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(54) **ELECTROLUMINESCENT COLOR DISPLAY PANEL**

ELEKTROLUMINESZENZ-FARBANZEIGE-PANEL

AFFICHEUR COULEUR ELECTROLUMINESCENT

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- **PATENT ABSTRACTS OF JAPAN vol. 2000, no. 21, 3 August 2001 (2001-08-03) & JP 2001 109401 A (MATSUSHITA ELECTRIC IND CO LTD), 20 April 2001 (2001-04-20)**

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Description

[0001] The invention relates to an electroluminescent color display panel according to the preamble of claim 1.

[0002] The invention also relates to a method of manufacturing an electroluminescent color display panel, and to an electronic device comprising the electroluminescent color display.

[0003] Electroluminescent display panels, comprising a plurality of organic electroluminescent devices are known. An electroluminescent device is a device, which, while making use of the phenomenon of electroluminescence, emits light when the device is suitably connected to a power supply. The term electroluminescence includes several phenomena which have the common feature that light is emitted by an electric discharge in gases, liquids and solid materials. Generally, an electroluminescent device comprises one or more layers made of an electroluminescent material disposed between a cathode and an anode. Electroluminescent display panels are also known, wherein numerous light-emitting devices are formed on a single substrate, arranged in groups in a regular grid pattern, each group forming a picture element, also referred to as pixel. Several light-emitting devices forming a column of the grid may share a common first electrode, i.e. a common anode, also referred to as anode line. Several light-emitting devices forming a row of the grid may share a common second electrode, i.e. a common cathode, also referred to as cathode line. The individual light-emitting devices in a given group emit light when their associated cathode line and anode line are activated at the same time. Activation may be by rows and columns or, as in an active matrix, with individual anode pads.

[0004] European patent application EP 0 767 599 discloses a 3 color organic electroluminescent display device comprising a matrix of the electroluminescent elements (herein also referred to as pixels). Each pixel in the matrix has one or more emitting devices for red, green and blue in order to display a color image, each emitting device being associated with an intersection of a column and a row of matrix electrodes. As shown in Fig. 1 of EP 0 767 599, the emitting devices for red are arranged on a column, or vertical line. In the same manner, the emitting devices for green and blue are arranged on vertical lines. A pixel comprises emitting devices of three vertical lines. This pixel layout is further referred to as 'V-line'. Alternatively, it is possible to form a pixel pattern with a delta arrangement of red, green and blue in the display panel and also draw a bent or meandered cathode pattern on the display panel.

[0005] EP 0 574 084 A1 discloses a flat panel type picture display having a luminescent screen and a large number of electron propagation ducts operating by means of electron wall interaction. At a given resolution hexagonal phosphor dot patterns in which dots are horizontally staggered generally produce fewer artefacts than in a 90° tilted orientation. An addressing system for withdrawing electrons from the propagation ducts and for directing them towards the luminescent screen is preferably formed as a multistepped structure with a preselection structure of rows of preselection electrodes and a fine-selection structure of rows of fine-selection electrodes. To interconnect the fine-selection electrodes in parallel in a minimal number of groups, it is advantageous when the fine-selection electrodes are arranged parallel to the preselection electrodes.

[0006] A disadvantage of the prior-art electroluminescent color display is that it provides a low image quality, in particular when moving images are displayed on low-resolution displays.

[0007] It is an object of the present invention to provide an electroluminescent color display panel having a perceptibly improved image quality, that also can be manufactured more conveniently.

[0008] To this end, a first aspect of the invention provides an electroluminescent color display panel as defined in claim 1. A second aspect of the invention provides a method of manufacturing an electroluminescent display panel as defined in claim 8. A third aspect of the invention provides an electronic device as defined in claim 12. Advantageous embodiments are defined in the dependent claims.

[0009] The different positional arrangement of the first and second color sections within two adjacent pixels disrupts pure grid-correlated patterns in the image, which patterns may arise from the arrangement of the pixels in a grid. This disruption of the grid-correlated patterns improves the perceived image quality. The adjacent pixels of a first pixel may comprise horizontally, vertically or diagonally neighboring pixels of the first pixel.

[0010] In color displays, the chosen arrangement of the color sections within a pixel determines the quality of the perceived image to a large extent. In the prior-art electroluminescent color display panels, the arrangement of the color sections within a pixel is the same for each pixel. Moreover, characteristic of this type of color display panel is that the pixels are usually arranged in a grid pattern comprising vertical columns and horizontal rows. The purely horizontally and/or vertically oriented pixel structures, with the same arrangement of the color sections within the pixels, clearly show a lower image quality, especially on low-resolution displays, because the human eye has a tendency to focus on correlated patterns originating from the pixel layout, which do not belong to the actual image. In the electroluminescent color display panel according to the invention, the pixels are still arranged in a grid pattern comprising vertical columns and horizontal rows. However, purely horizontally and/or vertically correlated patterns are disrupted because two adjacent pixels comprise a different arrangement of the color sections within the pixel.

[0011] An embodiment of the invention as defined in claim 1 is particularly useful when a printing technique, such as inkjet printing, is used in the manufacture of the color sections. When the first color sections are adjacent-

ly arranged on a plurality of parallel, laterally spaced lines, such a line of color sections can be printed by moving the printing head or heads, along the line or lines (the latter, in the case where more than one line is printed simultaneously). It is preferred that also the other color sections, which, in operation, emit light of the same color, are adjacently arranged on a plurality of parallel, laterally spaced lines. Preferably, the laterally spaced lines of the various color sections are substantially parallel. Although the pattern of emissive material of this embodiment is still a line-wise correlated color pattern, this correlated pattern is subjectively less annoying than a pure vertical or horizontal one.

[0012] The first color sections are adjacently arranged, and there is a small distance between two printing positions. Thus, the traveling distance of the printing head between two printing positions is small. This yields an efficiency advantage in the production process, because the time in which the printing head travels between two printing positions and does not contribute to the printing process, is small.

[0013] The advantage mentioned in the previous paragraph is even more exploited by an embodiment as defined in claim 4. In accordance with an embodiment as defined in claim 4, the first color sections, which are arranged on one slanting line, form a continuous strip of electroluminescent material. When using a printing technique, such as inkjet printing, this embodiment allows printing of a continuous line of deposited electroluminescent material of a specific color. Of course it is possible to interrupt the deposition at the appropriate positions, but this introduces problems in the manufacturing process related to positioning of the printing head above the substrate at the desired locations. Furthermore, after activation of the printing head, initial instabilities in the droplet formation may occur, resulting in an undefined layer thickness of the deposited emissive material. These disadvantages are, at least partially, cancelled out by the embodiment of the invention as defined in claim 3.

[0014] For example, the emitting devices for a first color are arranged on a column, or vertical line. In the same manner, the emitting devices for the other colors are arranged on vertical lines. The various lines with emitting devices of a certain color alternate. A pixel comprises emitting devices of each color from neighboring vertical lines, so that the various color sections in a pixel are adjacently positioned in the row direction. Examples of such display panels are plasma display panels and organic LED display panels.

[0015] Plasma display panels consist of a back plate equipped with a plurality of parallel channels. The bottom and the sidewalls of the channels are coated with red, green and blue phosphors, while each channel usually comprises phosphors of one color. The column (address) electrodes are located on the bottom of the channels. The front plate is equipped with a plurality of parallel, laterally spaced row electrodes. A plasma display panel cell is located at the crossing of a row and a column electrode. The front plate and the back plate are sealed together and filled with gas. In operation, light is emitted by an electric discharge in the gas. In a plasma display panel according to the invention, the channels are arranged on a plurality of parallel, laterally spaced slanting lines with respect to the rectangular grid as defined by the row and column electrodes.

[0016] Passive matrix organic LED displays may consist of a transparent substrate which is provided with a plurality of parallel, laterally spaced (transparent) column electrodes. The organic LED displays further consist of a plurality of parallel, laterally spaced continuous lines of organic electroluminescent material of a specific color (i.e. red, green or blue). The lines of organic electroluminescent material are usually oriented parallel to the column electrodes. The row electrodes are positioned perpendicular to the column electrodes and on top of the organic electroluminescent material,. In operation, the individual light-emitting devices of the organic LED display emit light when their row electrode and column electrode are activated at the same time. In the organic LED display panel according to the invention, the lines of organic electroluminescent material are arranged on a plurality of parallel, laterally spaced slanting lines with respect to the rectangular grid as defined by the row and column electrodes.

[0017] In an embodiment of the invention as defined in claim 4, the acute angle between a vertical column and the slanting lines is in a range of + 10 and - 10 degrees around a preferred angle α, and the preferred angle α is equal to:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

wherein n is the number of color sections in a pixel, P_r is the pitch of the pixels in the row direction, and P_c is the pitch of the pixels in the column direction. It is preferred in this embodiment that the color sections in a pixel are positioned side by side in the row direction. When using this preferred angle, the color sections in the pixels in the same column are shifted in the row direction with respect to the color sections in a neighboring pixel. The extent of the shift is such that the layout of the color sections in a pixel of the $(n+1)^{st}$ row in a first column, counting from said first row, is equal to the layout of the color sections in a pixel of the first row in said first column.

[0018] This design rule is also applicable when the color sections in a pixel are positioned side by side in the column direction. In this case, the acute angle between a vertical column and the slanting lines is in a range of + 10 and -10 degrees around a preferred angle β, and the preferred angle β is equal to:

$$\beta = \arctan\left(\frac{n \cdot P_c}{P_r}\right)$$

When using this preferred angle, the color sections in the pixels in the same row are shifted in the column direction with respect to the color sections in a neighboring pixel. The extent of the shift is such that the layout of the color sections in a pixel of the $(n+1)^{st}$ column in a first row, counting from said first column, is equal to the layout of the color sections in a pixel of the first column in said first row.

[0019] In accordance with a second aspect of the invention, a method of manufacturing an electroluminescent color display panel comprises the steps of:

- forming a plurality of parallel, laterally spaced first electrode strips on a substrate,
- arranging a plurality of parallel, laterally spaced electroluminescent strips, each strip, in operation, emitting light of one of at least a first or a second color, which strips of different colors are positioned side by side, in a repeating pattern
- forming a plurality of parallel, laterally spaced second electrode strips, which second electrode strips cross the plurality of first electrode strips such that, in operation, an individual light-emitting device is allocated at the crossing of a first and a second electrode strip,

and is characterized in that the electroluminescent strips, are arranged on a plurality of parallel, laterally spaced slanting lines with respect to a grid formed by the first and second electrode strips. The deposition of emissive material may be guided by a pattern of resist banks, oriented along the slanting lines. The emissive material is deposited between two resist banks. In this arrangement, printing may be effected occur in a continuous process, without the need of synchronized deposition. The resist banks prevent mixing of the printed electroluminescent material for different color sections.

[0020] In the case where the electroluminescent strips comprise an organic electroluminescent material, the organic electroluminescent material is preferably deposited, using an inkjet printer.

[0021] In accordance with a third aspect of the invention, an electronic device comprises an electroluminescent color display panel as defined in claim 1. The perceptibly improved image quality on low-resolution displays is especially advantageous in handheld or portable electronic devices such as, for example, mobile phones, personal organizers and calculators.

[0022] These and other aspects of the invention are apparent from and will be elucidated with reference to the embodiments described hereinafter.

[0023] In the drawings:

Fig. 1 schematically shows an equivalent-circuit diagram of an electroluminescent display panel,

Fig. 2 is a schematic view of a part of an electroluminescent display panel in accordance with the prior art, where a pixel contains emitting devices of three vertical lines (V-line pixel layout),

Fig. 3 is a schematic view of a part of an electroluminescent display panel in accordance with the invention, where two adjacent pixels in a column comprise a different positional arrangement of the color sections within the pixel,

Fig. 4 shows the result of a simulation of a picture as displayed on an electroluminescent display panel of the prior art,

Fig. 5 shows the result of a simulation of a picture as displayed on an electroluminescent display panel in accordance with the invention,

Fig. 6 is a schematic view of a part of another embodiment of the electroluminescent display panel in accordance with the invention, where the color sections of the plurality of pixels form a continuous color determining strip, which color sections, in operation, emit the same color and are arranged on one slanting line,

Fig. 7 is a schematic view of the embodiment of Fig. 6, where a possible layout of a column and a row electrode is presented, and

Figs. 8 through 10 show examples of electronic devices comprising an electroluminescent color display panel as defined in claim 1.

[0024] Fig. 1 schematically shows an equivalent circuit diagram of a part of an electroluminescent color display panel 1 comprising a plurality of light emitting sections arranged in n rows 2 and m columns 3. Each intersection of a row 2 and a column 3 electrode forms a light-emitting section. This display panel further includes a row-selection circuit 21 (for example, a multiplex circuit) and a data register 22. Externally presented information, for example, a video signal is processed in a control unit 23 which, dependent upon the information to be displayed, loads the individual parts of the data register 22. Mutual synchronization between the selection of the rows and the presentation of voltages to the column electrodes takes place by means of the control unit 23 via control lines 24.

[0025] Fig. 2 is a schematic view of a part of an electroluminescent display panel 1 of the prior art. For the sake of clarity, this and subsequent drawings are not drawn to scale and some parts are drawn on a longer scale. The electroluminescent display panel 1 comprises a plurality of pixels 4 arranged in rows 2 and columns 3 to form a grid pattern, or a matrix. Each pixel 4 of this example comprises three color sections: a red R, a green G and a blue B color section which, in operation, may emit red, green or blue light, respectively. This pixel configuration is used in matrix-addressed electroluminescent display panels. A picture is scanned, for example, row by row at a time while applying the appropriate sig-

nals to the columns.

[0026] According to the invention, the positional arrangement of the color sections within each pixel is different from the positional arrangement of the color sections within at least one adjacent pixel. An embodiment of the electroluminescent display panel 1 in accordance with the invention is shown in Fig. 3. In this embodiment, the RGB color sections are shifted along the direction of the rows 2. In the pixel 4 at the crossing of column 3 and row 2, the color sections are arranged, from left to right, as green G, blue B and red R. In the pixel 6 at the crossing of column 3 and row 5, the color sections are arranged, from left to right, as red R, green G and blue B. Thus, two adjacent pixels 4, 6 in a column 3 comprise a different positional arrangement of the color sections within the pixel. Moreover, the color sections R, G or B of the plurality of pixels, which color sections, in operation, emit the same color, are adjacently arranged on a plurality of parallel, laterally spaced slanting lines 7 with respect to the grid pattern of the pixels. The acute angle between a vertical column 3 and a slanting line 7 is equal to angle α:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

wherein n is the number of color sections in a pixel (in this example n = 3: R, G and B), P_r is the pitch of the pixels 4, 6 in the row 2, 5 direction, and P_c is the pitch of the pixels 4, 6 in the column 3 direction. The pitch is the distance between the centers of two adjacent pixels 4, 6.

[0027] In conformity with the pixel configurations of Figs. 2 and 3, Figs. 4 and 5 show the result of a simulation which compares an electroluminescent display panel having a V-line pixel layout (as in Fig. 2) and an electroluminescent display panel having a pixel layout according to the invention (as in Fig. 3). Although the pixel layout of Fig. 3 still has a line-wise correlated RGB pattern (along lines 7), the perceived image quality of Fig. 5 is improved when compared with the image of Fig. 4.

[0028] In some electroluminescent displays panels 1, such as plasma display panels and organic LED display panels, the electroluminescent material is deposited by using printing techniques, such as inkjet printing. The use of inkjet printing for depositing the luminescent material in the color sections R, G or B is applied most successfully if a line 8 of deposited electroluminescent material of a specific color can be printed continuously. Of course, it is possible to interrupt the inkjet deposition at the appropriate positions, but this introduces problems in the manufacturing process related to the positioning of the inkjet orifice above the substrate at the desired location. Furthermore, after activation of the piezo in the printing head, initial instabilities in the droplet formation occur, resulting in an undefined layer thickness of the deposited emissive material. It is therefore proposed that the color sections are not printed along the columns 3, but oriented diagonally across the columns 3. A schematic view of an example of the proposed pixel layout is presented in Fig. 6. In this embodiment of the invention occur continuously along the line 8, without the need of position synchronized deposition. With this pixel layout, a triplet color section arrangement is obtained which, to some extent, resembles the pixel layout presented in Fig. 3, while circumventing the above mentioned issues related to operation of the inkjet printer.

[0029] The deposition of the electroluminescent material may be guided by a pattern of resist banks 9, which are oriented diagonally across the columns. The electroluminescent material is deposited between two resist banks 9, which prevent mixing of the materials, which would result in unwanted and undefined color mixing.

[0030] To address the color sections of the embodiment of Fig. 6, it is preferred to use row 10 and column 11 electrodes as depicted in Fig. 7. As the color sections of the embodiment of Fig. 6 will have a diamond like shape, the column electrodes 11 may have a stepped pattern as shown in Fig. 7.

[0031] The perceptibly improved image quality on low-resolution displays according to the invention is especially advantageous in handheld or portable electronic devices such as mobile phones, personal organizers and calculators. Examples of such electronic devices comprising an electroluminescent color display panel 1 as defined in claim 1 are depicted in Figs. 8 through 10; Fig. 8 shows a mobile phone comprising an electroluminescent color display panel 1 according to the invention, Fig. 9 shows a calculator comprising an electroluminescent color display panel 1 according to the invention, and Fig. 10 shows a personal organizer comprising an electroluminescent color display panel 1 according to the invention.

[0032] In summary, the positional arrangement of the color section in each pixel of an electroluminescent display panel is different from the positional arrangement of the color sections in at least one adjacent pixel. This yields an improved image quality as perceived by the viewer, in particular when moving images are displayed on low-resolution displays. A preferred embodiment of the invention is an electroluminescent display panel in which the color sections are arranged on continuous lines, which are oriented to run diagonally across the display panel.

[0033] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. For example, the functionality of columns and rows may be transposed without departing from the invention.

[0034] The invention may also be applied in active matrix organic LED displays, where column and row electrodes are used for addressing a color section.

[0035] In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "to comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim.

Claims

1. An electroluminescent color display panel comprising a plurality of pixels arranged in rows and columns to form a grid pattern, each pixel comprising at least two color sections, a first color section of which emits light of a first color, and a second color section emits light of a second color being different from the first color, wherein the positional arrangement of the first and second color sections within a first one of the pixels, further referred to as the first pixel, is different from the positional arrangement of the first and second color sections within a second one of the pixels, further referred to as the second pixel, wherein the first pixel is adjacent to the second pixel, **characterized in that** the first color sections are adjacently arranged on parallel, laterally spaced apart, slanting lines with respect to the column direction.

2. An electroluminescent color display panel as claimed in claim 1, wherein the first pixel and the second pixel are arranged in the same column.

3. An electroluminescent color display panel as claimed in claim 1 or 2, wherein the first color sections, which are arranged on one slanting line, form a continuous strip of electroluminescent material.

4. An electroluminescent color display panel as claimed in claim 1, 2 or 3, wherein the acute angle between a vertical column and the slanting lines is in a range of +10 and -10 degrees around a preferred angle α, and the preferred angle α is equal to:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

wherein n is the number of color sections in a pixel, P_r is the pitch of the pixels in the row direction, and P_c is the pitch of the pixels in the column direction.

5. An electroluminescent color display panel as claimed in claim 1, 2, 3 or 4, wherein a color section comprises a layer of an organic electroluminescent material.

6. An electroluminescent color display panel as claimed in claim 5, wherein the organic electroluminescent material is a polymer.

7. An electroluminescent color display panel as claimed in claim 1, 2, 3 or 4, wherein a color section comprises a layer of a phosphor material which is excited by a plasma discharge.

8. A method of manufacturing an electroluminescent color display panel, said method comprising the steps of:

- forming a plurality of parallel, laterally spaced first electrode strips on a substrate,
- arranging a plurality of parallel, laterally spaced electroluminescent strips, each strip, in operation, emitting light of one of at least a first or a second color, wherein strips of different colors are positioned side by side, in a repeating pattern,
- forming a plurality of parallel, laterally spaced second electrode strips, which second electrode strips cross the plurality of first electrode strips such that, in operation, an individual light-emitting device is allocated at the crossing of a first and a second electrode strip,

characterized in that the electroluminescent strips are arranged on a plurality of parallel, laterally spaced slanting lines with respect to a grid formed by the first and second electrode strips.

9. A method as claimed in claim 8, wherein the second electrode strips cross the first electrode strips substantially perpendicularly, which yields a substantially rectangular grid formed by the first and second electrode strips.

10. A method as claimed in claim 8 or 9, wherein the acute angle between the first or the second electrode strip and a slanting line is in a range of +10 and -10 degrees around a preferred angle α, and the preferred angle α is equal to:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

wherein n is the number of color sections in a pixel, P_r is the pitch of the pixels in the row direction, and P_c is the pitch of the pixels in the column direction.

11. A method as claimed in claim 8 or 9, wherein the electroluminescent strips comprise an organic electroluminescent material, which organic electroluminescent material is deposited by using an inkjet printer.

12. An electronic device comprising an electroluminesc-

cent color display panel as claimed in claim 1.

Patentansprüche

1. Elektrolumineszenz-Farbanzeige-Panel mit einer großen Anzahl Pixel, die in Zeilen und Spalten angeordnet sind, um eine Gitterstruktur zu bilden, wobei jedes Pixel mindestens zwei Farbsektionen umfasst, wobei eine erste Farbsektion Licht einer ersten Farbe und eine zweite Farbsektion Licht einer sich von der ersten Farbe unterscheidenden, zweiten Farbe emittiert, wobei die positionelle Anordnung der ersten und zweiten Farbsektion innerhalb eines ersten der Pixel, im Weiteren als das erste Pixel bezeichnet, sich von der positionellen Anordnung der ersten und zweiten Farbsektion innerhalb eines zweiten der Pixel, im Weiteren als das zweite Pixel bezeichnet, unterscheidet, wobei das erste Pixel an das zweite Pixel angrenzt, **dadurch gekennzeichnet, dass** die ersten Farbsektionen auf parallelen, lateral voneinander beabstandeten, schrägen Linien gegenüber der Spaltenrichtung aneinander angrenzend angeordnet sind.

2. Elektrolumineszenz-Farbanzeige-Panel nach Anspruch 1, wobei das erste Pixel und das zweite Pixel in der gleichen Spalte angeordnet sind.

3. Elektrolumineszenz-Farbanzeige-Panel nach Anspruch 1 oder 2, wobei die ersten Farbsektionen, welche auf einer schrägen Linie angeordnet sind, einen kontinuierlichen Streifen aus elektrolumineszierendem Material bilden.

4. Elektrolumineszenz-Farbanzeige-Panel nach Anspruch 1, 2 oder 3, wobei der spitze Winkel zwischen einer vertikalen Spalte und den schrägen Linien in einem Bereich von +10 und -10 Grad um einen bevorzugten Winkel α liegt, und der bevorzugte Winkel α ist gleich:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

wobei n die Anzahl der Farbsektionen in einem Pixel, P_r den Abstand der Pixel in der Zeilenrichtung und P_c den Abstand der Pixel in der Spaltenrichtung darstellen.

5. Elektrolumineszenz-Farbanzeige-Panel nach Anspruch 1, 2, 3 oder 4, wobei eine Farbsektion eine Schicht aus einem organischen, elektrolumineszierenden Material umfasst.

6. Elektrolumineszenz-Farbanzeige-Panel nach Anspruch 5, wobei das organische, elektrolumineszierende Material ein Polymer ist.

7. Elektrolumineszenz-Farbanzeige-Panel nach Anspruch 1, 2, 3 oder 4, wobei eine Farbsektion eine Schicht aus einem Leuchtstoffmaterial umfasst, welches durch eine Plasmaentladung angeregt wird.

8. Verfahren zur Herstellung eines Elektrolumineszenz-Farbanzeige-Panels, wobei das Verfahren die folgenden Schritte umfasst:

- Ausbildung einer großen Anzahl paralleler, lateral beabstandeter, erster Elektrodenstreifen auf einem Substrat,
- Anordnung einer großen Anzahl paralleler, lateral beabstandeter, elektrolumineszierender Streifen, wobei jeder Streifen bei Betrieb Licht von zumindest einer ersten oder einer zweiten Farbe emittiert, wobei Streifen unterschiedlicher Farben in einer Wiederholungsstruktur nebeneinander positioniert sind,
- Ausbildung einer großen Anzahl paralleler, lateral beabstandeter, zweiter Elektrodenstreifen, welche die große Anzahl erster Elektrodenstreifen kreuzen, so dass bei Betrieb ein einzelnes, Licht emittierendes Element an der Kreuzung eines ersten und eines zweiten Elektrodenstreifens zugeordnet wird,

dadurch gekennzeichnet, dass die elektrolumineszierenden Streifen auf einer großen Anzahl paralleler, lateral beabstandeter, schräger Linien gegenüber einem durch die ersten und zweiten Elektrodenstreifen gebildeten Gitter angeordnet sind.

9. Verfahren nach Anspruch 8, wobei die zweiten Elektrodenstreifen die ersten Elektrodenstreifen im Wesentlichen senkrecht kreuzen, was ein durch die ersten und zweiten Elektrodenstreifen gebildetes, im Wesentlichen rechteckiges Gitter ergibt.

10. Verfahren nach Anspruch 8 oder 9, wobei der spitze Winkel zwischen dem ersten und dem zweiten Elektrodenstreifen in einem Bereich von +10 und -10 Grad um einen bevorzugten Winkel α liegt, und der bevorzugte Winkel α ist gleich:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

wobei n die Anzahl der Farbsektionen in einem Pixel, P_r den Abstand der Pixel in der Zeilenrichtung und P_c den Abstand der Pixel in der Spaltenrichtung darstellen.

11. Verfahren nach Anspruch 8 oder 9, wobei die elektrolumineszierenden Streifen ein organisches, elektrolumineszierendes Material aufweisen, welches unter Verwendung eines Tintenstrahldruckers deponiert wird.

12. Elektronische Anordnung mit einem Elektrolumineszenz-Farbanzeige-Panel nach Anspruch 1.

Revendications

1. Panneau d'affichage électroluminescent en couleur comprenant une pluralité de pixels qui sont agencés dans des rangées et dans des colonnes de manière à constituer une configuration de grille, chaque pixel comprenant au moins deux sections de couleur dont une première section de couleur émet une lumière d'une première couleur et dont une deuxième section de couleur émet une lumière d'une deuxième couleur qui est différente de la première couleur, dans laquelle l'agencement de positionnement des premières et des deuxièmes sections de couleur dans un premier des pixels, qui est encore appelé le premier pixel, est différent de l'agencement de positionnement des premières et des deuxièmes sections de couleur dans un deuxième des pixels, qui est encore appelé le deuxième pixel, où le premier pixel est adjacent au deuxième pixel, **caractérisé en ce que** les premières sections de couleur sont agencées d'une manière adjacente sur des lignes obliques parallèles latéralement espacées par rapport à la direction de colonne.

2. Panneau d'affichage électroluminescent en couleur selon la revendication 1, dans lequel le premier pixel et le deuxième pixel sont agencés dans la même colonne.

3. Panneau d'affichage électroluminescent en couleur selon la revendication 1 ou 2, dans lequel les premières sections de couleur qui sont agencées sur une ligne oblique constituent une bande continue constituée d'une matière électroluminescente.

4. Panneau d'affichage électroluminescent en couleur selon la revendication 1, 2 ou 3, dans lequel l'angle aigu entre une colonne verticale et les lignes obliques se situe dans une gamme comprise entre +10 et -10 degrés autour d'un angle préféré α et dans lequel l'angle aigu α est égal à:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

où n est le nombre de sections de couleur dans un pixel, P_r est le pas des pixels dans la direction de rangée et P_c est le pas des pixels dans la direction de colonne.

5. Panneau d'affichage électroluminescent en couleur selon la revendication 1, 2, 3 ou 4, dans lequel une section de couleur comprend une couche constituée d'une matière électroluminescente organique.

6. Panneau d'affichage électroluminescent en couleur selon la revendication 5, dans lequel la matière électroluminescente organique est un polymère.

7. Panneau d'affichage électroluminescent en couleur selon la revendication 1, 2, 3 ou 4, dans lequel une section de couleur comprend une couche constituée d'une substance de phosphore qui est excitée par une décharge de plasma.

8. Procédé de fabrication d'un panneau d'affichage électroluminescent en couleur, ledit procédé comprenant les étapes consistant à:

- former une pluralité de premières bandes d'électrode parallèles latéralement espacées sur un substrat,
- agencer une pluralité de bandes électroluminescentes parallèles latéralement espacées, chaque bande, en fonctionnement, émettant une lumière d'une première ou d'une deuxième couleur, où les bandes de couleurs différentes sont positionnées l'une à côté de l'autre, dans une configuration de répétition,
- former une pluralité de deuxièmes bandes d'électrode parallèles latéralement espacées, lesquelles deuxièmes bandes d'électrode traversent la pluralité des premières bandes d'électrode de telle façon que, en fonctionnement, un dispositif individuel émetteur de lumière est attribué au passage d'une première et d'une deuxième bande d'électrode,

caractérisé en ce que les bandes électroluminescentes sont agencées sur une pluralité de lignes obliques parallèles latéralement espacées par rapport à une grille qui est formée par les premières et les deuxièmes bandes d'électrode.

9. Procédé selon la revendication 8, dans lequel les deuxièmes bandes d'électrode traversent d'une manière sensiblement perpendiculaire les premières bandes d'électrode, ce qui fournit une grille sensiblement rectangulaire qui est formée par les premières et les deuxièmes bandes d'électrode.

10. Procédé selon la revendication 8 ou 9, dans lequel l'angle aigu entre la première ou la deuxième bande d'électrode et une ligne oblique se situe dans une

gamme comprise entre +10 et -10 degrés autour d'un angle préféré α et dans lequel l'angle aigu α est égal à:

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$

où n est le nombre de sections de couleur dans un pixel, P_r est le pas des pixels dans la direction de rangée et P_c est le pas des pixels dans la direction de colonne.

11. Procédé selon la revendication 8 ou 9, dans lequel les bandes électroluminescentes comprennent une matière électroluminescente organique, laquelle matière électroluminescente organique est déposée au moyen d'une imprimante à jet d'encre.

12. Dispositif électronique comprenant un panneau d'affichage électroluminescent en couleur selon la revendication 1.

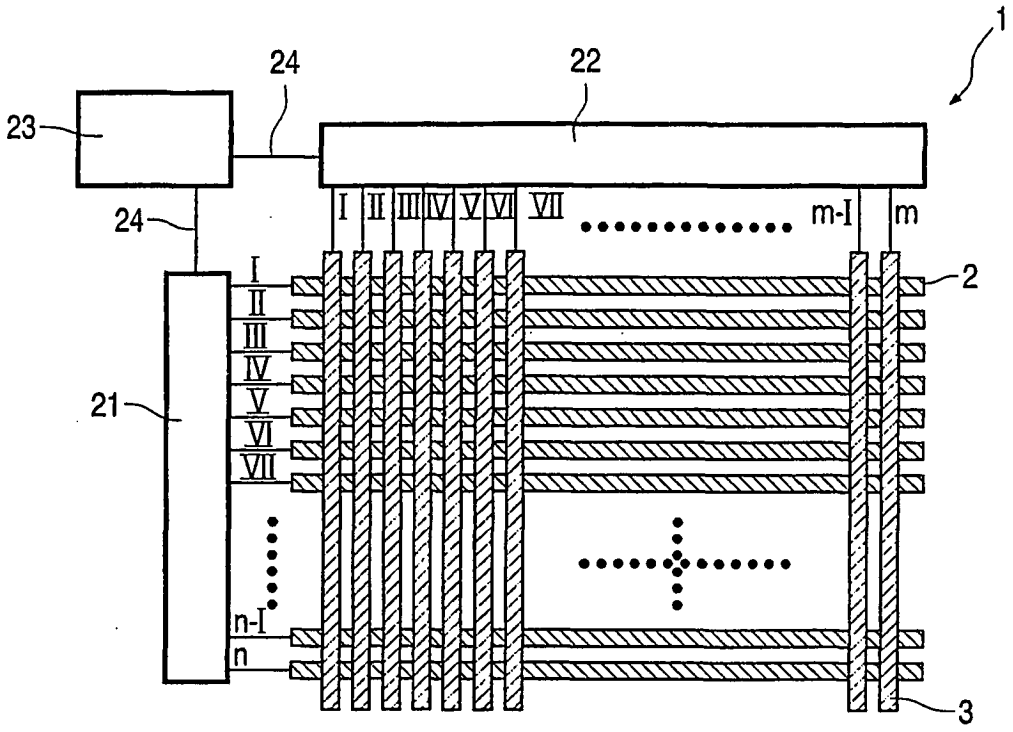
1
24
22
23
24
I II III IV V VI VII
m-I
m
2
21
I
II
III
IV
V
VI
VII
n-I
n
3

FIG. 1

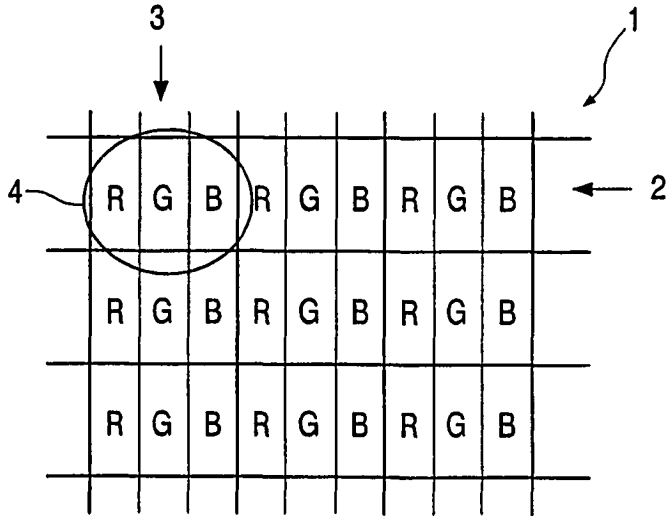
3
1
4
2
R G B R G B R G B
R G B R G B R G B
R G B R G B R G B

FIG. 2

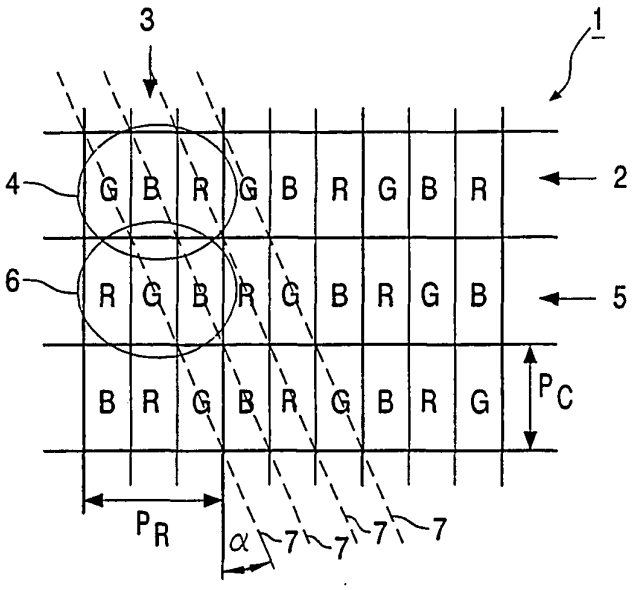

FIG. 3

FIG. 4

FIG. 5

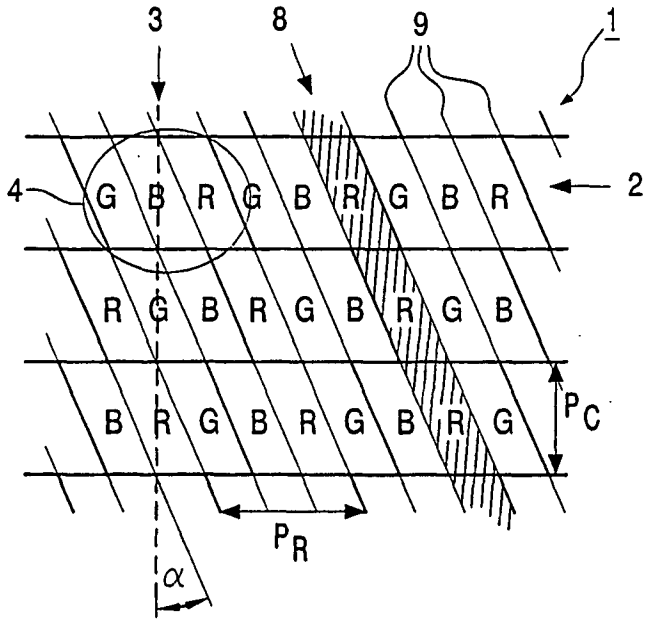
3
8
9
1
2
4
G B R G B R G B R
R G B R G B R G B
B R G B R G B R G
P_C
P_R
α

FIG. 6

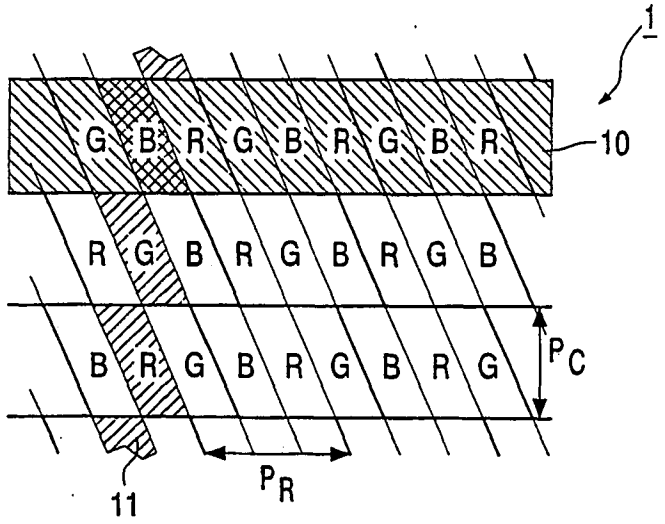
1
10
G B R G B R G B R
R G B R G B R G B
B R G B R G B R G
P_C
P_R
11

FIG. 7

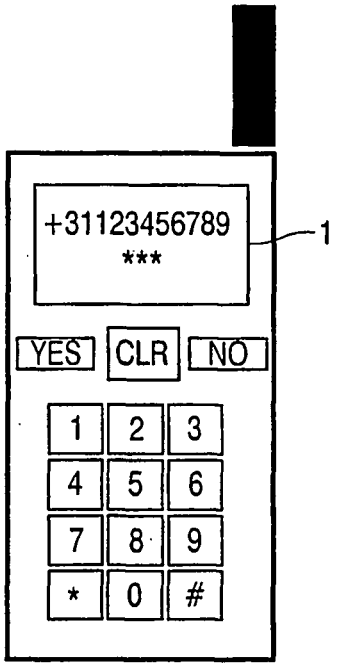
+31123456789
***
1
YES
CLR
NO
1 2 3
4 5 6
7 8 9
* 0 #

FIG. 8

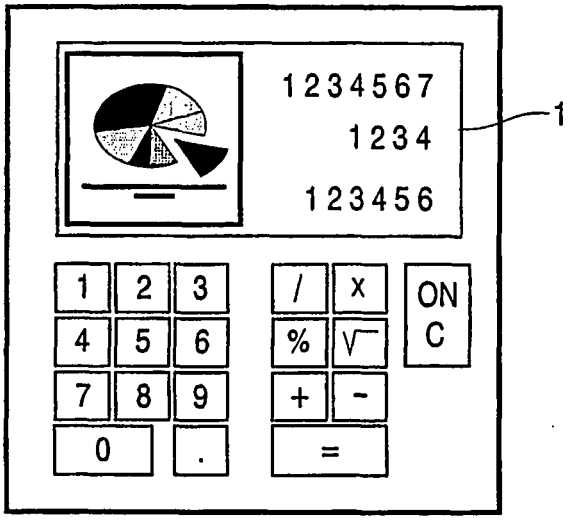
1234567
1234
123456
1
1 2 3
4 5 6
7 8 9
0 .
/ x
% √
+ -
=
ON
C

FIG. 9

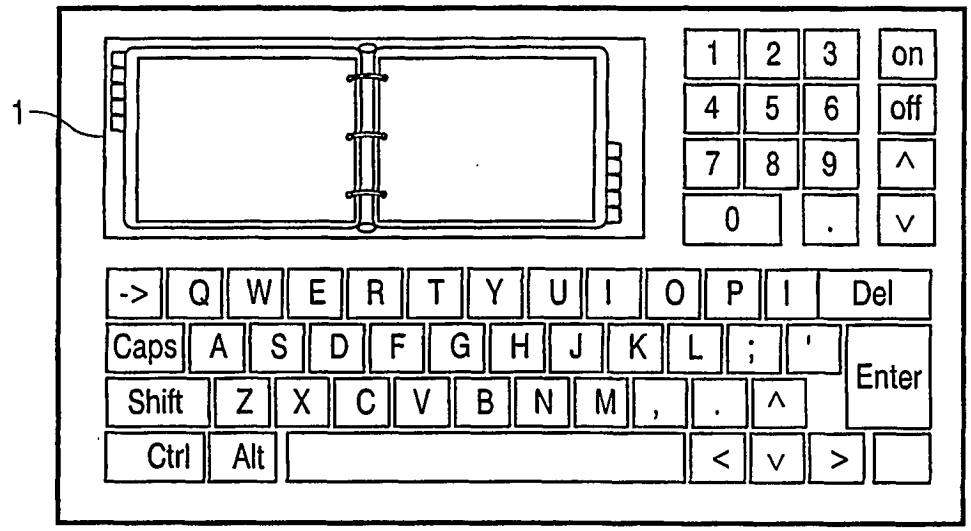
1
1 2 3 on
4 5 6 off
7 8 9 ^
0 . v
-> Q W E R T Y U I O P I Del
Caps A S D F G H J K L ; ' Enter
Shift Z X C V B N M , . ^
Ctrl Alt < v >

FIG. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0767599 A **[0004] [0004]**
- EP 0574084 A1 **[0005]**

专利名称(译)	电致发光彩色显示屏		
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外部链接	Espacenet		

摘要(译)

电致发光显示面板的每个像素中的颜色部分的位置布置不同于至少一个相邻像素中的颜色部分的位置布置。这产生了观察者所感知的改善的图像质量，特别是当在低分辨率显示器上显示运动图像时。本发明的一个优选实施例是一种电致发光显示板，其中彩色部分排列在连续的线上，这些线被定向成在显示板上对角地延伸。

$$\alpha = \arctan\left(\frac{P_r}{n \cdot P_c}\right)$$