(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 351 325 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
02.03.2016 Bulletin 2016/09

(51) Int Cl.:
H01L 51/56 *(2006.01)* ***H01L 27/32*** *(2006.01)*
B41J 2/135 *(2006.01)*

(21) Application number: **03076008.6**

(22) Date of filing: **04.04.2003**

(54) **Method and apparatus for manufacturing a display, such as, for instance, a polymer OLED display**

Verfahren und Vorrichtung zur Herstellung einer Anzeigevorrichtung wie zum Beispiel eine polymere OLED-Anzeige

Procédé et appareil de fabrication d'un afficheur tel qu'un afficheur polymère OLED

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR

(30) Priority: **05.04.2002 NL 1020312**

(43) Date of publication of application:
08.10.2003 Bulletin 2003/41

(73) Proprietor: **Meyer Burger (Netherlands) B.V.**
5657 EB Eindhoven (NL)

(72) Inventors:
- **Dings, Franciscus Cornelius**
  5505 TD Veldhoven (NL)
- **Evers, Marinus Franciscus Johanus**
  5591 JM Heeze (NL)
- **Brier, Peter**
  5624 NB Eindhoven (NL)

(74) Representative: **V.O.**
P.O. Box 87930
2508 DH Den Haag (NL)

(56) References cited:
EP-A- 0 930 641 **EP-A- 1 093 156**
WO-A-00/45964 **WO-A-01/46987**
WO-A-01/47045 **JP-A- H10 253 814**

- **PATENT ABSTRACTS OF JAPAN vol. 2002, no. 02, 2 April 2002 (2002-04-02) -& JP 2001 284047 A (SHARP CORP), 12 October 2001 (2001-10-12)**
- **PATENT ABSTRACTS OF JAPAN vol. 2000, no. 20, 10 July 2001 (2001-07-10) -& JP 2001 076619 A (FUJITSU LTD), 23 March 2001 (2001-03-23)**

EP 1 351 325 B1

Description

[0001] This invention relates to a method for manufacturing a display, such as, for instance, a polymer organic light emitting diode, comprising a substrate on which a structure, such as, for instance, a matrix structure in relief, is provided, which structure bounds a number of areas, wherein, with the aid of an inkjet printhead, an amount of liquid is deposited substantially onto each area.

[0002] This invention also relates to an apparatus for carrying out such a method, the apparatus being provided with a table for placing a substrate thereon, with an inkjet printhead for delivering liquid at a desired time, and with a displacement assembly for displacing the printhead relative to the substrate.

[0003] The substrate known per se comprises a transparent glass plate on which line-shaped, parallel transparent conductors are provided, which have a height of about 100 nm and which are made of Indium Tin Oxide (ITO) or other transparent, conductive material. Next, at right angles to the conductors, line-shaped, parallel, insulating shadowing structures have been applied, having a height of about 1- 2 μm.

[0004] Thus, between the shadowing structures and the conducting paths, areas are formed having a length and a width of from 5 to some 400 μm. Optionally, on top of the transparent conducting paths and under the shadowing structures, a buffer layer may be provided, having a height of 0.5 - 5 μm, in which recesses have been provided within the areas mentioned earlier. The recesses extend to the depth of the conductor mentioned earlier, so that pits bounded on five sides are formed. To make a polymer OLED display from the substrate, each area is to be filled with a polymer conductor (PDOT) and an organic electroluminescence medium (PPV). In a monochrome display a single type of PPV is deposited in all areas. A color display involves several types of PPV that emit different colors of light (for instance red, green and blue PPV). These types of PPV are to be deposited in different areas.

[0005] In the known method and apparatus for filling the areas of a substrate from which a display is being manufactured, use is made of an inkjet printhead which is movable relative to the table on which the substrate is accurately positioned. The table is provided with an electronic ruler, so that the position of the printhead relative to the table is known. In practice, it has been found that under the influence of various disturbing influences, such as, for instance, temperature variations in the substrate, an incorrect alignment of the substrate on the table and mechanical inaccuracies in the transport system of the table and/or the printhead, the liquid to be delivered by the printhead is not deposited in the areas on the substrate with sufficient accuracy (accuracies between 1/10 and 1/1000 of the length or width of the areas are desired). If any one of the areas of the substrate is not properly filled with liquid, such as, for instance, Pdot or red, green or blue PPV, the display will have to be rejected. It is therefore of essential importance that each area of the substrate can be accurately filled with the liquid. Especially when the substrates are larger, there is a substantial chance of defects owing to the disturbing influences mentioned earlier, such as temperature variations in the substrate, an incorrect alignment of the substrate on the table and mechanical inaccuracies in the transport system. To date, it has been attempted to tackle these problems by using a very accurate transport mechanism and very stable tables. However, practice has taught that these measures offer insufficient improvement.

[0006] JP-2001-28407A discloses a method in which an image recognition pattern is applied on the substrate. For example, the recognition pattern may include a circular mark in each pixel pit. Subsequently, position information of the substrate or the pixel is acquired with an image recognition device that senses the image recognition pattern on the substrate. The timing of the ejection of liquid material by the inkjet printhead is controlled on the basis of the position information of the substrate or the pixel.

[0007] The object of the invention is to provide a method and an apparatus by means of which the liquid to be deposited in the areas is deposited accurately in each area without such accurate delivery of the liquid being compromised by disturbing influences such as temperature variations, an incorrect alignment of the substrate on the table and mechanical inaccuracies in the transport system or the printhead.

[0008] To that end the invention provides the method of claim 1 and the apparatus according to claim 6.

[0009] In the most common cases, the sensor mentioned in the claims will be a sensor which gives a signal on edges of the areas (the edge of the conductor or the edge of the shadowing structure). These transitions are observed by this sensor with an accuracy sufficiently high for the application. In other cases, the sensor can be of a type which can also determine its position within the areas.

[0010] As the method and apparatus according to the invention involve measurement on the on the relief structure defining the position of the areas, the control knows with high accuracy where the areas are situated and consequently at what time the printhead is to be actuated to deliver an amount of liquid. Even when due to temperature variations in the substrate the structure has obtained a different shape than would be expected under normal circumstances, such different shape is observed by the at least one sensor and the delivery of the liquid is timed by the control of the printhead, such that the liquid is still deposited at the correct position in the area. This compensation also works when the substrate is positioned on the table in imperfect alignment or when play arises in the transport system.

[0011] It is noted that the structure can also include a reference structure provided on the substrate especially for that purpose. In that case, it is important that this reference structure is not only provided very locally but also

extends substantially throughout the length and width of the functional structure, for instance along the edges of the functional structure or within the functional structure, so that the reference structure can be related accurately, and also substantially in situ, to the functional structure. To that end, the functional structure can optionally be optimized for observation with the aid of sensors, for instance by including an encoder marking within the structure.

[0012] Further, it is to be noted that the invention is applicable not only with the above-described known substrate of a passive polymer OLED display but also with more complex substrates, such as, for instance, an active matrix polymer OLED display, where more conductors are situated in close mutual proximity and thin film transistors with complete electronic circuits are situated in the areas referred to. These more complex structures can also be used for observation of the position by means of sensors and, based on this observation, timing and positioning the delivery of the liquid.

[0013] The at least one sensor is positioned fixedly with respect to the printhead, so that in the case of a movably arranged printhead, the at least one sensor follows each movement of the printhead.

[0014] Further, according to a further elaboration of the invention, it is favorable when the displacement assembly is arranged for displacing the printhead relative to the substrate in a principal direction of movement, while two first sensors are provided which are designed for determining the skew of the structure relative to the principal direction of movement, and the control is arranged for timing the delivery of the liquid by the printhead, such that the determined skew is compensated. Preferably, the two first sensors of the pair are then mutually spaced apart such a distance that one sensor observes the shadowing structures on a first side of the printhead while the other sensor of the pair of sensors observes the shadowing structures on a second, opposite side of the printhead. Specifically when the printhead is provided with a number of nozzles arranged next to each other, it is of particular importance to determine the skew of the structure with the two sensors and, depending thereon, to control the time when the nozzles deliver the liquid, because in this way skew of the substrate relative to the row of nozzles can be compensated.

[0015] Essentially, the skew is determined by the time difference between the trigger signals of the two sensors. These trigger signals are produced at the time when a sensor passes a flank of a shadowing structure.

[0016] According to another further elaboration of the invention, at least one second sensor is provided for observing the position of the structure in a transverse direction extending perpendicularly to the principal direction of movement, while the displacement assembly is designed in such a manner that the printhead is displaceable in the transverse direction relative to the substrate by displacement of either the printhead or the table, and the control is designed for controlling the displacement in transverse direction on the basis of the position of the structure as observed by the at least one second sensor. This second sensor can observe, for instance, the position of a conducting path (ITO conductor) on the substrate. Optionally, two second sensors can be provided, of which one is directed at a conducting path and the other is directed between two conducting paths, the signal difference between the two sensors being used to control an actuator which displaces either the table or the printhead in transverse direction to keep the difference signal constant.

[0017] Naturally, within this elaboration, it is also possible to rotate the principal direction of movement 90 degrees, with the first sensor detecting the transitions of the conducting paths and the second sensor measuring the position in transverse direction of the printhead relative to the shadowing structures.

[0018] According to a still further elaboration of the invention, for each nozzle of the printhead, a third sensor corresponding to that respective nozzle is provided for the purpose of determining properties of the liquid delivered by the nozzle. These properties can be, for instance, the color, the volume, the layer thickness and/or the position of the liquid delivered. It is then preferred for the control to be designed to control the delivery of the liquid of a respective nozzle on the basis of the signals produced by the third sensor corresponding to the respective nozzle. These signals may then influence both the amount of liquid and the time of delivery of the liquid.

[0019] According to a further elaboration of the invention, at least one of the sensors may be designed as an optical pickup unit as used in a CD-ROM drive or DVD drive. Besides optical measuring principles, other principles are eligible for the sensors, such as, for instance, capacitive and magnetic principles. Different properties of the areas can be measured to determine their position, such as structure height, difference in reflection, absorption, capacitance, induction or magnetic field (eddy currents).

[0020] The invention will presently be further clarified on the basis of an exemplary embodiment represented in the drawing.

Fig. 1 shows a diagrammatic top plan view of a substrate with an inkjet printhead advancing relative thereto; and

Figs. 2-4 schematically show in top plan view a number of variants of a possible printhead design.

[0021] Fig. 1 schematically shows a top plan view of a substrate 1 having provided thereon shadowing structures 2 each forming a line-shaped elevation on the substrate 1. Also provided on the substrate are conducting paths 3, which, together with the shadowing structures 2, form a matrix structure bounding areas 4 in which liquid such as Pdot and subsequently red, green or blue PPV are to be deposited. To that end, the diagrammatically represented exemplary embodiment comprises an inkjet

printhead 5 which has a number of nozzles 6. Fixedly connected with this inkjet printhead 5 are a number of sensors 7, 7', 8, 8' and 9. The first sensors 7, 7' are mutually spaced apart, such that one sensor 7 is situated adjacent a first side of the printhead 5 while the other sensor 7' is situated adjacent a second, opposite side of the printhead 5. Thus, the skew in the working area of the printhead can be observed. It is also possible for the two first sensors 7, 7' to be connected with the printhead 5 such that they are situated above two opposite sides of the substrate. Thus, skewness of the entire substrate can be observed. The sensors 7, 7' can be designed, for instance, as an optical pickup unit as used in a CD or DVD drive. The sensors 7, 7' produce a signal when the sensors 7, 7' pass a flank of a mushroom structure 2. With such sensors 7, 7', the position of the flanks can be observed with an accuracy of 0.1-10 μm.

[0022] Of the second sensors 8, 8', one is directed at a conducting path 3 and another is directed between two conducting paths 3. On the basis of the difference signal between the two second sensors 8, 8', a transverse alignment control 10 controls the transverse position of the inkjet printhead 5 relative to the substrate 1 through operation of an actuator 11. This actuator 11 can engage either the printhead 5 or the table on which the substrate 1 has been placed. For each nozzle 6, a third sensor 9 is provided on the printhead 5. With the aid of these third sensors 9, for instance the volume, the color and/or the position of a delivered quantity of liquid can be measured. On the basis of the signals coming from the first sensors 7, 7' and the third sensors 9, a control 12 calculates the delay times and amplitudes of the signals controlling the inkjet printhead nozzles 6. These signals are stored in a buffer 13 to be subsequently delivered to the nozzles 6 depending on a trigger signal 14 from one of the first sensors 7'. With such a closed loop control, a very accurate delivery of liquid onto the substrate 1 is accomplished. It is possible here for the printhead 5 to be moved over the substrate 1 with a constant speed V, for instance through displacement of the substrate 1 or through displacement of the printhead 5. Further, it is possible to fill the areas 4 in several passes by moving the substrate 1 relative to the printhead 5 several times. Such a multipass operation enables the use of a relatively simple printhead 5. Such a multipass operation was not properly possible in the known method because the processing operation then took so long that the substrate, under the influence of temperature changes, was subject to changes in shape that led to an incorrect deposition of the liquid. That problem has presently been solved since, according to the invention, to control the delivery of the liquid, a measurement is performed on the structure of the substrate. The advantage is that a relatively simple printhead is less susceptible to failure than, for instance, a complex head having 256 nozzles. Naturally, the invention can also be of use for an apparatus provided with a combined inkjet printhead which deposits both the Pdot and the PPV or several colors of PPV in a single pass.

[0023] Examples of printheads are represented in Figs. 2-4. Fig. 2 shows a top plan view of a printhead 5 having a single nozzle 6, a single first sensor 7 additionally having the function of second sensor, and a single third sensor 9.

[0024] Fig. 3 shows a top plan view of a printhead in which the nozzles 6, viewed in the direction of movement, are arranged in line behind each other, so that in succession different liquids can be delivered in a single pass.

[0025] Fig. 4 shows a top plan view of a combined printhead 5, where two first sensors 7, 7' are fitted on a main frame part 15 of the printhead 5, and where each nozzle 6 is arranged in the main frame part 15 so as to be movable in a subframe 16. Connected with the subframe 16 in each case are a second sensor 8 and a third sensor 9.

[0026] It will be clear that the invention is not limited to the exemplary embodiment described but that various modifications are possible within the scope of the invention as defined by the claims. Thus, the invention also encompasses the variants only provided with a single sensor or two types of sensors. Naturally, the method is also applicable with liquids not containing any polymers or like organic substances, a case in point being, for example, E-ink displays.

Claims

1. A method for manufacturing a display comprising a substrate (1) on which a matrix structure (2) in relief is provided, which structure (2) bounds a number of areas (4), the method including:

- performing, with the aid of at least one sensor (7, 7', 8, 8', 9), a measurement on the substrate (1) to determine the position of the substrate (1); and
- controlling an inkjet printhead (5) on the basis of the thus determined position to deposit substantially in each area (4) an amount of liquid at the correct place,

characterized in that

- the at least one sensor (7, 7', 8, 8', 9) is positioned fixedly relative to the printhead (5) so that the at least one sensor (7, 7', 8, 8', 9) follows each movement of the printhead (5);

and **in that**

- the measurement is performed substantially in situ on the relief structure defining the position of a said area (4) in which an amount of liquid has to be delivered.

2. A method according to claim 1, wherein the printhead (5) is provided with a number of nozzles (6) arranged

next to each other, such that a number of areas (4) can be filled substantially simultaneously and wherein the printhead (5) includes two first sensors (7, 7'), the method including:

- determining the skew of the structure (2) relative to the printhead (5) with the two first sensors (7, 7') and, depending thereon,
- controlling the time of actuation of the nozzles (6), such that the skew relative to the printhead (5) is compensated.

3. A method according to any one of the preceding claims wherein the printing head (5) includes at least one second sensor (8, 8'), the method including:

- displacing the printhead (5) in a particular principal direction of movement relative to the substrate (1),
- observing the position of the structure (2) in a transverse direction, extending perpendicularly to the principal direction of movement with the at least one second sensor (8, 8');

wherein the printhead (5) is displaceable in the transverse direction relative to the substrate (1) by displacement of either the printhead (5) or the table, wherein the method includes:

controlling the displacement of the printhead (5) relative to the substrate (1) in the transverse direction on the basis of the position of the structure as observed by said at least one second sensor (8, 8').

4. A method according to any one of the preceding claims, wherein the printhead (5) includes third sensors (9) for measuring a property including at least one of the color, the position of deposition, the volume and the layer thickness of liquid already deposited in an area.

5. A method according to claim 4, including:

- controlling on the basis of the observed property the amount of liquid to be delivered by the printhead (5) and/or the time of delivery.

6. An apparatus for carrying out the method according to any one of the preceding claims, wherein the apparatus comprises:

- a table for placing a substrate (1) thereon the substrate (1) including a matrix structure (2) in relief, which structure (2) bounds a number of areas (4),
- an inkjet printhead (5) for delivering liquid at a desired time;
- a displacement assembly for displacing the printhead (5) relative to the substrate (1),
- at least one sensor (7, 7', 8, 8', 9); and
- a control (12) for processing the signals produced by the at least one sensor (7, 7', 8, 8', 9), for controlling the displacement of the displacement assembly and for timing the delivery of liquid by the printhead (5) on the basis of the signal produced by the at least one sensor (7, 7', 8, 8', 9);

characterized in that

- the at least one sensor is positioned fixedly relative to the printhead (5) so that the at least one sensor (7, 7', 8, 8', 9) follows each movement of the printhead (5);

and **in that**

- the at least one sensor (7, 7', 8, 8', 9) is configured to observe substantially in situ the relief structure defining the position of a said area (4) in which an amount of liquid has to be delivered.

7. An apparatus according to claim 6, wherein the displacement assembly is designed for displacing the printhead (5) relative to the substrate (1) in a principal direction of movement, while two first sensors (7, 7') are provided on the printhead (5) which are arranged for determining the skew of the structure (2) relative to the principal direction of movement, the control (12) being arranged for timing the delivery of the liquid by the printhead (5), such that the determined skew is compensated.

8. An apparatus according to claim 7, wherein at least one second sensor (8, 8') is provided for observing the position of the structure (2) in a transverse direction extending perpendicularly to the principal direction of movement, the displacement assembly being so designed that the printhead (5) is displaceable in the transverse direction relative to the substrate (1) by displacement of either the printhead (5) or the table, the control (12) being arranged for controlling the displacement in the transverse direction on the basis of the position of the structure (2) as observed by said at least one second sensor (8, 8').

9. An apparatus according to any one of claims 6-8, wherein for each nozzle (6) of the printhead (5) a third sensor (9), corresponding to that respective nozzle (6), is provided for determining properties of the liquid delivered by the nozzle (6), wherein at least one of the properties to be observed is the color, the volume, the layer thickness and/or the position of the liquid delivered.

10. An apparatus according to claim 9, wherein the control (12) is arranged for controlling the delivery of the liquid of a respective nozzle (6) on the basis of the signals produced by the third sensor (9) corresponding to the respective nozzle (6).

11. An apparatus according to any one of preceding claims 6-10, wherein at least one of the sensors (7, 7', 8, 8', 9) is an optical pickup unit as used in a CD-ROM or DVD drive.

12. An apparatus according to any one of claims 6-11, wherein at least one of the sensors (7, 7', 8, 8', 9) is a capacitive or eddy current sensor having a high position accuracy.

Patentansprüche

1. Verfahren zur Herstellung einer Anzeigevorrichtung, umfassend ein Substrat (1), auf dem eine Matrixstruktur (2) in Relief bereitgestellt ist, welche Struktur (2) an eine Anzahl von Bereichen (4) angrenzt, wobei das Verfahren Folgendes umfasst:

- Durchführung, mithilfe von mindestens einem Sensor (7, 7', 8, 8', 9), einer Messung an dem Substrat (1), um die Position des Substrats (1) zu bestimmen; und
- Steuerung eines Tintenstrahldruckkopfes (5) anhand der so bestimmten Position, um im Wesentlichen in jedem Bereich (4) eine Flüssigkeitsmenge an der richtigen Stelle abzugeben,

dadurch gekennzeichnet, dass

- der mindestens eine Sensor (7, 7', 8, 8', 9) ortsfest zu dem Druckkopf (5) positioniert ist, sodass der mindestens eine Sensor (7, 7', 8, 8', 9) jeder Bewegung des Druckkopfes (5) folgt;

und dadurch, dass

- die Messung im Wesentlichen in situ an der Reliefstruktur, die die Position des Bereiches (4), in dem eine Flüssigkeitsmenge abzugeben ist, durchgeführt wird.

2. Verfahren nach Anspruch 1, wobei der Druckkopf (5) mit einer Anzahl von nebeneinander angeordneten Düsen (6) versehen ist, sodass eine Anzahl von Bereichen (4) im Wesentlichen gleichzeitig gefüllt werden kann, und wobei der Druckkopf (5) zwei erste Sensoren (7, 7') umfasst, wobei das Verfahren Folgendes umfasst:

- Bestimmung der Neigung der Struktur (2) zu dem Druckkopf (5) mit den zwei ersten Sensoren (7, 7') und, abhängig davon,
- Steuerung der Betätigungszeit der Düsen (6), sodass die Neigung zum Druckkopf (5) ausgeglichen wird.

3. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Druckkopf (5) mindestens einen zweiten Sensor (8, 8') umfasst, wobei das Verfahren Folgendes umfasst:

- Verschieben des Druckkopfes (5) in einer bestimmten Hauptbewegungsrichtung zu dem Substrat (1),
- Beobachten der Position der Struktur (2) in einer Querrichtung, die senkrecht zu der Hauptbewegungsrichtung verläuft, mit dem mindestens einen zweiten Sensor (8, 8');

wobei der Druckkopf (5) durch Verschieben von entweder dem Druckkopf (5) oder dem Tisch in Querrichtung zu dem Substrat (1) verschiebbar ist,
wobei das Verfahren Folgendes umfasst:

Steuerung der Verschiebung des Druckkopfes (5) zu dem Substrat (1) in Querrichtung aufgrund der Position der Struktur, wie von dem mindestens einen zweiten Sensor (8, 8') beobachtet.

4. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Druckkopf (5) dritte Sensoren (9) zum Messen einer Eigenschaft umfasst, wie etwa u. a. mindestens eine Farbe, die Position der Auftragung, das Volumen und die Schichtdicke der bereits in einem Bereich abgegebenen Flüssigkeit.

5. Verfahren nach Anspruch 4, umfassend:

- Steuerung aufgrund der beobachteten Eigenschaft der vom Druckkopf (5) abzugebenden Flüssigkeitsmenge und/oder der Abgabezeit.

6. Vorrichtung zum Ausführen des Verfahrens nach einem der vorhergehenden Ansprüche, wobei die Vorrichtung Folgendes umfasst:

- einen Tisch, um darauf das Substrat (1) zu platzieren, wobei das Substrat (1) eine Matrixstruktur (2) in Relief aufweist, wobei die Struktur (2) an eine Anzahl von Bereichen (4) angrenzt,
- einen Tintenstrahldruckkopf (5) zum Abgeben von Flüssigkeit zu einem gewünschten Zeitpunkt;
- eine Verschiebungseinheit zum Verschieben des Druckkopfes (5) in Bezug auf das Substrat (1),
- mindestens einen Sensor (7, 7', 8, 8', 9); und
- eine Steuerung (12) zur Verarbeitung der von dem mindestens einen Sensor (7, 7', 8, 8', 9)

produzierten Signale, um die Verschiebung der Verschiebungsanordnung zu steuern und die Abgabe der Flüssigkeit durch den Druckkopf (5) aufgrund des von dem mindestens einen Sensor (7, 7', 8, 8', 9) produzierten Signals zu timen;

dadurch gekennzeichnet, dass

- der mindestens eine Sensor ortsfest zu dem Druckkopf (5) positioniert ist, sodass der mindestens eine Sensor (7, 7', 8, 8', 9) jeder Bewegung des Druckkopfes (5) folgt;

und dadurch dass

- der mindestens eine Sensor (7, 7', 8, 8', 9) konfiguriert ist, um im Wesentlichen in situ die Reliefstruktur, die die Position des Bereiches (4), in dem eine Flüssigkeitsmenge abzugeben ist, definiert, zu beobachten.

7. Vorrichtung nach Anspruch 6, wobei die Verschiebungsanordnung konzipiert ist, den Druckkopf (5) zu dem Substrat (1) in einer Hauptbewegungsrichtung zu verschieben, während zwei erste Sensoren (7, 7') auf dem Druckkopf (5) bereitgestellt sind, die angeordnet sind, die Neigung der Struktur (2) zur Hauptbewegungsrichtung zu bestimmen, wobei die Steuerung (12) angeordnet ist, um die Abgabe der Flüssigkeit durch den Druckkopf (5) so zu timen, dass die bestimmte Neigung ausgeglichen wird.

8. Vorrichtung nach Anspruch 7, wobei mindestens ein zweiter Sensor (8, 8') bereitgestellt ist, um die Position der Struktur (2) in einer Querrichtung, die parallel zu der Hauptbewegungsrichtung verläuft, zu beobachten, wobei die Verschiebungsanordnung so konzipiert ist, dass der Druckkopf (5) durch Verschieben von entweder dem Druckkopf (5) oder dem Tisch in Querrichtung zu dem Substrat (1) verschiebbar ist, wobei die Steuerung (12) angeordnet ist, die Verschiebung in der Querrichtung aufgrund der Position der Struktur (2), wie beobachtet von mindestens einem zweiten Sensor (8, 8'), zu steuern.

9. Vorrichtung nach einem der Ansprüche 6-8, wobei für jede Düse (6) des Druckkopfes (5) ein dritter Sensor (9) entsprechend dieser jeweiligen Düse (6) bereitgestellt ist, um Eigenschaften der von der Düse (6) abgegebenen Flüssigkeit zu bestimmen, wobei mindestens eine der zu beobachtenden Eigenschaften die Farbe, das Volumen, die Schichtdicke und/oder die Position der abgegebenen Flüssigkeit ist.

10. Vorrichtung nach Anspruch 9, wobei die Steuerung (12) angeordnet ist, um die Abgabe der Flüssigkeit einer entsprechenden Düse (6) aufgrund der Signale, produziert von dem dritten Sensor (9), welcher der jeweiligen Düse (6) entspricht, zu steuern.

11. Vorrichtung nach einem der vorhergehenden Ansprüche 6-10, wobei mindestens einer der Sensoren (7, 7', 8, 8', 9) eine optische Aufnahmeeinheit ist, wie sie in einem CD-ROM- oder DVD-Laufwerk verwendet wird.

12. Vorrichtung nach einem der Ansprüche 6-11, wobei mindestens einer der Sensoren (7, 7', 8, 8', 9) ein kapazitiver oder Wirbelstrom-Sensor mit einer hohen Positionsgenauigkeit ist.

Revendications

1. Procédé de fabrication d'un afficheur comprenant un substrat (1) sur lequel est placée une structure de matrice (2) en relief, laquelle structure (2) délimite un nombre de régions (4), le procédé comprenant les étapes suivantes :

- effectuer, à l'aide d'au moins un capteur (7, 7', 8, 8', 9), une mesure sur le substrat (1) pour déterminer la position du substrat (1) ; et
- commander une tête d'impression à jet d'encre (5) en se basant sur la position ainsi déterminée pour déposer substantiellement dans chaque région (4) une quantité de liquide au bon endroit,

caractérisé en ce que

- ledit au moins un capteur (7, 7', 8, 8', 9) est positionné de manière fixe par rapport à la tête d'impression (5) de telle manière que ledit au moins un capteur (7, 7', 8, 8', 9) suit chaque mouvement de la tête d'impression (5) ;

et **en ce que**

- la mesure est réalisée substantiellement *in situ* sur la structure en relief définissant la position d'une dite région (4) dans laquelle une quantité de liquide doit être déposée.

2. Procédé selon la revendication 1, dans lequel la tête d'impression (5) est pourvue d'un nombre de buses (6) placées côte à côte, de sorte qu'un nombre de régions (4) peuvent être remplies de façon substantiellement simultanée et dans lequel la tête d'impression (5) comprend deux premiers capteurs (7, 7'), le procédé comprenant les opérations suivantes :

- déterminer le décalage de la structure (2) par rapport à la tête d'impression (5) à l'aide des deux premiers capteurs (7, 7') et, en fonction de celui-ci,

- commander l'instant d'actionnement des buses (6), de telle manière que le décalage par rapport à la tête d'impression (5) est compensé.

3. Procédé selon l'une quelconque des revendications précédentes, dans lequel la tête d'impression (5) comprend au moins un deuxième capteur (8, 8'), le procédé comprenant les opérations suivantes :

- déplacer la tête d'impression (5) dans une direction principale particulière de déplacement par rapport au substrat (1),
- observer la position de la structure (2) dans une direction transversale, s'étendant perpendiculairement à la direction principale de déplacement avec ledit au moins un deuxième capteur (8, 8') ;

dans lequel la tête d'impression (5) est mobile dans la direction transversale par rapport au substrat (1) soit par déplacement de la tête d'impression (5), soit par déplacement de la table, dans lequel le procédé comprend l'opération suivante :

commander le déplacement de la tête d'impression (5) par rapport au substrat (1) dans la direction transversale en se basant sur la position de la structure observée par ledit au moins un deuxième capteur (8, 8').

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel la tête d'impression (5) comprend des troisièmes capteurs (9) pour mesurer une propriété comprenant au moins un paramètre parmi la couleur, la position du dépôt, le volume et l'épaisseur de couche du liquide déjà déposé dans une région.

5. Procédé selon la revendication 4, comprenant l'opération suivante :

- commander, d'après la propriété observée, la quantité de liquide à déposer au moyen de la tête d'impression (5) et/ou le moment du dépôt.

6. Appareil pour mettre en oeuvre le procédé selon l'une quelconque des revendications précédentes, dans lequel l'appareil comprend :

- une table sur laquelle doit être placé un substrat (1), le substrat (1) comprenant une structure de matrice (2) en relief, laquelle structure (2) délimite un nombre de régions (4),
- une tête d'impression à jet d'encre (5) pour distribuer du liquide à un instant voulu ;
- un ensemble de déplacement pour déplacer la tête d'impression (5) par rapport au substrat (1),
- au moins un capteur (7, 7', 8, 8', 9) ; et
- une commande (12) pour traiter les signaux produits par ledit au moins un capteur (7, 7', 8, 8', 9), pour commander le déplacement de l'ensemble de déplacement et pour minuter la distribution de liquide réalisée par la tête d'impression (5) en se basant sur le signal produit par ledit au moins un capteur (7, 7', 8, 8', 9) ;

caractérisé en ce que

- ledit au moins un capteur est positionné de façon fixe par rapport à la tête d'impression (5) de telle manière que ledit au moins un capteur (7, 7', 8, 8', 9) suit chaque mouvement de la tête d'impression (5) ;

et **en ce que**

- ledit au moins un capteur (7, 7', 8, 8', 9) est configuré pour observer substantiellement *in situ* la structure en relief définissant la position d'une dite région (4) dans laquelle une quantité de liquide doit être déposée.

7. Appareil selon la revendication 6, dans lequel l'ensemble de déplacement est conçu pour déplacer la tête d'impression (5) par rapport au substrat (1) dans une direction principale de déplacement, tandis que deux premiers capteurs (7, 7') sont placés sur la tête d'impression (5) et sont agencés pour déterminer le décalage de la structure (2) par rapport à la direction principale de déplacement, la commande (12) étant agencée pour minuter la distribution du liquide réalisée par la tête d'impression (5), de telle manière que le décalage déterminé est compensé.

8. Appareil selon la revendication 7, dans lequel au moins un deuxième capteur (8, 8') est prévu pour observer la position de la structure (2) dans une direction transversale qui s'étend perpendiculairement à la direction principale de déplacement, l'ensemble de déplacement étant conçu de telle manière que la tête d'impression (5) est mobile dans la direction transversale par rapport au substrat (1) soit par déplacement de la tête d'impression (5), soit par déplacement de la table, la commande (12) étant agencée pour commander le déplacement dans la direction transversale en se basant sur la position de la structure (2) observée par ledit au moins un deuxième capteur (8, 8').

9. Appareil selon l'une quelconque des revendications 6 à 8, dans lequel pour chaque buse (6) de la tête d'impression (5), un troisième capteur (9), correspondant à cette buse respective (6), est prévu pour déterminer les propriétés du liquide distribué par la buse (6), au moins l'une des propriétés à observer étant la couleur, le volume, l'épaisseur de couche

et/ou la position du liquide déposé.

10. Appareil selon la revendication 9, dans lequel la commande (12) est agencée pour commander la distribution du liquide d'une buse respective (6) en se basant sur les signaux produits par le troisième capteur (9) correspondant à la buse respective (6).

11. Appareil selon l'une quelconque des revendications 6 à 10, dans lequel au moins l'un des capteurs (7, 7', 8, 8', 9) est une unité de lecture optique comme celles utilisées dans un lecteur de CD-ROM ou de DVD.

12. Appareil selon l'une quelconque des revendications 6 à 11, dans lequel au moins l'un des capteurs (7, 7', 8, 8', 9) est un capteur capacitif ou à courants de Foucault ayant une haute précision de position.

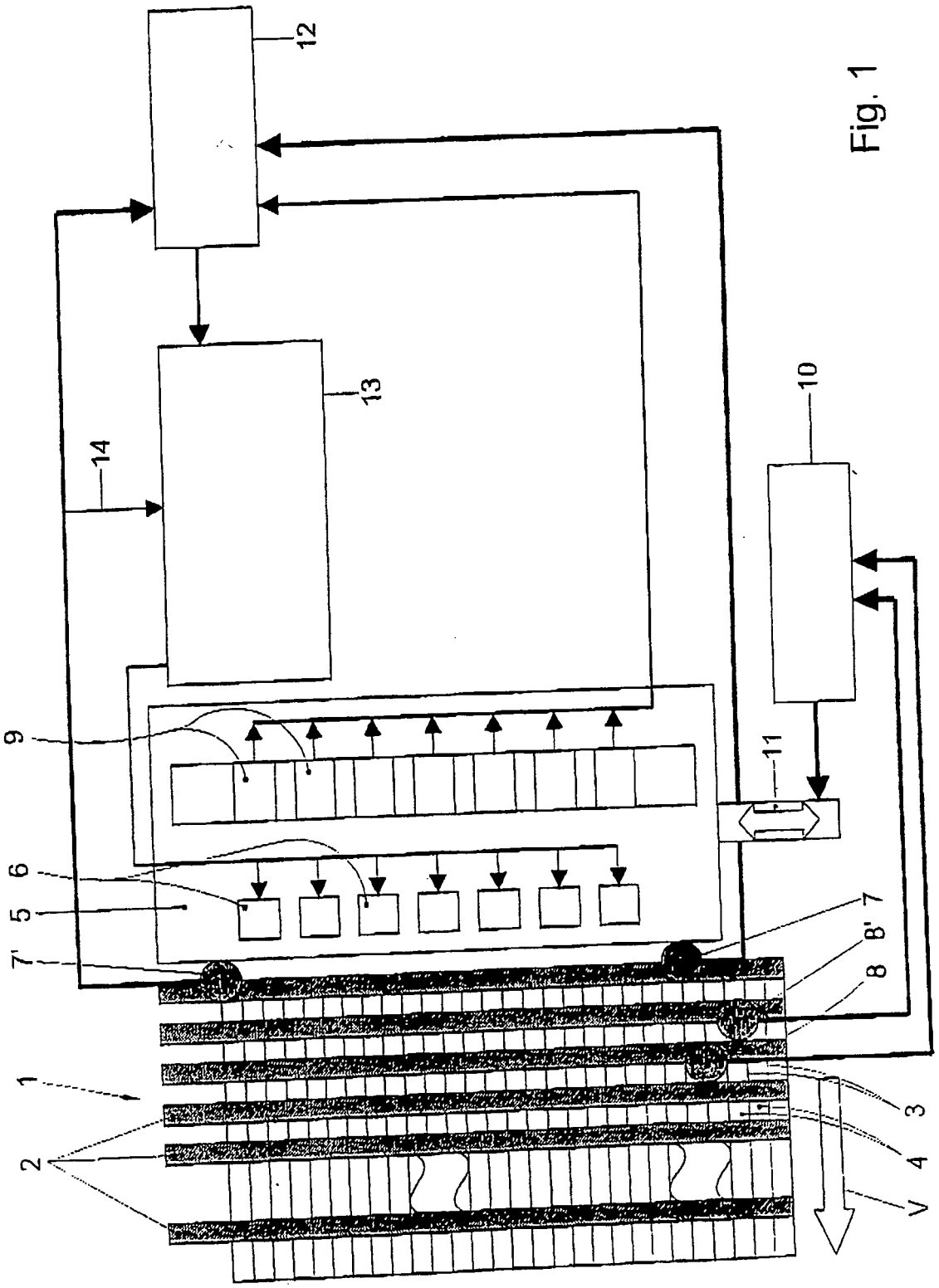

Fig. 1

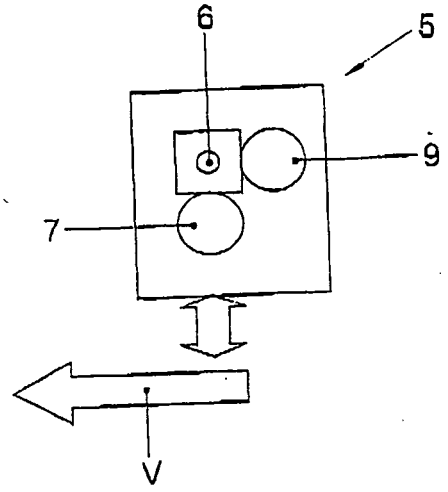

Fig. 2

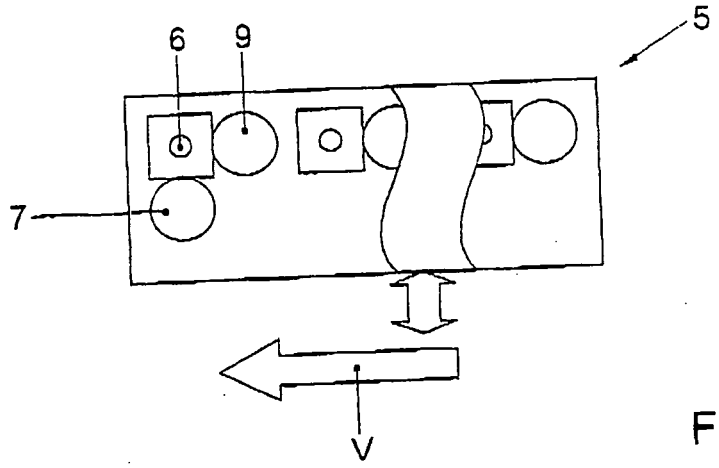

Fig. 3

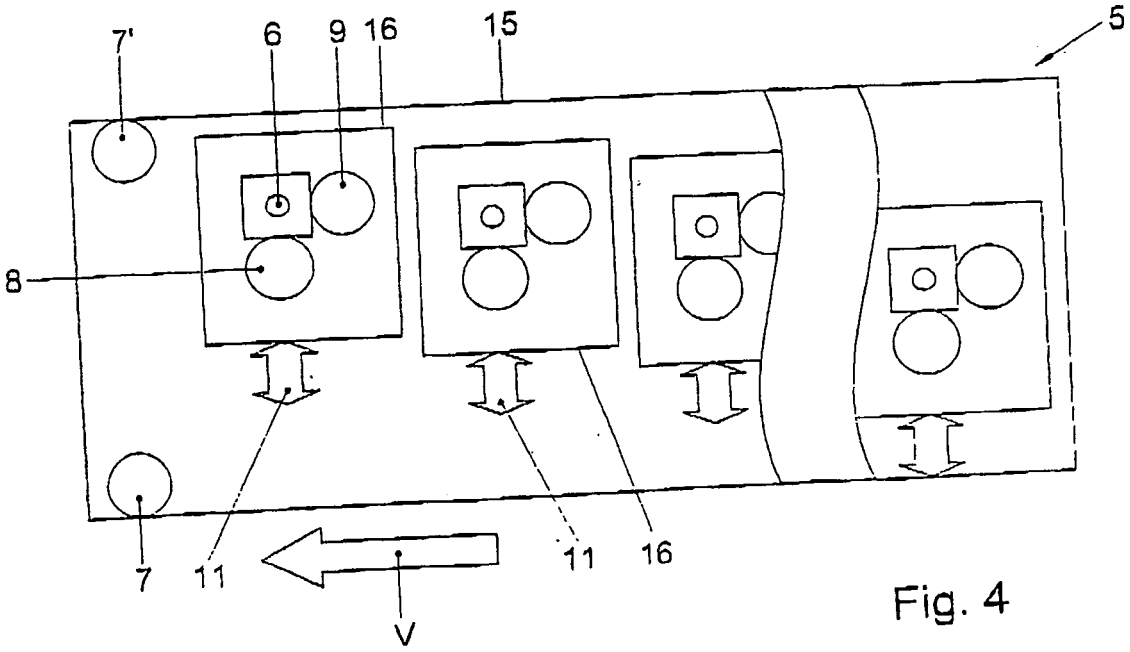

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001028407 A **[0006]**

专利名称(译)	用于制造显示器的方法和设备，例如聚合物OLED显示器		
公开(公告)号	EP1351325B1	公开(公告)日	2016-03-02
申请号	EP2003076008	申请日	2003-04-04
[标]申请(专利权)人(译)	欧提比集团有限公司		
申请(专利权)人(译)	OTB集团B.V.		
当前申请(专利权)人(译)	汉堡王（荷兰）有限公司		
[标]发明人	DINGS FRANCISCUS CORNELIUS EVERS MARINUS FRANCISCUS JOHANUS BRIER PETER		
发明人	DINGS, FRANCISCUS CORNELIUS EVERS, MARINUS FRANCISCUS JOHANUS BRIER, PETER		
IPC分类号	H01L51/56 H01L27/32 B41J2/135 B41J2/01 B05C5/00 B05C11/00 B05D1/26 H01L51/00 H01L51/40		
CPC分类号	H01L51/0005 H01L27/3295 H01L51/56		
优先权	1020312 2002-04-05 NL		
其他公开文献	EP1351325A1		
外部链接	Espacenet		

摘要(译)

描述了一种用于制造显示器的方法，该显示器包括基板，在该基板上设置有结构（2,3），例如浮雕的矩阵结构，该结构限定了多个区域（4），其中，借助于喷墨打印头（5），基本上在每个区域中沉积一定量的液体，其中借助于至少一个传感器（9）在基板上进行测量以确定相应区域的位置，并且在这样确定的位置的基础上，控制打印头以在正确的位置输送一定量的液体。还描述了用于执行该方法的设备，用于该方法的基板和利用该方法获得的显示器。