the design requirements.

[0028] In some embodiments, the electroluminescent unit L can be an organic light emitting diode (OLED). Of course, other elements with electroluminescent function can also be adopted according to the design requirements.

[0029] Referring to Figures 2 and 3, the work principle of the pixel circuit provided by an exemplary embodiment of the present disclosure will now be described in details.

Figure 2 shows a time sequence diagram of scanning signals input into respective scanning signal lines when the pixel circuit provided by the present disclosure is working. The time sequence diagram can be divided into four stages, which are shown in Fig.2 respectively as a reset stage W1, a first charging stage W2, a second charging stage W3 and a light emitting stage W4. In each stage, the current flow directions and voltage values of the pixel circuit are shown in Fig.3 (a), Fig. 3(b), Fig. 3(c) and Fig.3 (d) respectively. To facilitate explanation, further descriptions will be made given that the respective switch units and driving units are TFTs of P-channel type and the second terminals b1 and b2 of the two capacitors are grounded.

[0030] In the reset stage W1, as shown in Fig.2, among the scanning signal lines, only Em is at low voltage level, and the other scanning signal lines are at high voltage levels. At this time, only T5 and T5' are turned on, and the other TFTs are turned off. As shown in Fig.3(a), at this point, both terminals of capacitor C and both terminals of capacitor C' are grounded, and potentials at points a1, a2, b1, b2 are all zero.

[0031] In the first charging stage W2, as shown in Fig.2, among the scanning signal lines, only Scan[1] is at low voltage level, and the other scanning signal lines are at high voltage levels. The data voltage $V_{data} = V1$, and V1 is a voltage corresponding to the organic light emitting diode L. At this time, only T3, T4 and DT are turned on, the other switch TFTs are turned off, and the current charges the energy storage unit C in P1 along Lb in Fig. 3(b). After the charging is completed, the potential at point a1 equals to $V1 - V_{th1}$ (satisfying that the voltage difference between the gate and source of DT is V_{th1} , wherein Vth1 is the threshold voltage of DT).

[0032] In the second charging stage W3, as shown in Fig.2, among the scanning signal lines, only Scan[2] is at low voltage level, and the other scanning signal lines are at high voltage levels. Data voltage $V_{data} = V_2$, wherein V_2 is the voltage corresponding to organic light emitting diode L'. At this time, only T3', T4' and DT' are turned on, the other switch TFTs are turned off, and the current charges the energy storage unit C' in P2 along Lc in Fig.3 (c). After the charging is completed, the potential at point a2 equals to $V_2 - V_{th2}$ (satisfying that the voltage difference between the gate and source of DT' is V_{th2} , wherein V_{th2} is the threshold voltage of DT').

[0033] In the light emitting stage W4, as shown in Fig.2, among the scanning signal lines, only Scan[3] is at low voltage level, and the other scanning signal lines are at high voltage levels. At this time, T1, T2, T1', T2', DT and DT' are turned on, the other TFTs are turned off, Vdd supplies current to L and L' respectively along Ld1 and Ld2 in Fig. 3(d), making L and L' emit light.

[0034] According to the saturation current formula, at this point the current flowing through L is $I_L = K(V_{GS} - V_{th1})^2 = [V_{dd} - (V_1 - V_{th1}) - V_{th1}]^2 = K(V_{dd} - V_1)^2$.

[0035] Similarly, $I_{L'} = K(V_{dd} - V_2)^2$. As can be seen from the above formula, at this time, the operating current flowing through the two electroluminescent units is not affected by the threshold voltages of the driving transistors, and is only related to the data voltage V_{data} . The problem of threshold voltage (V_{th}) drift of the driving TFT due to the process technology and the long-time operation is completely solved, thus eliminating its influence on the current flowing through the electroluminescent unit, and ensuring the normal operation of the electroluminescent unit.

[0036] Based on the same concept, the present disclosure also provides a display apparatus comprising the pixel circuit of any one of the foregoing. The display apparatus can be any products or means with a display function, such as electronic paper, mobile phones, tablets, televisions, displays, notebook computers, digital photo frames and navigators, etc.

[0037] In some embodiments, in the display apparatus, the two sub-pixel circuits of the pixel circuit are positioned within two adjacent pixels respectively. In this way, components and parts can be distributed more uniformly on the respective substrates.

[0038] In some embodiments, the two adjacent pixels are positioned on the same side of their data voltage line. Fig.4 shows a case in which two adjacent pixels corresponding to one pixel circuit PU are at one side of the their corresponding data voltage line V_{data} . Alternatively, the two adjacent pixels are positioned on both sides of their data voltage line respectively. Fig.5 shows a case in which two adjacent pixels corresponding to one pixel circuit PU are at both sides of the their corresponding data voltage line V_{data} .

[0039] The above descriptions are only preferred implementations of the present disclosure. It should be noted that an ordinary skilled person in the art can also make

a number of improvements and modifications without departing from the scope of the present invention and these improvements and modifications should also be considered as within the protection scope of the present disclosure.

[0040] The present application claims the priority of Chinese Patent Application No. 201410274190.6 filed on June 18, 2014.

Claims

1. A pixel circuit comprising two sub-pixel circuits, wherein each sub-pixel circuit comprises a first switch unit, a second switch unit, a third switch unit, a fourth switch unit, a fifth switch unit, a driving unit, an energy storage unit and an electroluminescent unit; and a first terminal of the first switch unit is connected to an operating voltage line, a second terminal of the first switch unit is connected to an input of the driving unit, and the first switch unit is configured to provide an operating voltage to the driving unit under the control of a scanning signal line connected to a control terminal of the first switch unit; a first terminal of the second switch unit is connected to an output of the driving unit, a second terminal of the second switch unit is connected to the electroluminescent unit, and the second switch unit is configured to introduce a driving current provided by the driving unit into the electroluminescent unit under the control of a scanning signal line connected to a control terminal of the second switch unit; a first terminal of the third switch unit is connected to a data voltage line, a second terminal of the third switch unit is connected to the input of the driving unit, and the third switch unit is configured to connect the input of the driving unit to the data voltage line under the control of a scanning signal line connected to a control terminal of the third switch unit; a first terminal of the fourth switch unit is connected to the output of the driving unit, a second terminal of the fourth switch unit is connected to a first terminal of the energy storage unit and a control terminal of the driving unit, and the fourth switch unit is configured to make the output terminal of the driving unit and the control terminal of the driving unit conductive and charge the first terminal of the energy storage unit with the voltage at the output of the driving unit under the control of a scanning signal line connected to a control terminal of the fourth switch unit; a first terminal of the fifth switch unit is connected to the first terminal of the energy storage unit, a second terminal of the fifth switch unit is grounded, and the fifth switch unit is configured to set the voltage at the first terminal of the energy storage unit to zero under the control of a scanning signal line connected to a control terminal of the fifth switch unit; and

- in the two sub-pixel circuits, the first terminals of the third switch units are connected to the same data voltage line, the control terminals of the first switch units and the second switch units are all connected to a third scanning signal line, the control terminals of the fifth switch units are connected to a fourth scanning signal line, the control terminals of the third switch unit and the fourth switch unit in the first sub-pixel circuit are both connected to a first scanning signal line, and the control terminals of the third switch unit and the fourth switch unit in the second sub-pixel circuit are both connected to a second scanning signal line.
2. The pixel circuit according to claim 1, wherein two switch units whose control terminals are connected to the same scanning signal line are switches of the same channel type, so that the turn-on or turn-off states of the two switch units connected to the same scanning signal line are identical.
 3. The pixel circuit according to claim 1 or 2, wherein each of the switch units and each of the driving units are thin film transistors, the control terminal of each switch unit is a gate of the thin film transistor, the first terminal of each switch unit is a source of the thin film transistor, and the second terminal of each switch unit is a drain of the thin film transistor; the control terminal of each driving unit is a gate of the thin film transistor, the input of each driving unit is a source of the thin film transistor, and the output of each driving unit is a drain of the thin film transistor.
 4. The pixel circuit according to claim 3, wherein transistors corresponding to the driving units and the switch units are transistors whose source and drain are interchangeable, or the first terminal of each switch unit is a drain of the transistor and the second terminal thereof is a source of the transistor, and the input of each driving unit is a drain of the transistor and the output thereof is a source of the transistor.
 5. The pixel circuit according to claim 3 or 4, wherein each of the thin film transistors is of P-channel type.
 6. The pixel circuit according to any one of claims 1-5, wherein the energy storage unit is a capacitor.
 7. The pixel circuit according to any one of claims 1-6, wherein the electroluminescent unit is an organic light emitting diode.
 8. A display apparatus comprising the pixel circuit according to any one of claims 1-7.
 9. The display apparatus according to claim 8, wherein the two sub-pixel circuits of the pixel circuit are positioned within two adjacent pixels respectively.
 10. The display apparatus according to claim 9, wherein the two adjacent pixels are positioned on both sides of the data voltage line respectively.
 11. The display apparatus according to claim 9, wherein the two adjacent pixels are positioned on the same side of the data voltage line.
- ## Patentansprüche
1. Pixel-Schaltung mit zwei Sub-Pixel-Schaltungen, wobei jede Sub-Pixel-Schaltung eine erste Schalteinheit, eine zweite Schalteinheit, eine dritte Schalteinheit, eine vierte Schalteinheit, eine fünfte Schalteinheit, eine Treibereinheit, eine Energiespeichereinheit und eine Elektrolumineszenzeinheit aufweist; und ein erster Anschluss der ersten Schalteinheit mit einer Betriebsspannungsleitung verbunden ist, ein zweiter Anschluss der ersten Schalteinheit mit einem Eingang der Treibereinheit verbunden ist, und die erste Schalteinheit konfiguriert ist eine Betriebsspannung an die Treibereinheit unter der Steuerung einer Abtastsignalleitung, die mit einem Steueranschluss der ersten Schalteinheit verbunden ist, bereitzustellen; ein erster Anschluss der zweiten Schalteinheit mit einem Ausgang der Treibereinheit verbunden ist, ein zweiter Anschluss der zweiten Schalteinheit mit der Elektrolumineszenzeinheit verbunden ist, und die zweite Schalteinheit konfiguriert ist, einen Treiberstrom, der durch die Treibereinheit bereitgestellt wird, in die Elektrolumineszenzeinheit unter der Steuerung einer Abtastsignalleitung, die mit einem Steueranschluss der zweiten Schalteinheit verbunden ist, einzuspeisen; ein erster Anschluss der dritten Schalteinheit mit einer Datenspannungsleitung verbunden ist, ein zweiter Anschluss der dritten Schalteinheit mit dem Eingang der Treibereinheit verbunden ist, und die dritte Schalteinheit konfiguriert ist, den Eingang der Treibereinheit mit der Datenspannungsleitung unter der Steuerung einer Abtastsignalleitung, die mit einem Steueranschluss der dritten Schalteinheit verbunden ist, zu verbinden; ein erster Anschluss der vierten Schalteinheit mit dem Ausgang der Treibereinheit verbunden ist, ein zweiter Anschluss der der vierten Schalteinheit mit einem ersten Anschluss der Energiespeichereinheit und einem Steueranschluss der Treibereinheit verbunden ist, und die vierte Schalteinheit konfiguriert ist, den Ausgangsanschluss der Ansteuereinheit und den Steueranschluss der Treibereinheit leitend zu machen und den ersten Anschluss der Energiespeichereinheit mit der Spannung an dem Ausgang der Treibereinheit unter der Steuerung einer Abtastsignalleitung, die mit einem Steueranschluss der

- vierten Schalteinheit verbunden ist, zu laden; ein erster Anschluss der fünften Schalteinheit mit dem ersten Anschluss der Energiespeichereinheit verbunden ist, ein zweiter Anschluss der fünften Schalteinheit mit Masse verbunden ist, und die fünfte Schalteinheit konfiguriert ist, die Spannung an dem ersten Anschluss der Energiespeichereinheit unter der Steuerung einer Abtastsignalleitung, die mit einem Steueranschluss der fünften Schalteinheit verbunden ist, auf Null zu setzen; und in den zwei Sub-Pixel-Schaltungen die ersten Anschlüsse der dritten Schalteinheiten mit der gleichen Datenspannungsleitung verbunden sind, die Steueranschlüsse der ersten Schalteinheiten und der zweiten Schalteinheiten alle mit einer dritten Abtastsignalleitung verbunden sind, die Steueranschlüsse der fünften Schalteinheiten mit einer vierten Abtastsignalleitung verbunden sind, die Steueranschlüsse der dritten Schalteinheit und der vierten Schalteinheit in der ersten Sub-Pixel-Schaltung beide mit einer ersten Abtastsignalleitung verbunden sind, und die Steueranschlüsse der dritten Schalteinheit und der vierten Schalteinheit in der zweiten Sub-Pixel-Schaltung beide mit einer zweiten Abtastsignalleitung verbunden sind.
2. Pixel-Schaltung gemäß Anspruch 1, wobei zwei Schalteinheiten, deren Steueranschlüsse mit derselben Abtastsignalleitung verbunden sind, Schalter desselben Kanal-Typs sind, sodass die Einschalt- oder Ausschaltzustände der zwei Schalteinheiten, die mit der gleichen Abtastsignalleitung verbunden sind, identisch sind.
3. Pixel-Schaltung gemäß Anspruch 1 oder 2, wobei jede der Schalteinheiten und jede der Treibereinheiten Dünnschichttransistoren sind, der Steueranschluss jeder Schalteinheit ein Gate des Dünnschichttransistors ist, der erste Anschluss jeder Schalteinheit eine Source des Dünnschichttransistors ist, und jeder zweite Anschluss jeder Schalteinheit ein Drain des Dünnschichttransistors ist; der Steueranschluss jeder Treibereinheit ein Gate des Dünnschichttransistors ist, der Eingang jeder Treibereinheit eine Source des Dünnschichttransistors ist, und der Ausgang jeder Treibereinheit ein Drain des Dünnschichttransistors ist.
4. Pixel-Schaltung gemäß Anspruch 3, wobei Transistoren entsprechend den Treibereinheiten und den Schalteinheiten Transistoren sind, deren Source und Drain austauschbar sind, oder der erste Anschluss jeder Schalteinheit ein Drain des Transistors ist und ihr zweiter Anschluss eine Source des Transistors ist und der Eingang jeder Treibereinheit ein Drain des Transistors ist und ihr Ausgang eine Source des Transistors ist.
5. Pixel-Schaltung gemäß Anspruch 3 oder 4, wobei jeder der Dünnschichttransistoren ein P-Kanal-Typ ist.
6. Pixel-Schaltung gemäß einem der Ansprüche 1 bis 5, wobei die Energiespeichereinheit ein Kondensator ist.
7. Pixel-Schaltung gemäß einem der Ansprüche 1 bis 6, wobei die Elektrolumineszenzeinheit eine organische lichtaussendende Diode ist.
8. Anzeigevorrichtung mit der Pixel-Schaltung gemäß einem der Ansprüche 1 bis 7.
9. Anzeigevorrichtung gemäß Anspruch 8, wobei die zwei Sub-Pixel-Schaltungen der Pixel-Schaltung jeweils in zwei benachbarten Pixeln angeordnet sind.
10. Anzeigevorrichtung gemäß Anspruch 9, wobei die zwei benachbarten Pixel jeweils auf beiden Seiten der Datenspannungsleitung angeordnet sind.
11. Anzeigevorrichtung gemäß Anspruch 9, wobei die zwei benachbarten Pixel auf der gleichen Seite der Datenspannungsleitung angeordnet sind.

Revendications

1. Circuit de pixel comprenant deux circuits de sous-pixel, dans lequel :

chaque circuit de sous-pixel comprend une première unité de commutation, une deuxième unité de commutation, une troisième unité de commutation, une quatrième unité de commutation, une cinquième unité de commutation, une unité de pilotage, une unité de stockage d'énergie et une unité électroluminescente ; et une première borne de la première unité de commutation est connectée à une ligne de tension de fonctionnement, une seconde borne de la première unité de commutation est connectée à une entrée de l'unité de pilotage, et la première unité de commutation est configurée de manière à ce qu'elle applique une tension de fonctionnement sur l'unité de pilotage sous la commande d'une ligne de signal de balayage qui est connectée à une borne de commande de la première unité de commutation ; une première borne de la deuxième unité de commutation est connectée à une sortie de l'unité de pilotage, une seconde borne de la deuxième unité de commutation est connectée à l'unité électroluminescente, et la deuxième unité de commutation est configurée de manière à ce qu'elle introduise un courant de pilotage qui est

appliqué par l'unité de pilotage à l'intérieur de l'unité électroluminescente sous la commande d'une ligne de signal de balayage qui est connectée à une borne de commande de la deuxième unité de commutation ;

une première borne de la troisième unité de commutation est connectée à une ligne de tension de données, une seconde borne de la troisième unité de commutation est connectée à l'entrée de l'unité de pilotage, et la troisième unité de commutation est configurée de manière à ce qu'elle connecte l'entrée de l'unité de pilotage à la ligne de tension de données sous la commande d'une ligne de signal de balayage qui est connectée à une borne de commande de la troisième unité de commutation ;

une première borne de la quatrième unité de commutation est connectée à la sortie de l'unité de pilotage, une seconde borne de la quatrième unité de commutation est connectée à une première borne de l'unité de stockage d'énergie et à une borne de commande de l'unité de pilotage, et la quatrième unité de commutation est configurée de manière à ce qu'elle rende conductrices la borne de sortie de l'unité de pilotage et la borne de commande de l'unité de pilotage et de manière à ce qu'elle charge la première borne de l'unité de stockage d'énergie avec la tension au niveau de la sortie de l'unité de pilotage sous la commande d'une ligne de signal de balayage qui est connectée à une borne de commande de la quatrième unité de commutation ;

une première borne de la cinquième unité de commutation est connectée à la première borne de l'unité de stockage d'énergie, une seconde borne de la cinquième unité de commutation est reliée à la masse, et la cinquième unité de commutation est configurée de manière à ce qu'elle définisse la tension au niveau de la première borne de l'unité de stockage d'énergie à zéro sous la commande d'une ligne de signal de balayage qui est connectée à une borne de commande de la cinquième unité de commutation ; et

et dans les deux circuits de sous-pixel, les premières bornes des troisièmes unités de commutation sont connectées à la même ligne de tension de données, les bornes de commande des premières unités de commutation et des deuxième unités de commutation sont toutes connectées à une troisième ligne de signal de balayage, les bornes de commande des cinquièmes unités de commutation sont connectées à une quatrième ligne de signal de balayage, les bornes de commande de la troisième unité de commutation et de la quatrième unité de commutation dans le premier circuit de sous-pixel sont toutes deux connectées à une première ligne de signal de

balayage, et les bornes de commande de la troisième unité de commutation et de la quatrième unité de commutation dans le second circuit de sous-pixel sont toutes deux connectées à une deuxième ligne de signal de balayage.

2. Circuit de pixel selon la revendication 1, dans lequel deux unités de commutation dont les bornes de commande sont connectées à la même ligne de signal de balayage sont des commutateurs du même type de canal, de sorte que les états d'activation/les états passants ou les états de désactivation/les états bloqués des deux unités de commutation qui sont connectées à la même ligne de signal de balayage sont identiques.
3. Circuit de pixel selon la revendication 1 ou 2, dans lequel chacune des unités de commutation et chacune des unités de pilotage sont des transistors à film mince, la borne de commande de chaque unité de commutation est une grille du transistor à film mince, la première borne de chaque unité de commutation est une source du transistor à film mince et la seconde borne de chaque unité de commutation est un drain du transistor à film mince ; la borne de commande de chaque unité de pilotage est une grille du transistor à film mince, l'entrée de chaque unité de pilotage est une source du transistor à film mince, et la sortie de chaque unité de pilotage est un drain du transistor à film mince.
4. Circuit de pixel selon la revendication 3, dans lequel les transistors qui correspondent aux unités de pilotage et aux unités de commutation sont des transistors dont la source et le drain sont interchangeables, ou la première borne de chaque unité de commutation est un drain du transistor et sa seconde borne est une source du transistor, et l'entrée de chaque unité de pilotage est un drain du transistor et sa sortie est une source du transistor.
5. Circuit de pixel selon la revendication 3 ou 4, dans lequel chacun des transistors à film mince est du type à canal P.
6. Circuit de pixel selon l'une quelconque des revendications 1 à 5, dans lequel l'unité de stockage d'énergie est un condensateur.
7. Circuit de pixel selon l'une quelconque des revendications 1 à 6, dans lequel l'unité électroluminescente est une diode à émission de lumière organique.
8. Appareil d'affichage comprenant le circuit de pixel selon l'une quelconque des revendications 1 à 7.
9. Appareil d'affichage selon la revendication 8, dans lequel les deux circuits de sous-pixel du circuit de

pixel sont respectivement positionnés à l'intérieur de deux pixels adjacents.

10. Appareil d'affichage selon la revendication 9, dans lequel les deux pixels adjacents sont respectivement positionnés sur les deux côtés de la ligne de tension de données. 5
11. Appareil d'affichage selon la revendication 9, dans lequel les deux pixels adjacents sont positionnés sur le même côté de la ligne de tension de données. 10

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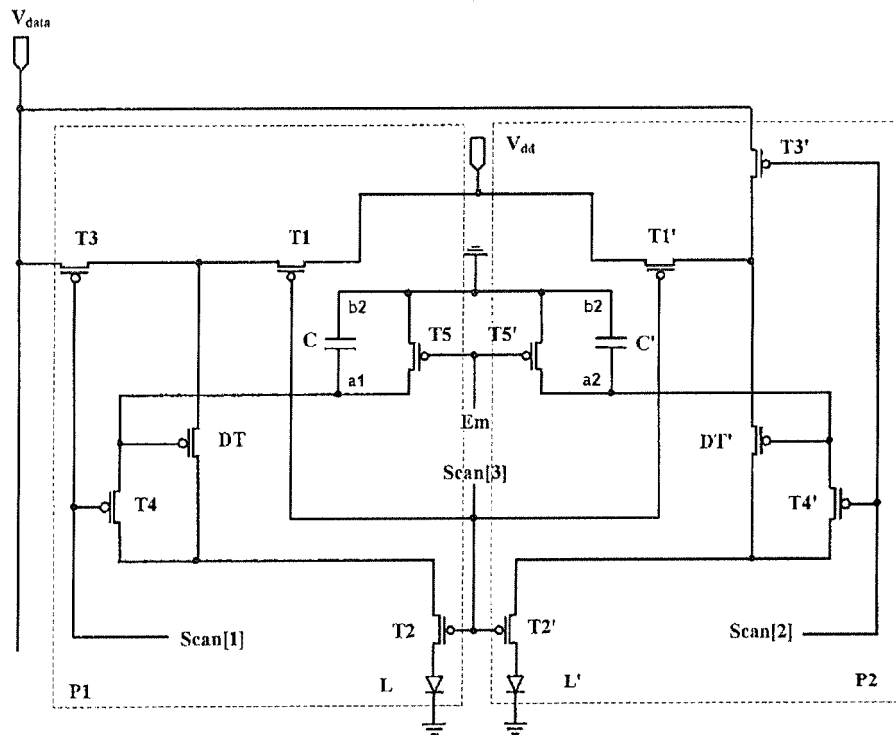


Fig. 1

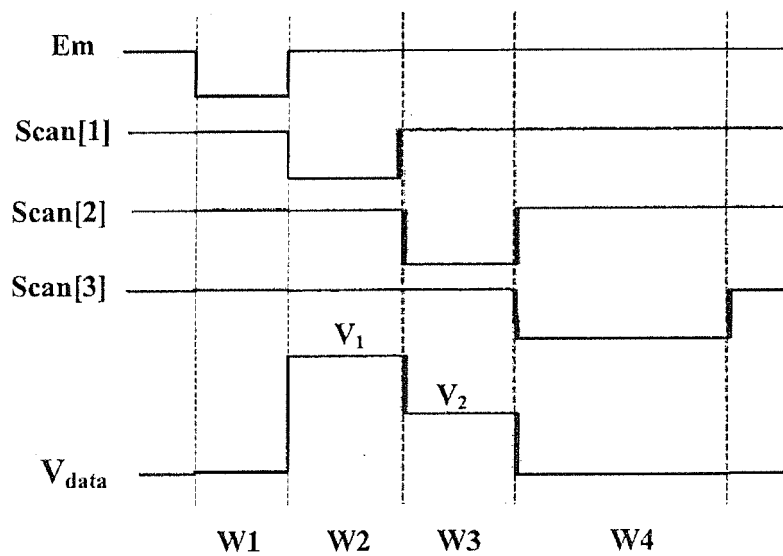


Fig. 2

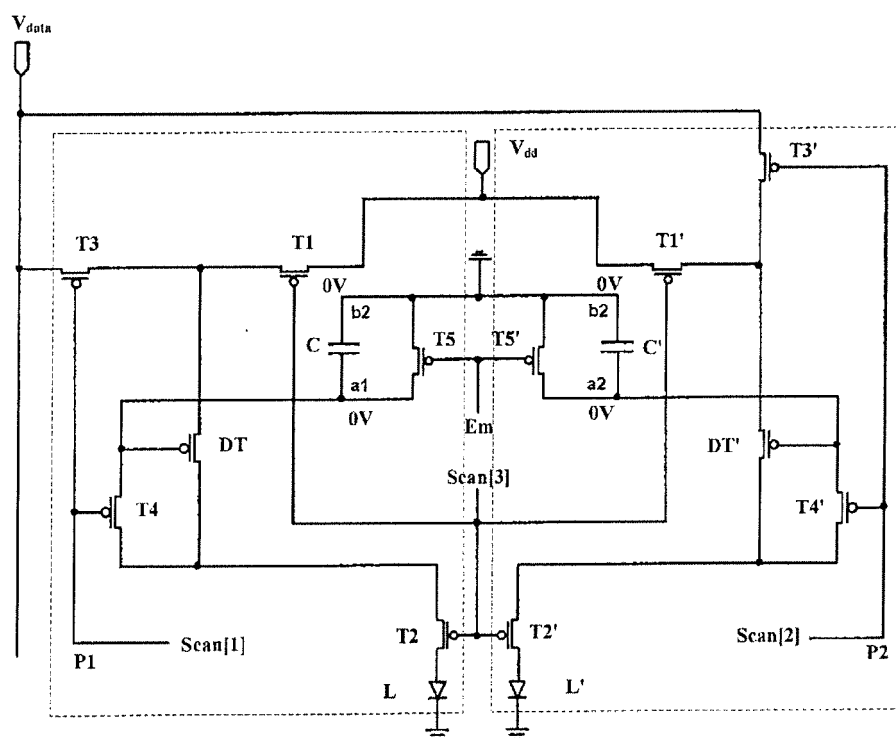


Fig. 3(a)

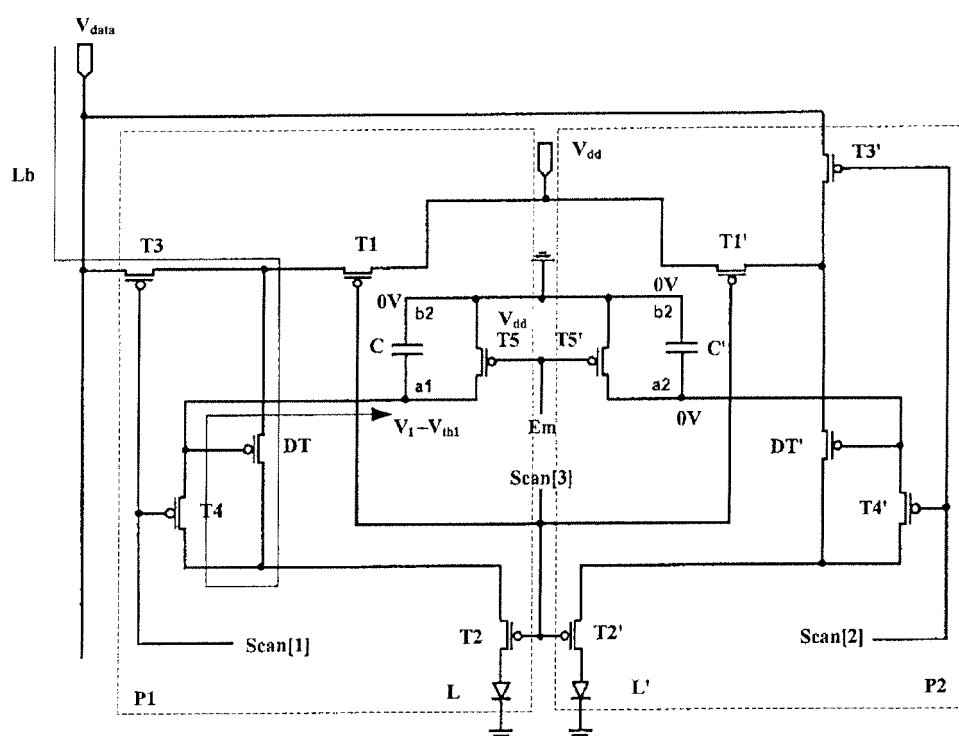


Fig. 3(b)

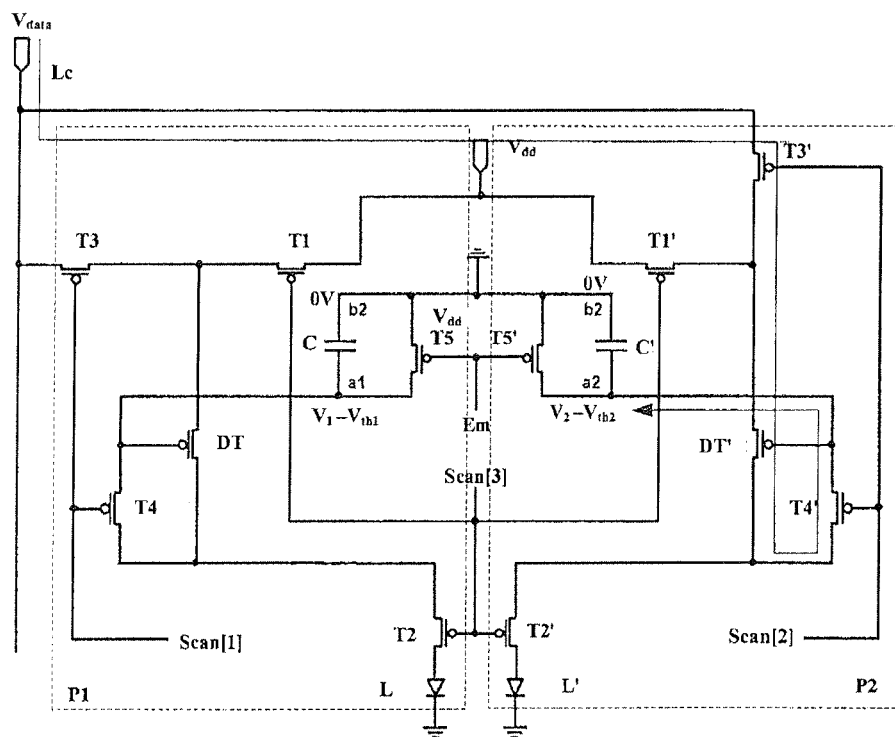


Fig. 3(c)

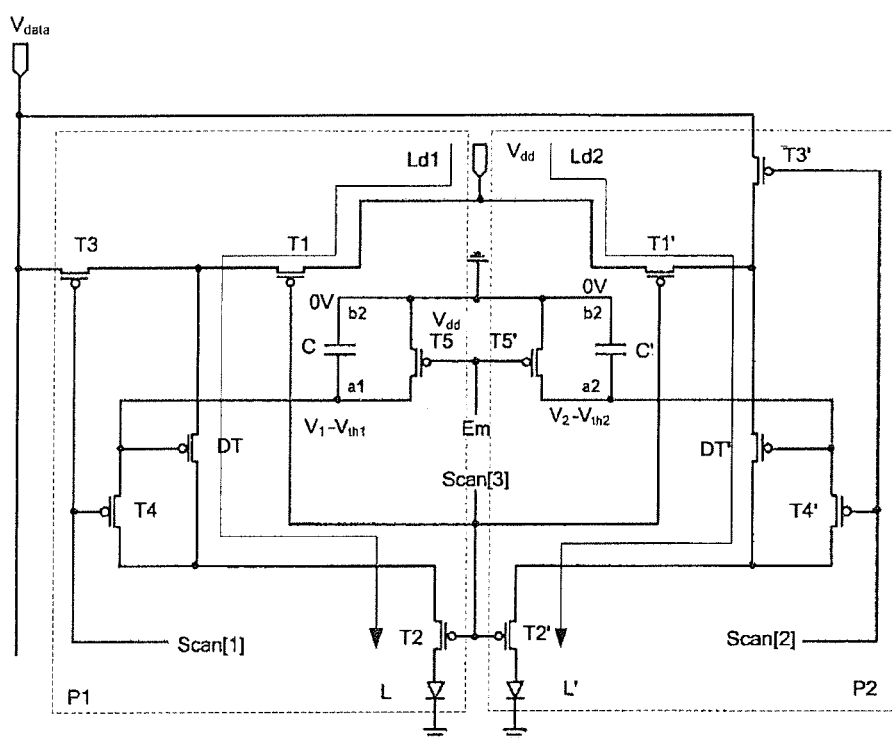


Fig. 3(d)

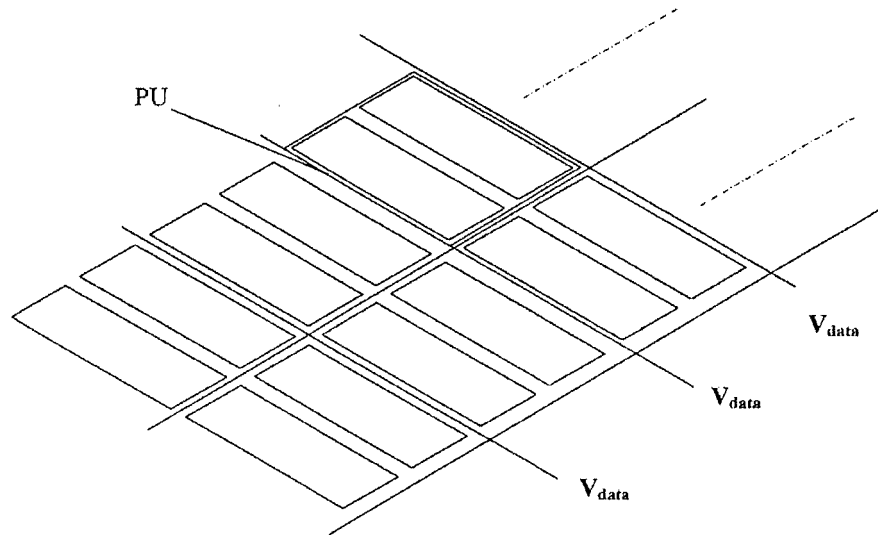


Fig. 4

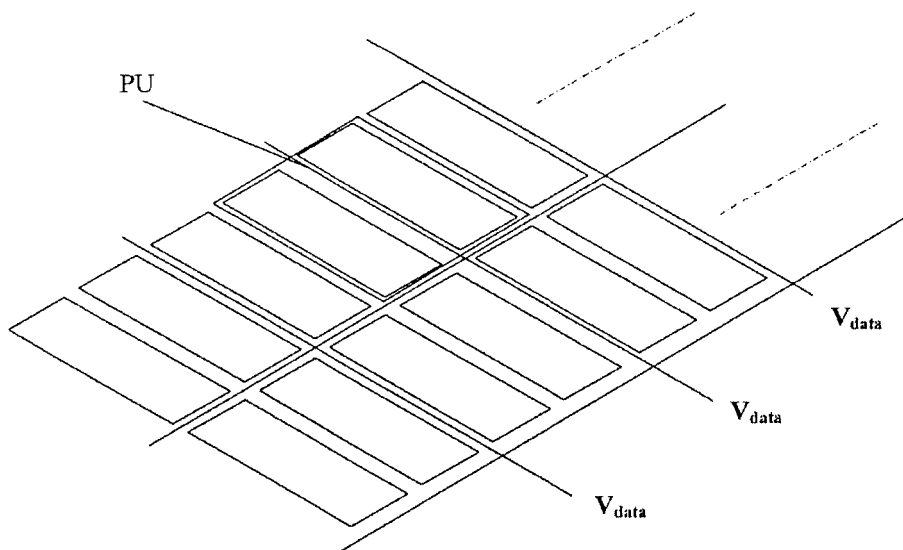


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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- CN 103000134 [0006]
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专利名称(译)	像素电路和显示设备		
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优先权	201410274190.6 2014-06-18 CN		
其他公开文献	EP3159878A1 EP3159878A4		
外部链接	Espacenet		

摘要(译)

提供一种像素电路，包括具有相同结构的两个子像素电路（P1，P2）。每个子像素电路（P1，P2）包括五个开关单元（T1，T2，T3，T4，T5），驱动单元（DT），能量存储单元（C）和电致发光单元（L）。两个子像素电路（P1，P2）连接到相同的工作电压线（Vdd），相同的数据电压线（Vdata），相同的第一扫描信号线（Scan[1]）和相同的第三个扫描信号线（Scan[3]），并连接到不同的第二扫描信号线（Scan[2]），使得在像素电路中，流过电致发光单元（L）的工作电流不受阈值的影响相应的驱动晶体管的电压，完全解决了由于驱动晶体管的阈值电压的漂移引起的显示亮度不均匀的问题。同时，补偿电路用于驱动两个像素（P1，P2），两个相邻像素（P1，P2）共用多条信号线，从而减少了显示装置中像素电路的信号线数量，减少了像素间距，并增加像素密度。还提供了一种使用像素电路的显示装置。

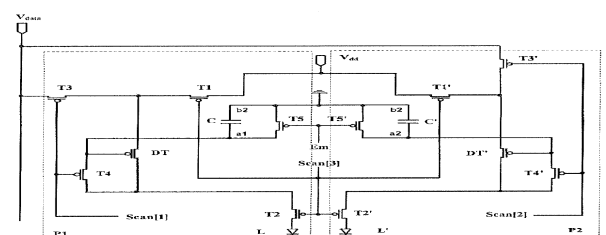


Fig. 1

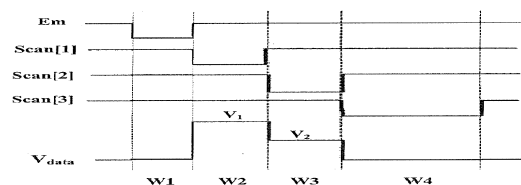


Fig. 2