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

(11) EP 2 991 116 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
22.01.2020 Bulletin 2020/04

(51) Int Cl.:
H01L 27/32 *(2006.01)* ***H01L 51/00*** *(2006.01)*
G06F 3/041 *(2006.01)* ***H01L 51/52*** *(2006.01)*
G09G 5/00 *(2006.01)* ***G06F 3/044*** *(2006.01)*

(21) Application number: **15182874.6**

(22) Date of filing: **28.08.2015**

(54) IN CELL-TYPE TOUCH PANEL INTEGRATED FLEXIBLE ORGANIC LIGHT EMITTING DISPLAY DEVICE

IN ZELLENTYP-BERÜHRUNGSBILDSCHIRM INTEGRIERTE, FLEXIBLE ORGANISCHE LICHTEMITTIERENDE ANZEIGEVORRICHTUNG

DISPOSITIF D'AFFICHAGE ÉLECTROLUMINESCENT ORGANIQUE À PANNEAU TACTILE DE TYPE CELLULAIRE SOUPLE INTÉGRÉ

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **29.08.2014 KR 20140114179**

(43) Date of publication of application:
02.03.2016 Bulletin 2016/09

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Description

[0001] This application claims the priority of Korean Patent Application No. 10-2014-0114179 filed on August 29, 2014, in the Korean Intellectual Property Office.

Field of the Invention

[0002] The present disclosure relates to an in-cell type touch panel integrated flexible organic light emitting display device. Delamination and cracks of a pad unit which is laminated to a flexible organic light emitting display device can be reduced when a touch panel is integrated.

Description of the Related Art

[0003] The field of display devices for visually displaying electrical information signals has grown rapidly. Thus, studies for developing performance such as thinning, weight lightening, and low power consumption, of various display devices have continued. Representative examples of the display devices include a Liquid Crystal Display (LCD) device, a Plasma Display Panel (PDP) device, a Field Emission Display (FED) device, an Electro-Wetting Display (EWD) device, an Organic Light Emitting Display (OLED) device, and the like.

[0004] In particular, the organic light emitting display device is a self-light emitting display device that does not need an additional light source unlike a liquid crystal display. Thus, the organic light emitting display device can be manufactured into a lightweight and thin form. Further, the organic light emitting display device is advantageous in terms of power consumption since it is driven with a low voltage. Also, the organic light emitting display device has a fast response speed, a wide viewing angle, and an infinite contrast ratio. Therefore, the organic light emitting display device has been recognized as a next-generation display device. However, in spite of such advantages, the organic light emitting display device has a disadvantage of being particularly vulnerable to moisture and oxygen. Thus, there is a problem in obtaining the reliability as compared with the other display devices.

[0005] The organic light emitting display device displays images using an organic light emitting element as a self-light emitting element. The organic light emitting display device includes a plurality of pixels formed of organic light emitting elements. The organic light emitting element includes a first electrode (e.g., anode), an organic light emission layer, a second electrode (e.g., cathode), and a bank. The organic light emission layer formed of an organic substance and configured to generate electro luminescence on the basis of an electrical signal applied between the first electrode and the second electrode is disposed between the first electrode and the second electrode. A plurality of organic light emitting elements is separated by the bank.

[0006] If the organic light emitting display device is of a top-emission type, the first electrode has reflective characteristics and the second electrode has transparent characteristics or translucent characteristics in order to emit a light emitted from the organic light emission layer in an upward direction. Further, in order to secure the reliability, a transparent encapsulation part configured to protect the organic light emitting element against oxygen and moisture is formed on the organic light emitting element.

[0007] Such an organic light emitting display device may further include a touch panel (or other type of touch user interface). Generally, a touch panel includes an add-on type touch panel attached to an external surface of an organic light emitting display device, an on-cell type touch panel disposed on an organic light emitting display device, and an in-cell type touch panel integrated within an organic light emitting display device. In the in-cell type touch panel integrated organic light emitting display device, a touch panel is integrated. Thus, it can be realized in a thin form as compared with the add-on type or on-cell type organic light emitting display device.

[0008] US 2014/0014960 A1 describes a display device having a touch sensor. One surface of a thin substrate of one of stacked substrates is provided with a layer including a touch sensor, and one surface of a thin substrate of other stacked substrates is provided with a layer including a display element. In one example, a first substrate is provided with a display portion, wirings electrically connected to the display portion, and wirings electrically connected to the touch sensor through contact portions. A resin layer in which conductive particles are dispersed is provided in the contact portion. By the contact of the conductive particles in the resin layer with both a sensor electrode and an electrode, the sensor electrode and wiring are electrically connected to each other.

[0009] US 2014/0078077 A1 describes an organic light emitting display having a structure including an in-cell touch electrode array. In an example, a touch pad portion is connected to a pad portion of a thin film transistor array via a sealant including a conductive ball, when the upper and lower substrates are joined to each other via an adhesive layer.

[0010] US 2010/0265188 A1 relates to a passive touch sensor configuration integrated with an OLED structure.

[0011] EP 2698821 A2 describes an organic light emitting display, in which a distance between an outermost surface of a touch pad portion and an outermost surface of a dummy pad portion in a touch pad portion is smaller than the distance in a neighboring portion adjacent to the touch pad portion.

[0012] US 2014/0078701 A1, relates to a display device, in which a photosensitive resin adheres a display module and a cover member to each other.

SUMMARY OF THE INVENTION

[0013] The invention is indicated in the independent claims. Further embodiments are indicated in the dependent claims.

[0014] In recent years, a flexible organic light emitting display device (F-OLED) capable of maintaining a display performance even if bent like paper has been developed. It is to be substituted for nonflexible display devices using a flexible substrate formed of a flexible material such as plastic, metal or a flexible glass. Such a flexible substrate is applied to a display device that has an excellent durability and the substrate cannot be easily broken.

[0015] Meanwhile, various technologies for integrating a touch panel in such display devices have been under research. In particular, if overall thickness of a display device is increased due to an attached touch panel, the bendability of a flexible organic light emitting display device is decreased. Therefore, technologies capable of realizing an excellent touch performance while minimizing an increase in thickness are needed.

[0016] The inventors of the present disclosure have continued research and development for commercialization of a top-emission type touch panel integrated flexible organic light emitting display device having an excellent bendability, while being lightweight and thin in form.

[0017] To be specific, in the top-emission type touch panel integrated flexible organic light emitting display device, a second electrode transmits a light emitted from an organic light emission layer. In particular, since the second electrode is formed of a metal material, if a touch panel is provided under the second electrode, the second electrode shields an electrostatic capacitive touch signal. Therefore, a touch panel in a top-emission flexible organic light emitting display device has been limited to be provided on a second electrode.

[0018] Further, the organic light emission layer may be damaged at a high temperature of about 110°C or more. Furthermore, generally, the deposition temperature required for forming a touch electrode of a touch panel is high enough to damage the organic light emission layer. Therefore, there has been technical limitation in providing a touch panel on an organic light emission layer.

[0019] In order to solve the above-described problems, the inventors of the present disclosure provided an organic light emitting display panel on a first flexible substrate and separately provided a touch panel on a second flexible substrate. Further, the inventors of the present disclosure bonded the first flexible substrate to the second flexible substrate using a transparent adhesive layer. In particular, according to such a touch panel integrated type, an organic light emission layer is not damaged at a high temperature.

[0020] In order to drive the above-described top-emission type touch panel integrated flexible organic light emitting display device, the inventors of the present disclosure provided a first pad unit on the first flexible substrate and a second pad unit on the second flexible substrate. Further, the inventors of the present disclosure formed a line so as to electrically connect the first pad unit with a touch driver circuit. Furthermore, the inventors of the present disclosure formed a line so as to electrically connect the second pad unit with a touch electrode. Then, the inventors of the present disclosure electrically connected the second flexible substrate with the first flexible substrate using a conductive ball. Such a touch panel integrated type has an advantage of being light and thin, but there are some problems with the pad unit due to an in-cell type structure.

[0021] Firstly, the pad units respectively formed on the first flexible substrate and the second flexible substrate are exposed to the outside. Thus, moisture permeates into the exposed area or a pad delamination defect occurs while the conductive ball is separated from the pad units due to a stress caused by bending.

[0022] Secondly, line units connected with the pad units respectively formed on the first flexible substrate and the second flexible substrate are cut or broken by the conductive ball when the first flexible substrate and the second flexible substrate are bonded to each other.

[0023] Thirdly, if a gap between the first flexible substrate and the second flexible substrate is too short, the flexibility can be improved. But a parasitic capacitance is increased, which causes a decrease in touch sensitivity. On the other hand, if the gap is too long, the parasitic capacitance is decreased and the touch sensitivity is improved. But a degree of exposure of the pad unit is increased, which deteriorates the pad delamination defect and reduces the flexibility.

[0024] Particularly, the above-described problems are independent from each other and also intimately connected with each other. For example, if the gap is increased, the parasitic capacitance of the touch panel is decreased, but the pad delamination defect and the line break caused by the conductive ball are increased. The term "line break" refers to an electrical signal line such as the first touch line unit 114 or the second touch line unit 124 that is cut or broken in two by a conductive ball. If a signal line is disconnected in any such manner, then electrical signal cannot be transmitted thereby. Also, the bendability deteriorates. On the other hand, if the gap is decreased, the parasitic capacitance is increased and problems occur with respect to touch sensitivity. Thus, there are difficulties in application of the touch panel to a display panel.

[0025] Accordingly, an object of the present disclosure is to provide a flexible organic light emitting display device including a pad unit which is configured to improve a stress durability generated at the pad unit with minimized thickness in order to solve a pad delamination defect.

[0026] Accordingly, another object of the present disclosure is to provide a flexible organic light emitting display device including a line unit which is configured to improve a line break durability caused by a conductive ball. The conductive ball at the line unit is connected with a pad unit when it is used for bonding.

[0027] Accordingly, yet another object of the present disclosure is to provide a flexible organic light emitting display device configured to achieve both excellent flexibility and touch sensitivity simultaneously with minimized thickness and also minimize physical stress in a pad unit.

[0028] The objects of the present disclosure are not limited to the aforementioned objects, and other objects, which are not mentioned above, will be apparent to a person having ordinary skill in the art from the following description.

[0029] A flexible organic light emitting display device comprises a first flexible substrate and a second flexible substrate spaced apart from the first flexible substrate, the first flexible substrate and the second flexible substrate configured to have a first gap at a display area and a second gap at a peripheral area surrounding the display area, a first touch line unit connected with a first pad unit on the first flexible substrate at the peripheral area, a second touch line unit connected with a second pad unit on the second flexible substrate at the peripheral area; and a gap balancing conductive element included in a conductive adhesive layer configured to electrically connect the first pad unit and the second pad unit and for maintaining the second gap on the basis of the first gap.

[0030] The flexible organic light emitting display device may further comprise a transparent adhesive layer between the first flexible substrate and the second flexible substrate with a thickness corresponding to the dimensions of the gap balancing conductive element at the peripheral area.

[0031] A difference between the first gap and the second gap may be less than 10%.

[0032] The first gap may be equal to the second gap and the gap balancing conductive element may have one or more shapes among a ball, a column, a hexagon, a rounded shape or combinations thereof.

[0033] The flexible organic light emitting display device may further comprise a plurality of thin-film transistors on the first substrate at the display area, an organic light emitting element including a first electrode on the plurality of the thin-film transistors, an organic light emission layer on the first electrode and a second electrode on the organic light emission layer, a transparent flexible encapsulation unit on the organic light emitting element, and a touch electrode unit on the second flexible substrate at a touch area,

[0034] The touch electrode unit and the second electrode may be defined to have a third gap therebetween, which is determined in consideration of bendability of the flexible organic light emitting display device and a parasitic capacitance formed between the second electrode and the touch electrode unit.

[0035] The third gap may be from 4μm to 13 μm.

[0036] The transparent adhesive layer may be formed along at least one side of the first pad unit and the second pad unit.

[0037] The transparent adhesive layer may be configured to surround the first pad unit and the second pad unit.

[0038] The first touch line unit is configured to include a first auxiliary touch line unit and the second touch line unit is configured to include a second auxiliary touch line unit.

[0039] The first auxiliary touch line unit includes a plurality of first lines separated in parallel with each other, each of the first lines are connected to the first pad unit and the first touch line unit and the second auxiliary touch line unit includes a plurality of second lines separated in parallel with each other, each of the second line are connected to the second pad unit and the second touch line unit.

[0040] The dimensions of the gap balancing conductive element may be larger than a width of the first lines of the first auxiliary touch line unit and a width of the second lines of the second auxiliary touch line unit.

[0041] The first auxiliary touch line unit and the second auxiliary touch line unit include one or more shapes among a zigzag shape, a diamond shape, a rounded shape and a wavy shape, or combinations thereof.

[0042] The flexible organic light emitting display device may further comprise a driving circuit unit connected to the first touch line unit and configured to be positioned on the first flexible substrate at a bendable area.

[0043] The driving circuit unit may be configured to be non-overlapped with the second flexible substrate.

[0044] An area for the second flexible substrate, overlapped with an area where the driving circuit unit is mounted, may be configured to be cut out.

[0045] The present disclosure has an effect of reducing physical stress generated in a pad unit and also improving the bendability of the pad unit by forming a diameter of a conductive ball. The conductive ball is for connecting a first flexible substrate and a second flexible substrate. The diameter of the conductive ball is determined on the basis of the total thickness of other various elements configuring a flexible organic light emitting display device.

[0046] According to another aspect a method for producing a flexible organic light emitting display device is provided, comprising the steps of: providing a first flexible substrate having a first touch line unit connected with a first pad unit on the first flexible substrate at a peripheral area; providing a second flexible substrate having a second touch line unit connected with a second pad unit on the second flexible substrate at the peripheral area; bonding the first flexible substrate to the second flexible substrate using a conductive adhesive layer, wherein a gap balancing conductive element is included in the conductive adhesive layer to electrically connect the first pad unit and the second pad unit, wherein the first flexible substrate and the second flexible substrate have a first gap at a display area and a second gap at a peripheral area surrounding the display area.

[0047] Further, the present disclosure has an effect of reducing physical stress generated at the pad unit by forming a transparent adhesive layer having a thickness near the pad unit. The thickness corresponds to the total thickness of other various elements configuring the flexible organic light emitting display device. The stress can also be reduced by forming the transparent adhesive layer to seal the pad unit.

[0048] Furthermore, the present disclosure has an effect of reducing a frequency of a line break caused by the conductive ball during a bonding process using the conductive ball for a mass production. The reduction of the frequency of line break is achieved by forming a line unit adjacent to the pad unit to have a specific shape.

[0049] The effects of the present disclosure are not limited to the aforementioned effects, and other various effects are included in the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0050] The above and other aspects, features and other advantages of the present disclosure will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1A to FIG. 1C are schematic plan views of a flexible organic light emitting display device according to an exemplary embodiment of the present disclosure;
FIG. 1D is a schematic cross-sectional view of the flexible organic light emitting display device according to an exemplary embodiment of the present disclosure;
FIG. 2 is an enlarged plan view of a pad unit of the flexible organic light emitting display device according to an exemplary embodiment of the present disclosure;
FIG. 3 is an enlarged plan view of a pad unit of an flexible organic light emitting display device according to another exemplary embodiment of the present disclosure;
FIG. 4 to FIG. 7 are enlarged plan views of a pad unit of the flexible organic light emitting display device according to yet another exemplary embodiment of the present disclosure; and
FIG. 8 is a schematic plan view of a flexible organic light emitting display device according to still another exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0051] Advantages and features of the present disclosure, and methods for accomplishing the same will be more clearly understood from exemplary embodiments described below with reference to the accompanying drawings. However, the present disclosure is not limited to the following exemplary embodiments but may be implemented in various different forms. The exemplary embodiments are provided only to complete disclosure of the present disclosure and to fully provide a person having ordinary skill in the art to which the present disclosure pertains with the category of the invention, and the present disclosure will be defined by the appended claims.

[0052] The shapes, sizes, ratios, angles, numbers, and the like illustrated in the accompanying drawings for describing the exemplary embodiments of the present disclosure are merely examples, and the present disclosure is not limited thereto. Further, in the following description, a detailed explanation of known related technologies may be omitted to avoid unnecessarily obscuring the subject matter of the present disclosure. The terms such as "comprising", "including," "having," and "consist of' used herein are generally intended to allow other elements to be added unless the terms are used with the term "only". Any references to singular may include plural unless expressly stated otherwise.

[0053] Elements are interpreted to include an ordinary error range even if not expressly stated.

[0054] When the position relation between two parts is described using the terms such as "on", "above", "below", and "next", one or more parts may be positioned between the two parts unless the terms are used with the term "immediately" or "directly".

[0055] When an element or layer is referred to as being "on" another element or layer, it may be directly on the other element or layer, or intervening elements or layers may be present.

[0056] Although the terms "first", "second", and the like are used for describing various elements, these elements are not confined by these terms. These terms are merely used for distinguishing one element from the other elements. Therefore, a first element to be mentioned below may be a second element in a technical concept of the present disclosure.

[0057] Throughout the whole disclosure, the same reference numerals denote the same elements.

[0058] Since size and thickness of each element illustrated in the drawings are represented merely for convenience in explanation, the present disclosure is not necessarily limited to the illustrated size and thickness of each element.

[0059] The features of various embodiments of the present disclosure can be partially or entirely bonded to or combined with each other and can be interlocked and operated in technically various ways as can be fully understood by a person having ordinary skill in the art, and the embodiments can be carried out independently of or in association with each other.

[0060] Hereinafter, an in-cell type touch panel integrated flexible organic light emitting display device of top-emission type having bendability according to an exemplary embodiments of the present disclosure will be briefly described with reference to FIG. 1A to FIG. 1D.

[0061] Hereinafter, a flexible organic light emitting display device of the present disclosure will be assumed as an in-cell type touch panel integrated flexible organic light emitting display device of top-emission type.

[0062] FIG. 1A illustrates an organic light emitting display panel 110 of a flexible organic light emitting display device 100. The organic light emitting display panel 110 performs a function of displaying an image according to an image signal input from the outside.

[0063] The organic light emitting display panel 110 will be described in detail below. To be specific, the organic light emitting display panel 110 is formed on a first flexible substrate 111. A display area A/A and a peripheral area P/A of the organic light emitting display panel 110 are configured on the first flexible substrate 111.

[0064] The display area A/A configured on the first flexible substrate 111 refers to an area configured to display an image by a plurality of pixels including a plurality of organic light emitting elements. The display area A/A of the organic light emitting display panel 110 according to an exemplary embodiment of the present disclosure is configured to have bendability or flexibility. The display area A/A with bendability can be bent by a user or realized as having a curved surface, but is not limited thereto. The display area A/A can be realized as being flat. Even if the display area A/A is realized as being flat, the display area A/A has the bendability and thus has an advantage of not being fragile by an external shock.

[0065] The peripheral area P/A configured on the first flexible substrate 111 refers to a peripheral area of the display area A/A in which a plurality of pad unit and a plurality of lines are positioned. The peripheral area P/A surrounds the display area A/A as illustrated in FIG. 1A. The peripheral area P/A of the organic light emitting display panel 110 according to an exemplary embodiment of the present disclosure may include a bendable area. In this case, the bendable area may be folded so as to realize a narrow bezel or may be configured to include a curved surface so as to realize a curved bezel, but is not limited thereto. The bendable area can be realized as being flat. Even if the bendable area is realized as being flat, it still has bendability and thus has an advantage of not being fragile by external pressure.

[0066] The plurality of pad units at the peripheral area P/A is configured to include at least a first pad unit 112.

[0067] The first pad unit 112 refers to a pad unit configured to be bonded to a second pad unit 122 formed on the second flexible substrate 121, as illustrated in FIG. IB. The first pad unit 112 is configured to be connected with a first touch line unit 114. Further, the first touch line unit 114 is configured to be electrically connected with a touch panel driving unit.

[0068] The touch panel driving unit refers to a circuit unit configured to generate a signal for controlling a touch panel 120 formed on the second flexible substrate 121 illustrated in FIG. 1B and detect a touch position applied by a user onto the display screen. Hereinafter, for convenience in explanation, the touch panel driving unit according to an exemplary embodiment of the present disclosure will be described as being integrated with a driving circuit unit 140, but is not limited thereto. Also, the touch panel driving unit can be configured as being separated from the driving circuit unit 140. If the above-described touch panel driving unit (not illustrated) is installed within the driving circuit unit 140, the first touch line unit 114 is configured to be connected with the driving circuit unit 140.

[0069] The driving circuit unit 140 refers to a circuit unit configured to receive an image signal input from the outside and control the display area A/A so as to display an image on the display area A/A. Generally, since the driving circuit unit 140 is realized as a semiconductor integrated circuit, it is rigid and has poor bendability. Therefore, if the driving circuit unit 140 is mounted at the bendable area of the first flexible substrate 111, when the bendable area is bent, the driving circuit unit 140 is highly likely to be delaminated. However, if the driving circuit unit 140 is not mounted at the bendable area, but mounted on a connection part 135, the bendable area can be bent regardless of the driving circuit unit 140, but it is not limited thereto. The driving circuit unit 140 can be directly mounted on the bendable area.

[0070] The connection part 135 refers to a connection part that electrically connects the flexible organic light emitting display device 100 with an external system. The driving circuit 140 is configured to be mounted on the connection part 135 of the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure. The connection part 135 is configured to be bonded to a third pad unit 130. The connection part 135 can be realized as a flexible cable, a flexible printed circuit board (FPCB), or the like, but is not limited thereto.

[0071] The third pad unit 130 refers to a pad unit configured to be bonded to the connection part 135 that electrically connects the flexible organic light emitting display device 100 with the external system.

[0072] The first touch line unit 114 refers to a line configured to be electrically connected with the first pad unit 112 so as to transmit and receive a touch signal. The number of the first touch line units 114 is determined so as to correspond to the number of channels of a touch electrode formed at the touch panel 120.

[0073] FIG. 1B illustrates the touch panel 120 of the flexible organic light emitting display device 100. The touch panel 120 performs a function of detecting a touch position (due to, e.g., a user's finger or a stylus).

[0074] The touch panel 120 will be described in detail. The touch panel 120 is formed on the second flexible substrate 121. At the second flexible substrate 121, a touch area T/A and a non-touch area N/A of the touch panel 120 are configured.

[0075] The touch area T/A refers to an area where a touch electrode is formed and an electrical signal is generated to detect an input position. The touch area T/A of the touch panel 120 according to an exemplary embodiment of the present disclosure includes a touch electrode unit 126 including a plurality of touch driving electrodes Tx and a plurality of touch detection electrodes Rx intersecting each other. Further, such a configuration is referred to as a mutual-capacitance type. However, the touch area T/A is not limited thereto, and may be of a self-capacitance type. In the self-capacitance type, only a plurality of touch detection electrodes Rx is disposed. Further, the touch panel 120 can be realized as various other types, such as a resistive type or an electromagnetic type.

[0076] The non-touch area N/A refers to an area in which the second touch line unit 124 and the second pad unit 122 are formed. The second touch line unit 124 according to an exemplary embodiment of the present disclosure is configured to be electrically connected with the touch electrode at the touch area T/A so as to transfer a touch signal. The second pad unit 122 and the first pad unit 112 formed on the first flexible substrate 111 according to an exemplary embodiment of the present disclosure are bonded to each other by a conductive ball 192. The second pad unit 122 is configured to be connected with the second touch line unit 124.

[0077] According to this configuration, a signal generated in the touch area T/A is transferred to the second pad unit 122 through the second touch line unit 124 and transferred to the first pad unit 112 through the conductive ball 192. Then, a signal is transferred to the driving circuit unit 140 including the touch panel driving unit through the first touch line unit 114, so that a touch can be detected.

[0078] According to this configuration, the touch panel 120 can be integrated within the flexible organic light emitting display device 100. In other words, flexible organic light emitting display device 100 includes the in-cell type touch panel.

[0079] FIG. 1C is a plan view illustrating a state where the organic light emitting display panel 110 illustrated in FIG. 1A is bonded to the touch panel 120 illustrated in FIG. IB. FIG. 1C illustrates an area in which the first pad unit 112 and the second pad unit 122 are bonded to each other as indicated by a dotted line (X).

[0080] The first pad unit 112 and the second pad unit 122 of the flexible organic light emitting display device 100 are bonded to each other by a conductive adhesive layer 190 including a plurality of the conductive balls 192 and are electrically connected with each other. For example, an anisotropic conductive film (ACF) or an anisotropic conductive paste (ACP) may be used as the conductive adhesive layer 190.

[0081] In particular, the conductive balls 192 may also be considered as "gap balancing conductive elements", because such can serve a dual purpose. First, it provides a conductive path between the touch electrodes and the touch IC. Second, it provides improved bendability and reliability for the flexible display device by maintaining or balancing the gap at the peripheral area (P/A) to be equal or similar to the gap at the display area (A/A). The present disclosure is not limited by the shape of the conductive balls 192. Shapes of the gap balancing conductive element can be a ball, a column, a hexagon, a rounded shape and etc.

[0082] Referring to FIG. 1C, the first flexible substrate 111 and the second flexible substrate 121 are bonded to each other by a transparent adhesive layer 186. The transparent adhesive layer 186 is formed so as to cover the display area A/A but is not formed on the first pad unit 112 and the second pad unit 122. Further, the transparent adhesive layer 186 is formed so as to surround the first pad unit 112 and the second pad unit 122. The transparent adhesive layer 186 is expressed by diagonally hatched lines as illustrated in FIG. 1C.

[0083] The transparent adhesive layer 186 has transparency and adhesiveness. The transparent adhesive layer 186 may be formed of any one of olefin-based, acrylic-based, and silicon-based materials. In particular, the transparent adhesive layer 186 may be formed of an olefin-based moisture permeation-delayed material exhibiting hydrophobicity. The transparent adhesive layer 186 is formed to have a thickness of 3 μm to 12 μm.

[0084] According to this configuration, the transparent adhesive layer 186 configured to surround the first pad unit 112 and the second pad unit 122 can delay permeation of oxygen and moisture which causes corrosion of the pad units. Thus, there is an effect of delaying corrosion of the first pad unit 112 and the second pad unit 122.

[0085] Further, if the transparent adhesive layer 186 is formed so as to surround the first pad unit 112 and the second pad unit 122, as illustrated in FIG. 1C, the transparent adhesive layer 186 fills an empty space around a pad unit. Therefore, a stress (e.g., tensile stress or compressive stress) caused by bending is not concentrated on the pad units but is distributed to the adjacent transparent adhesive layer 186. In other words, the conductive adhesive layer 190 electrically connects the first pad unit 112 and the second pad unit 122. The transparent adhesive layer 186 is patterned to surround the first pad unit 112 and the second pad unit 122. Thus, there is an effect of reducing the possibility of a pad delamination defect or improving durability of the first pad unit 112 and the second pad unit 122.

[0086] Further, the area of the second flexible substrate 121 is smaller than the area of the first flexible substrate 111. To be specific, the second flexible substrate 121 is configured so as not to cover the third pad unit 130 formed on the first flexible substrate 111. According to this configuration, when the third pad unit 130 and the connection part 135 are bonded to each other, the second flexible substrate 121 does not cause interference. In order to prevent such interference, for example, the second flexible substrate 121 and the third pad unit 135 may be separated from each other by, but not limited to, 50 μm or more.

[0087] The touch area T/A of the touch panel 120 is disposed so as to correspond to the display area A/A of the organic light emitting display panel 110. To be specific, the touch area T/A is configured so as to be overlapped with at least the entire display area A/A. That is, the touch area T/A has an area greater than the display area A/A. According to this configuration, not only a touch position input into the entire display area A/A, but also a touch position input into the peripheral area P/A can be detected.

[0088] Further, since the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure is of a top-emission type, the touch panel 120 is configured to transmit an image displayed on the organic light emitting display panel 110. Therefore, the touch area T/A overlapped with the display area A/A is configured to have an optical transmissivity of 90% or more.

[0089] FIG. 1D illustrates a cross section taken along lines id-id' and id"-id'" of FIG. 1C.

[0090] The cross section of the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure will be described in detail with reference to FIG. 1D.

[0091] The flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure is configured to include the first flexible substrate 111, the first pad unit 112, the second pad unit 122, the third pad unit 130, the connection part 135, a multi-buffer layer 150, an active layer 152, a gate insulation film 154, a gate electrode 156, an interlayer insulation film 158, a first contact hole 160, a thin-film transistor insulation film 162, a source electrode 164, a drain electrode 166, a planarization layer 168, a second contact hole 170, a first electrode 172, a bank 174, an organic light emission layer 176, a second electrode 178, a first encapsulation layer 180, a particle compensation layer 182, a second encapsulation layer 184, the transparent adhesive layer 186, a third encapsulation layer 188, the conductive adhesive layer 190, the conductive ball 192, and the second flexible substrate 121, but is not limited thereto. Some of the elements may be omitted or may be substituted with other similar elements.

[0092] A material and thickness of the first flexible substrate 111 according to an exemplary embodiment of the present disclosure need to be determined in consideration of bendability suitable for flexible display and thermal resistance and chemical resistance suitable for a deposition process of a thin-film transistor (TFT). The first flexible substrate 111 may be formed of, for example, polyimid having a thickness of about 10 to 30 μm, and for example, polyimid having a thickness of 15 μm, but is not limited thereto. Further, in the case of the top-emission flexible organic light emitting display device 100, the first flexible substrate 111 is configured so as not to transmit light emitted from the organic light emission layer. Thus, a high transparency is not required.

[0093] The multi-buffer layer 150 according to an exemplary embodiment of the present disclosure is formed on the first flexible substrate 111. The multi-buffer layer 150 includes a plurality of inorganic layers in order to delay the arrival of oxygen and moisture permeating through the first flexible substrate 111 at the organic light emission layer 176.

[0094] The multi-buffer layer 150 may be formed of, for example, a double-layer of inorganic layers of different materials, more for example, silicon nitride (SiNx) and silicon oxide (SiOx). for example, the multi-buffer layer 150 may be formed of a four-layer structure of SiNx/ SiOx/ SiNx/ SiOx with a thickness of 1000 Å/ 1000 Å/ 1000 Å/ 1000 Å in consideration of bendability and a moisture permeation-delaying property, but is not limited thereto.

[0095] A plurality of thin-film transistors (TFT) is formed on the multi-buffer layer 150.

[0096] The plurality of thin-film transistors (TFT) according to an exemplary embodiment of the present disclosure includes at least the active layer 152, the gate insulation film 154, the gate electrode 156, the interlayer insulation film 158, the thin-film transistor insulation film 162, the source electrode 164, and the drain electrode 166. This structure may be referred to as a coplanar transistor structure. The plurality of thin-film transistors (TFT) may control luminance of a plurality of pixels so as to display a desired image. Hereinafter, the plurality of thin-film transistors (TFT) will be described in detail.

[0097] The active layer 152 can be formed of oxide-semiconductor or silicon-semiconductor.

[0098] In the active layer 152, for example, an area in contact with the source electrode 164 and the drain electrode 166 may have a conductor property and an area overlapped with the gate electrode 156 may have a semiconductor property. For example, such properties may be realized by performing, but not limited to, a plasma process or a particle doping process to an area for the source electrode 164 and the drain electrode 166.

[0099] The gate insulation film 154 electrically insulates the active layer 152 and the gate electrode 156. The gate insulation film 154 may be formed of, for example, silicon-based materials or aluminum oxide (Al_2O_3). For example, the gate insulation film 154 may be formed of silicon oxide having thickness of about 600 Å to 1400 Å considering bendability suitable for flexible display, an electrical insulation property, and a variable semiconductor property of the active layer 152 in response to an electrical signal applied to the gate electrode 156, but is not limited thereto.

[0100] The gate electrode 156 is formed on the gate insulation film 154. The gate electrode 156 is electrically insulated from the active layer 152 by the gate insulation film 154. The active layer 152 has a conductive or semiconductive property in response to the electrical signal applied to the gate electrode 156. The gate electrode 156 may be formed of, for example, a highly conductive material, for example, any one of molybdenum (Mo), aluminum (Al), chromium (Cr), gold (Au), titanium (Ti), nickel (Ni), neodymium (Nd), and copper (Cu), or an alloy thereof, or a multilayered structure thereof. For example, the gate electrode 156 may be formed of molybdenum having a thickness of 2000 Å in consideration of bendability suitable for flexible display and conductivity, but is not limited thereto.

[0101] The gate electrode 156 is configured to be applied with an electrical signal from a gate driver.

[0102] The interlayer insulation film 158 is formed on the gate insulation film 154 and the gate electrode 156. The interlayer insulation film 158 electrically insulates the gate electrode 156 from the source electrode 164 and the drain electrode 166. The interlayer insulation film 158 may be formed of, for example, an inorganic substance to have greater thickness than the gate insulation film 154. For example, the interlayer insulation film 158 may be formed of a laminate having a total thickness of 5000 Å including silicon oxide having a thickness of 2000 Å and silicon nitride having a thickness of 3000 Å in consideration of bendability and an electrical insulation property in order to minimize a parasitic capacitance formed by the gate electrode 156, the source electrode 164, and the drain electrode 166, but is not limited thereto.

[0103] The source electrode 164 is formed on the interlayer insulation film 158. The source electrode 164 is applied with a signal corresponding to an image from the driving circuit unit 140. The source electrode 164 may be formed of, for example, a highly conductive material, for example, any one of molybdenum (Mo), aluminum (Al), chromium (Cr), gold (Au), titanium (Ti), nickel (Ni), neodymium (Nd), and copper (Cu), or an alloy thereof, or a multilayered structure thereof. For example, the source electrode 164 may be formed of a three-layer structure of Ti/ Al/ Ti with a thickness of 500 Å/ 4000 Å/ 500 Å in consideration of conductivity and bendability suitable for flexible display, but is not limited thereto.

[0104] The source electrode 164 is electrically connected with one side surface of the active layer 152 through the first contact hole 160 formed at the gate insulation film 154 and the interlayer insulation film 158. The source electrode 164 is applied with a signal generated by the driving circuit unit 140.

[0105] The drain electrode 166 is formed in the same manner as the source electrode 164 at the same time. Therefore, redundant descriptions thereof will be omitted. The drain electrode 166 is electrically connected with an opposite side surface of the active layer 152 through the first contact hole 160 formed at the gate insulation film 154 and the interlayer insulation film 158. When the active layer 152 is in a conductive state, the drain electrode 166 is applied with a voltage, which is applied to the source electrode 164, through the active layer 152.

[0106] The thin-film transistor (TFT) has been illustrated as having a coplanar structure, but is not limited thereto, and the thin-film transistor may have an inverted-staggered structure.

[0107] The first pad unit 112 or the third pad unit 130 is formed at the same time when the source electrode 164 and the drain electrode 166 are formed, but is not limited thereto. The first pad unit 112 or the third pad unit 130 may be formed at the same time when the gate electrode 156 is formed.

[0108] The second pad unit 122 is formed at the same time when the touch electrode unit 126 is formed, but is not limited thereto. The second pad unit 122 may be formed at the same time when the first touch line unit 114 is formed.

[0109] The thin-film transistor insulation film 162 is formed on the interlayer insulation film 158, the source electrode 164, and the drain electrode 166. The thin-film transistor insulation film 162 performs a function of increasing a life of the organic light emission layer 176 by delaying the permeation of moisture and oxygen which may permeate into the organic light emission layer 176 from the first flexible substrate 111 through the thin-film transistor (TFT). The thin-film transistor insulation film 162 may be formed of, for example, an inorganic substance, for example, silicon nitride, and for example, silicon nitride having a thickness of 2500 Å to 4000 Å in order for the thin-film transistor insulation film 162 to perform the function of delaying the permeation of moisture and oxygen while maintaining bendability, but is not limited thereto.

[0110] The thin-film transistor insulation film 162 can delay the permeation of moisture and oxygen into the organic light emission layer 176 from the thin-film transistor (TFT) and thus increase a life of the flexible organic light emitting display device 100.

[0111] The planarization layer 168 is formed on the thin-film transistor insulation film 162. The planarization layer 168 planarizes an upper surface of the non-flat thin-film transistor insulation film 162 including various elements of the thin-film transistor (TFT). The first electrode 172 is formed on the planarization layer 168. The planarization layer 168 provides a flat surface such that the first electrode 172 is formed to be flat. At the same time, the planarization layer 168 minimizes a parasitic capacitance formed between the thin-film transistor (TFT) and the first electrode 172. In this respect, the planarization layer 168 may be formed of, for example, an organic substance having flowability, for example, photo acryl having a low permittivity, and for example, photo acryl having a thickness of 2 μm to 3 μm, but is not limited thereto. Further, the planarization layer 168 may include a non-flat structure formed in a partial area of the planarization layer 168 in order to improve light extraction efficiency of the organic light emitting element. For example, the non-flat structure may further include a micro lens array (MLA), an uneven or diffused reflection pattern, and the like.

[0112] A plurality of organic light emitting elements formed on the plurality of thin-film transistors (TFT) will be described with reference to FIG. 1D again.

[0113] The organic light emitting element includes the first electrode 172, the organic light emission layer 176, and the second electrode 178. Each of the organic light emitting elements is configured to emit any one of red, green, blue, and white lights. The plurality of organic light emitting elements is separated by the banks 174.

[0114] The first electrode 172 is electrically connected with the drain electrode 166 through the second contact hole 170 formed at the thin-film transistor insulation film 162 and the planarization layer 168. The first electrode 172 is formed of a conductive material having a high work function in order to supply a hole to the organic light emission layer 176.

[0115] The first electrode 172 is patterned in the unit of a sub-pixel on the planarization layer 168. That is, a shape of a plurality of sub-pixels of the flexible organic light emitting display device 100 is formed so as to correspond to the patterned shape of the first electrode 172.

[0116] Referring to FIG. 1D again, the bank 174 is formed so as to cover the planarization layer 168 and a partial area of the periphery of the first electrode 172. The bank 174 may be formed of an organic insulation material, for example, any one of polyimide, photo acryl, and benzocyclobutene (BCB).

[0117] The second electrode 178 is formed on the bank 174 and the organic light emission layer 176. The second electrode 178 is formed of a material having a low work function in order to supply an electron to the organic light emission layer 176. If it is formed of a metallic material having a low work function, indium-zinc-oxide (IZO), silver (Ag), titanium (Ti), aluminum (Al), molybdenum (Mo), or an alloy of silver (Ag) and magnesium (Mg) may be used. The second electrode 178 of the top-emission type flexible organic light emitting display device 100 is configured to have transparency in order to transmit light toward an upper surface. The second electrode 178 is configured to be applied with a base voltage (Vss) or a ground voltage (GND).

[0118] The organic light emitting element emits a light from the organic light emission layer 176 corresponding to a potential difference between a voltage applied to the first electrode 172 and a voltage applied to the second electrode 178. The emitted light is reflected by a reflector formed on a rear surface of the first electrode 172 toward an upper surface. Since the second electrode 178 transmits the reflected light, the flexible organic light emitting display device 100 can display an image.

[0119] A transparent flexible encapsulation unit formed on an upper surface of the organic light emitting element will be described with reference to FIG. 1D again.

[0120] The transparent flexible encapsulation unit of the flexible organic light emitting display device 100 includes at least the first encapsulation layer 180, the particle compensation layer 182, and the second encapsulation layer 184. The transparent flexible encapsulation unit has a stacked structure for example, an inorganic substance, an organic substance, and an inorganic substance in order to delay the arrival of oxygen and moisture permeating through the transparent flexible encapsulation unit of the flexible organic light emitting display device 100 at the organic light emission layer 176.

[0121] The first encapsulation layer 180 is formed of an inorganic substance. For example, the first encapsulation layer 180 may be formed of any one of silicon nitride (SiNx) or aluminum oxide (Al_2O_3) by a vacuum film forming method such as chemical vapor deposition (CVD) or atomic layer deposition (ALD), but is not limited thereto. Further, the first encapsulation layer 180 is configured to have transparency satisfying a visible transmissivity of 90% or more in order to transmit light emitted from the organic light emission layer 176. Furthermore, the first encapsulation layer 180 needs to be deposited at 110°C or less in order not to damage the organic light emission layer 176 while the first encapsulation layer 180 is formed.

[0122] The first encapsulation layer 180 may be formed of, for example, aluminum oxide or silicon nitride, for example, silicon nitride having a thickness of 5000 Å to 15000 Å or aluminum oxide having a thickness of 200 Å to 1500 Å in consideration of bendability and a moisture permeation-delaying property, but is not limited thereto. In particular, if the first encapsulation layer 180 is formed of aluminum oxide, it can be formed thin with excellent bendability as compared with silicon nitride.

[0123] The particle compensation layer 182 is formed of an organic substance having flowability. The particle compensation layer 182 performs a function of compensating a crack of the first encapsulation layer 180 caused by a particle or particle introduced when the first encapsulation layer 180 is formed. The particle compensation layer 182 may be formed of, for example, an organic substance having a high flowability, for example, a silicon oxycarbon (SiOCz), acryl, or epoxy-based resin, and for example, an organic substance having a thickness of 2 μm to 20 μm and a viscosity of 500 cp (centipoise) to 30000 cp, but is not limited thereto. Further, the particle compensation layer 182 is configured to have transparency satisfying a visible transmissivity of 90% or more in order to transmit light emitted from the organic light emission layer 176. Furthermore, the particle compensation layer 182 needs to be deposited at 110°C or less in order not to damage the organic light emission layer 176 while the particle compensation layer 182 is formed.

[0124] The second encapsulation layer 184 is formed of an inorganic substance. For example, the second encapsulation layer 184 may be formed of any one of silicon nitride (SiNx) or aluminum oxide (Al_2O_3) by a vacuum film forming method such as chemical vapor deposition or atomic layer deposition, but is not limited thereto. Further, the second encapsulation layer 184 is configured to have transparency satisfying a visible transmissivity of 90% or more in order to transmit light emitted from the organic light emission layer 176. Furthermore, the second encapsulation layer 184 needs to be deposited at 110°C or less in order not to damage the organic light emission layer 176 while the second encapsulation layer 184 is formed.

[0125] The second encapsulation layer 184 may be formed of, for example, silicon nitride, and for example, silicon nitride having a thickness of 5000 Å to 15000 Å or aluminum oxide having a thickness of 200 Å to 1500 Å in consideration of bendability and a moisture permeation-delaying property, but is not limited thereto. In particular, if the second encapsulation layer 184 is formed of aluminum oxide, it can be formed to be thin with excellent bendability as compared with silicon nitride.

[0126] The transparent flexible encapsulation unit has transparency for transmitting light emitting from the organic light emission layer 176 together with excellent bendability while achieving an excellent moisture permeation-delaying property.

[0127] The organic light emitting display panel 110 formed on the first flexible substrate 111 has been described above.

[0128] Hereinafter, the touch panel 120 formed on the second flexible substrate 121 will be described.

[0129] The touch panel 120 is configured to include the second flexible substrate 121, the third encapsulation layer 188, the touch electrode unit 126, the touch line unit 124, and the second pad unit 122.

[0130] A material and thickness of the second flexible substrate 121 according to an exemplary embodiment of the present disclosure need to be determined in consideration of bendability suitable for flexible display and thermal resistance and chemical resistance suitable for a deposition process of a thin-film transistor (TFT). The second flexible substrate 121 may be formed of, for example, polyimid having a thickness of about 10 to 30 μm, and for example, polyimid having a thickness of 15 μm, but is not limited thereto. Further, in the case of the top-emission flexible organic light emitting display device 100, the second flexible substrate 121 is configured to transmit light emitted from the organic light emission layer. Thus, a high transmissivity is required.

[0131] The third encapsulation layer 188 according to an exemplary embodiment of the present disclosure may be formed of, for example, a double-layer of inorganic layers of different materials, for example, silicon nitride (SiNx) and silicon oxide (SiOx). for example, the third encapsulation layer 188 may be formed of a four-layer structure of SiNx/ SiOx/ SiNx/ SiOx with a thickness of 1000 Å/ 1000 Å/ 1000 Å/ 1000 Å in consideration of bendability and a moisture permeation-delaying property, but is not limited thereto. According to this configuration, a plurality of organic light emitting elements may have an excellent encapsulation property since the permeation of moisture and oxygen is delayed by the first encapsulation layer 180, the second encapsulation layer 184, and the third encapsulation layer 188.

[0132] The touch electrode unit 126 according to an exemplary embodiment of the present disclosure is formed of a transparent conductive material. The touch electrode unit 126 may be formed of, for example, ITO (indium-tin-oxide), and more for example, ITO having a thickness of 100 Å to 1000 Å, but is not limited thereto, and can be formed of metal-mesh or graphene.

[0133] The organic light emitting display panel 110 formed on the first flexible substrate 111 and the touch panel 120 formed on the second flexible substrate 121 are disposed to face each other and bonded to each other by the transparent adhesive layer 186.

[0134] Further, a parasitic capacitance formed between the second electrode 178 and the touch electrode unit 126 is inversely proportional to a gap L1 therebetween. If the parasitic capacitance increases, touch sensitivity decreases. Therefore, in order to minimize a parasitic capacitance, for example, the gap L1 between the second electrode 178 and the touch electrode unit 126 is set to at least 4 μm or more, but is not limited thereto.

[0135] On the other hand, if the gap L1 between the second electrode 178 and the touch electrode unit 126 increases, the bendability of the flexible organic light emitting display device 100 is decreased. Further, if the gap L1 increases, a diameter of the conductive ball 192 may be increased on the basis of the increment portion of the gap L1. In this case, the possibility of a line break at the touch line unit increases. Therefore, the gap L1 may be set, for example, at least 13 μm or less in consideration of bendability of the flexible organic light emitting display device 100, but is not limited thereto.

[0136] With the gap L1, the flexible organic light emitting display device 100 can achieve both excellent bendability and touch performance. For example, the gap L1 is determined from 4 μm to 13 μm.

[0137] A gap L2 between the first flexible substrate 111 and the second flexible substrate 121 at the display area A/A is determined depending on thicknesses of the laminated thin-film transistor (TFT), organic light emitting element, transparent flexible encapsulation unit, transparent adhesive layer 186, and the like. Thickness of each element may vary if necessary.

[0138] The gap L2 is determined by the total thickness of all of the elements formed between the first flexible substrate 111 and the second flexible substrate 121.

[0139] For example, the gap L2 according to an exemplary embodiment of the present disclosure may be set in the range of, for example, 15 μm to 33 μm, but is not limited thereto.

[0140] Meanwhile, if a prior art conductive ball 92 such that the typical diameter is less than 5 μm which is not designed for the in-cell type touch panel integrated flexible organic light emitting display device of the present disclosure is used for connecting the first pad unit 112 and the second pad unit 122, a gap between the first flexible substrate 111 and the second flexible substrate 121 at the peripheral area P/A is shorter than the gap L2 at the display area A/A. To be specific, since some elements included the organic light emitting element, (e.g., the thin-film transistor (TFT), and the transparent encapsulation unit) at the display area A/A may be excluded at the peripheral area P/A. Therefore, the overall thicknesses of the elements formed between the first flexible substrate 111 and the second flexible substrate 121 at the peripheral area P/A are relatively small. Therefore, the gap between the first flexible substrate 111 and the second flexible substrate 121 at the peripheral area P/A may be shorter than the gap L2.

[0141] That is, since the gap between the first flexible substrate 111 and the second flexible substrate 121 at the peripheral area P/A is shorter than the gap L2, the peripheral area P/A and the display area A/A may not be formed to be flat. Therefore, in order to form the peripheral area P/A and the display area A/A to be flat, a diameter of the conductive ball 192 bonded between the first pad unit 112 and the second pad unit 122 at the peripheral area P/A may be increased for balancing. For example, considering the total thickness of the transparent adhesive layer 186, the thin-film transistor (TFT), the organic light emitting element, and the transparent flexible encapsulation unit, the diameter of the conductive ball 192 may be set corresponding thereto. According to this configuration, the display area A/A and the peripheral area P/A are compensated so as to be flat. Thus, the gap L2 can be equal to a gap L3. Therefore, a stress applied to the first pad unit 112 and the second pad unit 122 is not concentrated on the bonded conductive ball 192 but uniformly distributed to the peripheral P/A.

[0142] In conclusion, the diameter of the conductive ball 192 of the in-cell type touch panel integrated flexible organic light emitting display device 100 for connecting the first pad unit 112 and second pad unit 122 may be determined for balancing in consideration of a difference between the total thickness of the elements formed on the peripheral area P/A and the total thickness of the elements formed on the display area A/A, but is not limited thereto. The thickness can be set such that a difference between the gap L2 and the gap L3 is less than 10% or a gap tolerance is less than 10%.

[0143] Also, thickness of the transparent adhesive layer 186 configured to surround the first pad unit 112 and the second pad unit 122 may correspond to the diameter of the conductive ball 192. According to this configuration, since a stress applied to the first pad unit 112 and the second pad unit 122 is distributed to the transparent adhesive layer 186, the first pad unit 112 and the second pad unit 122 can be more reliably bonded to each other. Even if the area corresponding thereto is bent, the stress can be more uniformly distributed. Thus, excellent bendability can be realized.

[0144] The connection part 135 is bonded onto the third pad unit 130 by the prior art conductive ball 92. The prior art conductive ball 92 is a widely used conductive ball having a diameter of about 5μm. For example, if a diameter of the conductive ball is larger than the width of a signal line, it is easier to cause line break problem at the signal line when the conductive ball is pressed on the signal line. Also, if a diameter of the conductive ball is larger than the line pitch of the adjacent lines, the adjacent lines may be short-circuited through the conductive ball positioned between the adjacent lines. Therefore, in the prior art, there is no motivation to increase the diameter of the conductive ball and a conductive ball having a relatively smaller diameter is preferred. However, in clear contrast, for the in-cell type touch panel integrated flexible organic light emitting display device 100, the diameter of the conductive ball needs to be increased for balancing the gap difference of the display area A/A and the peripheral area P/A.

[0145] FIG. 2 is an enlarged plan view of a rectangular area X indicated by a dotted line in FIG. 1C. A diameter of a plurality of conductive balls 192 is determined so as to improve flatness of the peripheral area P/A and the display area A/A. Particularly, in this case, the diameter of the plurality of conductive balls 192 may be larger than a width of the first touch line unit 114 and the second touch line unit 124. Thus, when the conductive balls 192 are bonded onto the first touch line unit 114, the first touch line unit 114 may be cut or broken. Likewise, when the conductive balls 192 are bonded onto the second touch line unit 124, the second touch line unit 124 may be cut or broken.

[0146] The flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure includes an auxiliary touch line unit which can improve a defect caused by a line break or reduce a stress applied to the pad units. To be specific, the first touch line unit 114 in an area coated with the conductive adhesive layer 190 including the conductive balls 192 is configured to include a first auxiliary touch line unit 115. Likewise, the second touch line unit 124 is configured to include a second auxiliary touch line unit 125.

[0147] In each first auxiliary touch line unit 115, a plurality of lines is separated in parallel with each other at an equal gap (e.g., line pitch). One end of each first auxiliary touch line unit 115 is connected to the first pad unit 112. An opposite end of each first auxiliary touch line unit 115 is connected with each first touch line unit 114. A gap between the first auxiliary touch line units 115 is set to be greater than at least the diameter of the conductive ball 192, but is not limited thereto.

[0148] In each second auxiliary touch line unit 125, a plurality of lines is separated in parallel with each other at an equal gap. One end of each second auxiliary touch line unit 125 is connected to the second pad unit 122. An opposite end of each second auxiliary touch line unit 125 is connected with each second touch line unit 124. A gap between the second auxiliary touch line units 125 is set to be greater than at least the diameter of the conductive ball 192, but is not limited thereto.

[0149] The number of the plurality of lines of the first auxiliary touch line unit 115 may be the same as the number of the plurality of lines of the second auxiliary touch line unit 125, but is not limited thereto, and may be different from each other.

[0150] According to this configuration, even if one of the plurality of lines of the first auxiliary touch line unit 115 is cut or broken by the conductive ball 192, connection can be made by the other lines. Therefore, there is an effect of reducing a line break caused by an increase in diameter of the plurality of conductive balls 192.

[0151] Hereinafter, a flexible organic light emitting display device according to another exemplary embodiment of the present disclosure will be described with reference to FIG. 3. The first touch line unit 114 and the second touch line unit 124 formed on a pad unit of a flexible organic light emitting display device 300 are respectively configured to include a first auxiliary touch line unit 315 and a second auxiliary touch line unit 325 each has a zigzag shape. According to this configuration, if the pad unit is bent, a stress applied to the line units is reduced. Thus, durability to repeated bending is improved.

[0152] The flexible organic light emitting display device 300 according to another exemplary embodiment of the present disclosure is the same as the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure except the above-described part. Thus, redundant descriptions thereof will be omitted.

[0153] Hereinafter, a flexible organic light emitting display device according to yet another exemplary embodiment of the present disclosure will be described with reference to FIG. 4. The first touch line unit 114 and the second touch line unit 124 formed on a pad unit of a flexible organic light emitting display device 400 are respectively configured to include a first auxiliary touch line unit 415 including a plurality of first lines which is separated each other and a second auxiliary touch line unit 425 including a plurality of second lines which is separated each other, and each lines having a zigzag shape. According to this configuration, if the pad unit is bent, a stress applied to the line units is reduced, if a line is cut or broken caused by the plurality of conductive balls 192, connection can be made by the other lines and, thus, durability to repeated bending is improved even if the diameter of the conductive ball 192 is larger than the width of anyone of the touch line units.

[0154] The flexible organic light emitting display device 400 according to yet another exemplary embodiment of the present disclosure is the same as the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure except the above-described part. Thus, redundant descriptions thereof will be omitted.

[0155] Hereinafter, a flexible organic light emitting display device according to still another exemplary embodiment of the present disclosure will be described with reference to FIG. 5. The first touch line unit 114 and the second touch line unit 124 formed on a pad unit of an flexible organic light emitting display device 500 are respectively configured to include a first auxiliary touch line unit 515 and a second auxiliary touch line unit 525 each has a diamond shape. According to this configuration, if the pad unit is bent, a stress applied to the line units is reduced, if a portion of the line is cut or broken caused by the plurality of conductive balls 192, connection can be made by the other portion of the line and, thus, durability to repeated bending is improved even if the diameter of the conductive ball 192 is larger than the width of anyone of the touch line units.

[0156] The flexible organic light emitting display device 500 according to still another exemplary embodiment of the present disclosure is the same as the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure except the above-described part. Thus, redundant descriptions thereof will be omitted.

[0157] Hereinafter, a flexible organic light emitting display device according to still another exemplary embodiment of the present disclosure will be described with reference to FIG. 6. The first touch line unit 114 and the second touch line unit 124 formed on a pad unit of a flexible organic light emitting display device 600 are respectively configured to include a first auxiliary touch line unit 615 and a second auxiliary touch line unit 625 each has a rounded shape or a wavy shape. According to this configuration, if the pad unit is bent, a stress applied to the line units is reduced, if a portion of the line is cut or broken caused by the plurality of conductive balls 192, connection can be made by the other portion of the line and, thus, durability to repeated bending is improved even if the diameter of the conductive ball 192 is larger than the width of any one of the touch line units.

[0158] The flexible organic light emitting display device 600 according to still another exemplary embodiment of the present disclosure is the same as the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure except the above-described part. Thus, redundant descriptions thereof will be omitted.

[0159] Meanwhile, although not illustrated in FIG. 2 to FIG. 6, a first auxiliary touch line unit and a second auxiliary touch line unit may be formed on a curved surface (e.g., curved display device).

[0160] Hereinafter, a flexible organic light emitting display device according to still another exemplary embodiment of the present disclosure will be described with reference to FIG. 7. In a flexible organic light emitting display device 700, a transparent adhesive layer 786 is formed along one side of a pad unit. That is, the transparent adhesive layer 786 may be formed along a lower side of the pad unit as illustrated in FIG. 7, but is not limited thereto. The transparent adhesive layer 786 may be formed along at least one side of the pad unit so as to correspond to a plurality of sides of the pad unit.

[0161] The flexible organic light emitting display device 700 according to still another exemplary embodiment of the present disclosure is the same as the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure except the above-described part. Thus, redundant descriptions thereof will be omitted.

[0162] Hereinafter, a flexible organic light emitting display device according to still another exemplary embodiment of the present disclosure will be described with reference to FIG. 8. In a flexible organic light emitting display device 800, a driving circuit unit 840 is disposed on a first flexible substrate 111. Herein, an area for a second flexible substrate 821 overlapped with an area where the driving circuit unit 840 is mounted is configured to be cut out or the driving circuit unit 840 positioned on the first flexible substrate 111 is configured to be non-overlapped with the second flexible substrate 821. According to this configuration, even if the driving circuit unit 840 is mounted on the first flexible substrate 111, the driving circuit unit 840 can be disposed without extending an additional space on the first flexible substrate 111. Further, since the driving circuit unit 840 is not disposed on a connection part 835, the connection part 835 can be easily bent.

[0163] The flexible organic light emitting display device 800 according to still another exemplary embodiment of the present disclosure is the same as the flexible organic light emitting display device 100 according to an exemplary embodiment of the present disclosure except the above-described part. Thus, redundant descriptions thereof will be omitted.

Claims

1. A flexible organic light emitting display device comprising:

   a first flexible substrate (111) and a second flexible substrate (121) spaced apart from the first flexible substrate (111), the first flexible substrate (111) and the second flexible substrate (121) configured to have a first gap (L2) separating the first and second flexible substrates at a display area (A/A) and a second gap (L3) separating the first and second flexible substrates at a peripheral area (P/A) surrounding the display area (A/A);
   a first touch line (114) connected with a first pad unit (112) on the first flexible substrate (111) at the peripheral area (P/A);
   a second touch line (124) connected with a second pad unit (122) on the second flexible substrate (121) at the peripheral area (P/A); and
   a plurality of conductive elements (192) included in a conductive adhesive layer (190) configured to electrically connect the first pad unit (112) and the second pad unit (122) and for maintaining the second gap (L3),
   characterized in that in an area coated with the conductive adhesive layer (190) including the conductive elements (192), the first touch line (114) includes a first auxiliary touch line unit (115) that includes a plurality of first lines parallel to each other and separated from each other, and the second touch line (124) includes a second auxiliary touch line unit (125) that includes a plurality of second lines parallel to each other and separated from each other,
   wherein each of the first lines of the first auxiliary touch line unit (115) are connected to the first pad unit (112) and to the first touch line (114), and wherein each of the second lines of the second auxiliary touch line unit (125) are connected to the second pad unit (122) and to the second touch line (124).

2. The flexible organic light emitting display device according to claim 1, further comprising:
   a transparent adhesive layer (186) between the first flexible substrate (111) and the second flexible substrate (121) having a thickness corresponding to the dimensions of the conductive elements (192) at the peripheral area (P/A).

3. The flexible organic light emitting display device according to claim 1 or 2, wherein a difference between the first gap (L2) and the second gap (L3) is less than 10%.

4. The flexible organic light emitting display device according to claim 1 or 2, wherein the first gap (L2) is equal to the second gap (L3).

5. The flexible organic light emitting display device according to any one of the preceding claims, wherein the conductive elements (192) have one or more shapes among a ball, a column, a hexagon, a rounded shape or combinations thereof.

6. The flexible organic light emitting display device according to any one of the preceding claims, further comprising:

   a plurality of thin-film transistors (TFT) on the first substrate (111) at the display area (A/A);
   an organic light emitting element including a first electrode (172) on the plurality of the thin-film transistors (TFT), an organic light emission layer (176) on the first electrode (172) and a second electrode (178) on the organic light emission layer (176);
   a transparent flexible encapsulation unit (180, 182, 184) on the organic light emitting element; and
   a touch electrode unit (126) on the second flexible substrate (121) at a touch area,
   wherein the touch electrode unit (126) and the second electrode (178) are defined to have a third gap (L1) therebetween.

7. The flexible organic light emitting display device according to any one of the preceding claims 2-6, wherein the transparent adhesive layer (186) is formed along at least one side of the first pad unit (112) and the second pad unit (122).

8. The flexible organic light emitting display device according to any one of the preceding claims 2-7, wherein the transparent adhesive layer (186) is configured to surround the first pad unit (112) and the second pad unit (122).

9. The flexible organic light emitting display device according to any one of the preceding claims, wherein the dimensions of the conductive elements (192) are larger than a width of the first lines of the first auxiliary touch line unit (115) and a width of the second lines of the second auxiliary touch line unit (125).

10. The flexible organic light emitting display device according to any one of the preceding claims, wherein the first auxiliary touch line unit (115) and the second

auxiliary touch line unit (125) include one or more shapes among a zigzag shape (315, 325, 415, 425), a diamond shape (515, 525) a rounded shape (625) and a wavy shape, or combinations thereof.

11. The flexible organic light emitting display device according to any one of the preceding claims, further comprising:
a driving circuit unit (140) connected to the first touch line (114) and positioned on the first flexible substrate (111) at a bendable area, wherein the driving circuit unit (140) is non-overlapped with the second flexible substrate (121).

12. The flexible organic light emitting display device according to claim 11, wherein the area of the second flexible substrate (121), which area is overlapped with an area where the driving circuit unit (140) is mounted, is cut out.

13. Method for producing the flexible organic light emitting display device of claim 1 comprising the steps:

providing a first flexible substrate (111) having a first touch line (114) connected with a first pad unit (112) on the first flexible substrate (111) at the peripheral area (P/A);
providing a second flexible substrate (121) having a second touch line (124) connected with a second pad unit (122) on the second flexible substrate (121) at the peripheral area (P/A);
bonding the first flexible substrate (111) to the second flexible substrate (121) using a conductive adhesive layer (190), wherein a plurality of conductive elements (192) is included in the conductive adhesive layer (190) to electrically connect the first pad unit (112) and the second pad unit (122),
wherein in an area coated with the conductive adhesive layer (190) including the conductive elements (192), the first touch line (114) includes a first auxiliary touch line unit (115) that includes a plurality of first lines parallel to each other and separated from each other, and the second touch line (124) includes a second auxiliary touch line unit (125) that includes a plurality of second lines parallel to each other and separated from each other,
wherein each of the first lines of the first auxiliary touch line unit (115) are connected to the first pad unit (112) and to the first touch line (114), and wherein each of the second lines of the second auxiliary touch line unit (125) are connected to the second pad unit (122) and to the second touch line (124), and
wherein the first flexible substrate (111) and the second flexible substrate (121) have a gap (L2) separating the first and second flexible substrates at a display area (A/A) and have a gap (L3) separating the first and second flexible substrates at a peripheral area (P/A) surrounding the display area (A/A).

Patentansprüche

1. Flexible organische lichtemittierende Anzeigevorrichtung, umfassend:

ein erstes flexibles Substrat (111) und ein zweites flexibles Substrat (121), das vom ersten flexiblen Substrat (111) beabstandet ist, wobei das erste flexible Substrat (111) und das zweite flexible Substrat (121) ausgelegt sind, einen ersten Spalt (L2), der das erste und das zweite flexible Substrat an einem Anzeigebereich (A/A) trennt, und einen zweiten Spalt (L3) aufzuweisen, der das erste und das zweite flexible Substrat an einem peripheren Bereich (P/A) trennt, der den Anzeigebereich (A/A) umgibt;
eine erste Berührungsleitung (114), die im peripheren Bereich (P/A) mit einer ersten Anschlussfeldeinheit (112) auf dem ersten flexiblen Substrat (111) verbunden ist;
eine zweite Berührungsleitung (124), die im peripheren Bereich (P/A) mit einer zweiten Anschlussfeldeinheit (122) auf dem zweiten flexiblen Substrat (121) verbunden ist; und
eine Vielzahl von leitenden Elementen (192), die in einer leitenden Klebeschicht (190) enthalten sind und ausgelegt sind, die erste Anschlussfeldeinheit (112) und die zweite Anschlussfeldeinheit (122) elektrisch zu verbinden und den zweiten Spalt (L3) beizubehalten,
dadurch gekennzeichnet, dass
in einem Bereich, der mit der leitenden Klebeschicht (190) beschichtet ist, die die leitenden Elemente (192) enthält, die erste Berührungsleitung (114) eine erste Berührungshilfsleitungseinheit (115) enthält, die eine Vielzahl von zueinander parallelen und voneinander beabstandeten ersten Leitungen enthält, und die zweite Berührungsleitung (124) eine zweite Berührungshilfsleitungseinheit (125) enthält, die eine Vielzahl von zueinander parallelen und voneinander beabstandeten zweiten Leitungen enthält,
wobei jede der ersten Leitungen der ersten Berührungshilfsleitungseinheit (115) mit der ersten Anschlussfeldeinheit (112) und mit der ersten Berührungsleitung (114) verbunden ist und wobei jede der zweiten Leitungen der zweiten Berührungshilfsleitungseinheit (125) mit der zweiten Anschlussfeldeinheit (122) und mit der zweiten Berührungsleitung (124) verbunden ist.

2. Flexible organische lichtemittierende Anzeigevorrichtung nach Anspruch 1, ferner umfassend: eine transparente Klebeschicht (186) zwischen dem ersten flexiblen Substrat (111) und dem zweiten flexiblen Substrat (121) mit einer Dicke, die den Abmessungen der leitenden Elemente (192) im peripheren Bereich (P/A) entspricht.

3. Flexible organische lichtemittierende Anzeigevorrichtung nach Anspruch 1 oder 2, wobei eine Differenz zwischen dem ersten Spalt (L2) und dem zweiten Spalt (L3) unter 10 % liegt.

4. Flexible organische lichtemittierende Anzeigevorrichtung nach Anspruch 1 oder 2, wobei der erste Spalt (L2) und der zweite Spalt (L3) gleich sind.

5. Flexible organische lichtemittierende Anzeigevorrichtung nach einem der vorangehenden Ansprüche, wobei die leitenden Elemente (192) eine oder mehrere Formen aus einer Kugel, einer Säule, einem Hexagon, einer runden Form oder Kombinationen davon aufweisen.

6. Flexible organische lichtemittierende Anzeigevorrichtung nach einem der vorangehenden Ansprüche, ferner umfassend:

   eine Vielzahl von Dünnschichttransistoren (TFT) auf dem ersten Substrat (111) im Anzeigebereich (A/A);
   ein organisches lichtemittierendes Element, das eine erste Elektrode (172) auf der Vielzahl von Dünnschichttransistoren (TFT), eine organische Lichtemissionsschicht (176) auf der ersten Elektrode (172) und eine zweite Elektrode (178) auf der organischen Lichtemissionsschicht (176) enthält;
   eine transparente flexible Kapselungseinheit (180, 182, 184) auf dem organischen lichtemittierenden Element; und
   eine Berührungselektrodeneinheit (126) auf dem zweiten flexiblen Substrat (121) in einem Berührungsbereich,
   wobei die Berührungselektrodeneinheit (126) und die zweite Elektrode (178) definiert sind, einen dritten Spalt (L1) dazwischen aufzuweisen.

7. Flexible organische lichtemittierende Anzeigevorrichtung nach einem der vorangehenden Ansprüche 2-6, wobei die transparente Klebeschicht (186) entlang mindestens einer Seite der ersten Anschlussfeldeinheit (112) und der zweiten Anschlussfeldeinheit (122) gebildet ist.

8. Flexible organische lichtemittierende Anzeigevorrichtung nach einem der vorangehenden Ansprüche 2-7, wobei die transparente Klebeschicht (186) ausgelegt ist, die erste Anschlussfeldeinheit (112) und die zweite Anschlussfeldeinheit (122) zu umgeben.

9. Flexible organische lichtemittierende Anzeigevorrichtung nach einem der vorangehenden Ansprüche, wobei die Abmessungen der leitenden Elemente (192) größer als eine Breite der ersten Leitungen der ersten Berührungshilfsleitungseinheit (115) und eine Breite der zweiten Leitungen der zweiten Berührungshilfsleitungseinheit (125) sind.

10. Flexible organische lichtemittierende Anzeigevorrichtung nach einem der vorangehenden Ansprüche, wobei die erste Berührungshilfsleitungseinheit (115) und die zweite Berührungshilfsleitungseinheit (125) eine oder mehrere Formen aus einer Zickzackform (315, 325, 415, 425), einer Rautenform (515, 525), einer runden Form (625) und einer Wellenform oder Kombinationen daraus enthalten.

11. Flexible organische lichtemittierende Anzeigevorrichtung nach einem der vorangehenden Ansprüche, ferner umfassend: eine Ansteuerungsschaltkreiseinheit (140), die mit der ersten Berührungsleitung (114) verbunden ist und in einem biegbaren Bereich auf dem ersten flexiblen Substrat (111) positioniert ist, wobei die Ansteuerungsschaltkreiseinheit (140) das zweite flexible Substrat (121) nicht überlappt.

12. Flexible organische lichtemittierende Anzeigevorrichtung nach Anspruch 11, wobei der Bereich des zweiten flexiblen Substrats (121), dessen Bereich einen Bereich überlappt, in dem die Ansteuerungsschaltkreiseinheit (140) montiert ist, ausgeschnitten ist.

13. Verfahren zum Herstellen der flexiblen organischen lichtemittierenden Anzeigevorrichtung nach Anspruch 1, umfassend die Schritte:

   Bereitstellen eines ersten flexiblen Substrats (111) mit einer ersten Berührungsleitung (114), die im peripheren Bereich (P/A) mit einer ersten Anschlussfeldeinheit (112) auf dem ersten flexiblen Substrat (111) verbunden ist;
   Bereitstellen eines zweiten flexiblen Substrats (121) mit einer zweiten Berührungsleitung (124), die im peripheren Bereich (P/A) mit einer zweiten Anschlussfeldeinheit (122) auf dem zweiten flexiblen Substrat (121) verbunden ist;
   Bonden des ersten flexiblen Substrats (111) unter Verwendung einer leitenden Klebeschicht (190) an das zweite flexible Substrat (121), wobei eine Vielzahl von leitenden Elementen (192) in der leitenden Klebeschicht (190) enthalten ist, um die erste Anschlussfeldeinheit (112) und die zweite Anschlussfeldeinheit (122) elektrisch zu

verbinden,
wobei die erste Berührungsleitung (114) in einem Bereich, der mit der leitenden Klebeschicht (190) beschichtet ist, die die leitenden Elemente (192) enthält, eine erste Berührungshilfsleitungseinheit (115) enthält, die eine Vielzahl von zueinander parallelen und voneinander getrennten ersten Leitungen enthält, und die zweite Berührungsleitung (124) eine zweite Berührungshilfsleitungseinheit (125) enthält, die eine Vielzahl von zueinander parallelen und voneinander getrennten zweiten Leitungen enthält,
wobei jede der ersten Leitungen der ersten Berührungshilfsleitungseinheit (115) mit der ersten Anschlussfeldeinheit (112) und mit der ersten Berührungsleitung (114) verbunden ist und wobei jede der zweiten Leitungen der zweiten Berührungshilfsleitungseinheit (125) mit der zweiten Anschlussfeldeinheit (122) und mit der zweiten Berührungsleitung (124) verbunden ist und wobei das erste flexible Substrat (111) und das zweite flexible Substrat (121) einen Spalt (L2) aufweisen, der das erste und das zweite flexible Substrat an einem Anzeigebereich (A/A) trennt, und einen Spalt (L3) aufweisen, der das erste und das zweite flexible Substrat an einem peripheren Bereich (P/A) trennt, der den Anzeigebereich (A/A) umgibt.

Revendications

1. Dispositif d'affichage électroluminescent organique souple comprenant :

   un premier substrat souple (111) et un second substrat souple (121) espacé du premier substrat souple (111), le premier substrat souple (111) et le second substrat souple (121) étant configurés pour avoir un premier intervalle (L2) séparant les premier et second substrats souples au niveau d'une zone d'affichage (A/A) et un deuxième intervalle (L3) séparant les premier et second substrats souples au niveau d'une zone périphérique (P/A) entourant la zone d'affichage (A/A) ;
   une première ligne tactile (114) reliée à une première unité de plot (112) sur le premier substrat souple (111) au niveau de la zone périphérique (P/A) ;
   une seconde ligne tactile (124) reliée à une seconde unité de plot (122) sur le second substrat souple (121) au niveau de la zone périphérique (P/A) ; et
   une pluralité d'éléments conducteurs (192) inclus dans une couche adhésive conductrice (190) configurée pour relier électriquement la première unité de plot (112) et la seconde unité de plot (122) et maintenir le deuxième intervalle (L3),
   caractérisé par le fait que
   dans une zone recouverte de la couche adhésive conductrice (190) comprenant les éléments conducteurs (192), la première ligne tactile (114) comprend une première unité de ligne tactile auxiliaire (115) qui comporte une pluralité de premières lignes parallèles les unes aux autres et séparées les unes des autres, et la seconde ligne tactile (124) comprend une seconde unité de ligne tactile auxiliaire (125) qui comporte une pluralité de secondes lignes parallèles les unes aux autres et séparées les unes des autres,
   chacune des premières lignes de la première unité de ligne tactile auxiliaire (115) étant reliée à la première unité de plot (112) et à la première ligne tactile (114), et chacune des secondes lignes de la seconde unité de ligne tactile auxiliaire (125) étant reliée à la seconde unité de plot (122) et à la seconde ligne tactile (124).

2. Dispositif d'affichage électroluminescent organique souple selon la revendication 1, comprenant en outre :
   une couche adhésive transparente (186) entre le premier substrat souple (111) et le second substrat souple (121), ayant une épaisseur correspondant aux dimensions des éléments conducteurs (192) au niveau de la zone périphérique (P/A).

3. Dispositif d'affichage électroluminescent organique souple selon la revendication 1 ou 2, dans lequel une différence entre le premier intervalle (L2) et le deuxième intervalle (L3) est de moins de 10 %.

4. Dispositif d'affichage électroluminescent organique souple selon la revendication 1 ou 2, dans lequel le premier intervalle (L2) est égal au deuxième intervalle (L3).

5. Dispositif d'affichage électroluminescent organique souple selon l'une quelconque des revendications précédentes, dans lequel les éléments conducteurs (192) ont une ou plusieurs formes parmi une bille, une colonne, un hexagone, une forme arrondie ou des combinaisons de celles-ci.

6. Dispositif d'affichage électroluminescent organique souple selon l'une quelconque des revendications précédentes, comprenant en outre :

   une pluralité de transistors en couches minces (TFT) sur le premier substrat (111) au niveau de la zone d'affichage (A/A) ;
   un élément électroluminescent organique comprenant une première électrode (172) sur la pluralité de transistors en couches minces (TFT),

une couche électroluminescente organique (176) sur la première électrode (172), et une seconde électrode (178) sur la couche électroluminescente organique (176) ;
une unité d'encapsulation souple transparente (180, 182, 184) sur l'élément électroluminescent organique ; et
une unité d'électrode tactile (126) sur le second substrat souple (121) au niveau d'une zone tactile,
l'unité d'électrode tactile (126) et la seconde électrode (178) étant définies pour avoir un troisième intervalle (L1) entre elles.

7. Dispositif d'affichage électroluminescent organique souple selon l'une quelconque des revendications précédentes 2 à 6, dans lequel la couche adhésive transparente (186) est formée le long d'au moins un côté de la première unité de plot (112) et de la seconde unité de plot (122).

8. Dispositif d'affichage électroluminescent organique souple selon l'une quelconque des revendications précédentes 2 à 7, dans lequel la couche adhésive transparente (186) est configurée pour entourer la première unité de plot (112) et la seconde unité de plot (122).

9. Dispositif d'affichage électroluminescent organique souple selon l'une quelconque des revendications précédentes, dans lequel les dimensions des éléments conducteurs (192) sont plus grandes qu'une largeur des premières lignes de la première unité de ligne tactile auxiliaire (115) et qu'une largeur des secondes lignes de la seconde unité de ligne tactile auxiliaire (125).

10. Dispositif d'affichage électroluminescent organique souple selon l'une quelconque des revendications précédentes, dans lequel la première unité de ligne tactile auxiliaire (115) et la seconde unité de ligne tactile auxiliaire (125) comprennent une ou plusieurs formes parmi une forme en zigzag (315, 325, 415, 425), une forme de losange (515, 525), une forme arrondie (625) et une forme ondulée, ou des combinaisons de celles-ci.

11. Dispositif d'affichage électroluminescent organique souple selon l'une quelconque des revendications précédentes, comprenant en outre :
une unité de circuit de commande (140) reliée à la première ligne tactile (114) et positionnée sur le premier substrat souple (111) au niveau d'une zone cintrable, l'unité de circuit de commande (140) n'étant pas en chevauchement avec le second substrat souple (121).

12. Dispositif d'affichage électroluminescent organique souple selon la revendication 11, dans lequel la zone du second substrat souple (121), laquelle zone est chevauchée par une zone où l'unité de circuit de commande (140) est montée, est découpée.

13. Procédé de production du dispositif d'affichage électroluminescent organique souple selon la revendication 1, comprenant les étapes :

disposer un premier substrat souple (111) ayant une première ligne tactile (114) reliée à une première unité de plot (112) sur le premier substrat souple (111) au niveau de la zone périphérique (P/A) ;
disposer un second substrat souple (121) ayant une seconde ligne tactile (124) reliée à une seconde unité de plot (122) sur le second substrat souple (121) au niveau de la zone périphérique (P/A) ;
coller le premier substrat souple (111) au second substrat souple (121) à l'aide d'une couche adhésive conductrice (190), une pluralité d'éléments conducteurs (192) étant inclus dans la couche adhésive conductrice (190) pour relier électriquement la première unité de plot (112) et la seconde unité de plot (122),
dans une zone recouverte de la couche adhésive conductrice (190) comprenant les éléments conducteurs (192), la première ligne tactile (114) comprenant une première unité de ligne tactile auxiliaire (115) qui comprend une pluralité de premières lignes parallèles les unes aux autres et séparées les unes des autres, et la seconde ligne tactile (124) comprenant une seconde unité de ligne tactile auxiliaire (125) qui comprend une pluralité de secondes lignes parallèles les unes aux autres et séparées les unes des autres,
chacune des premières lignes de la première unité de ligne tactile auxiliaire (115) étant reliée à la première unité de plot (112) et à la première ligne tactile (114), et chacune des secondes lignes de la seconde unité de ligne tactile auxiliaire (125) étant reliée à la seconde unité de plot (122) et à la seconde ligne tactile (124), et le premier substrat souple (111) et le second substrat souple (121) ayant un intervalle (L2) séparant les premier et second substrats souples au niveau d'une zone d'affichage (A/A) et ayant un intervalle (L3) séparant les premier et second substrats souples au niveau d'une zone périphérique (P/A) entourant la zone d'affichage (A/A).

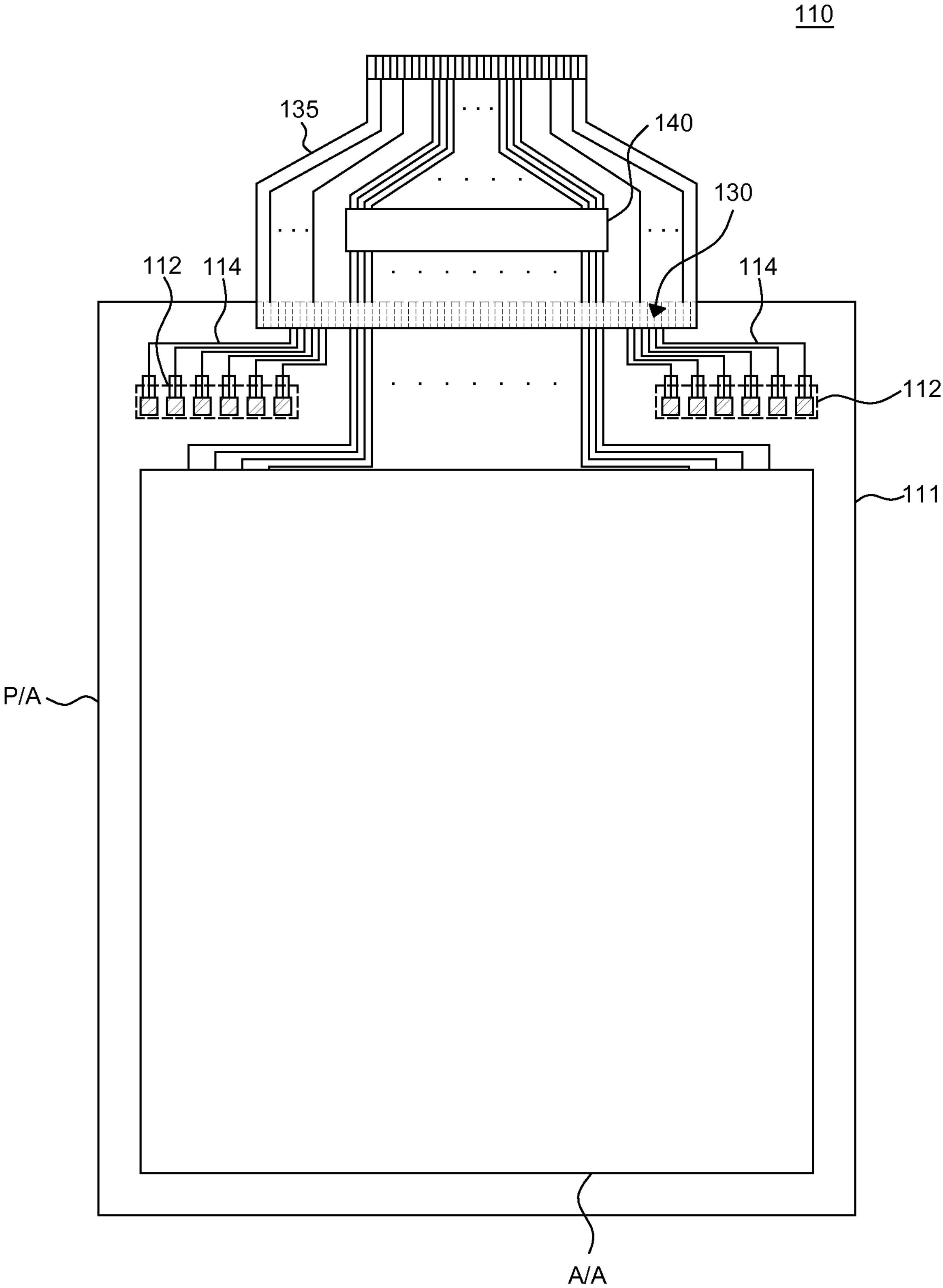

FIG. 1A

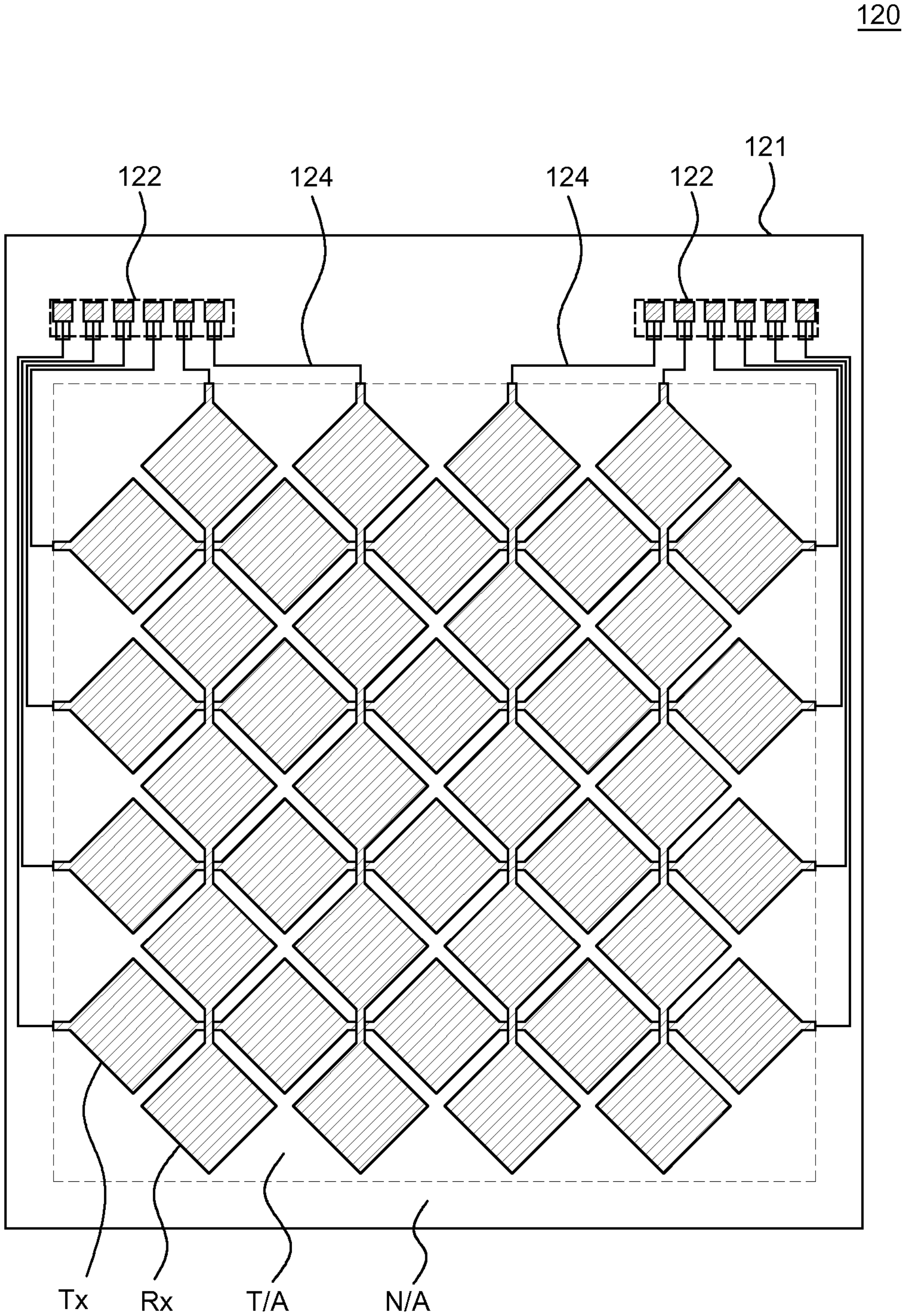

FIG. 1B

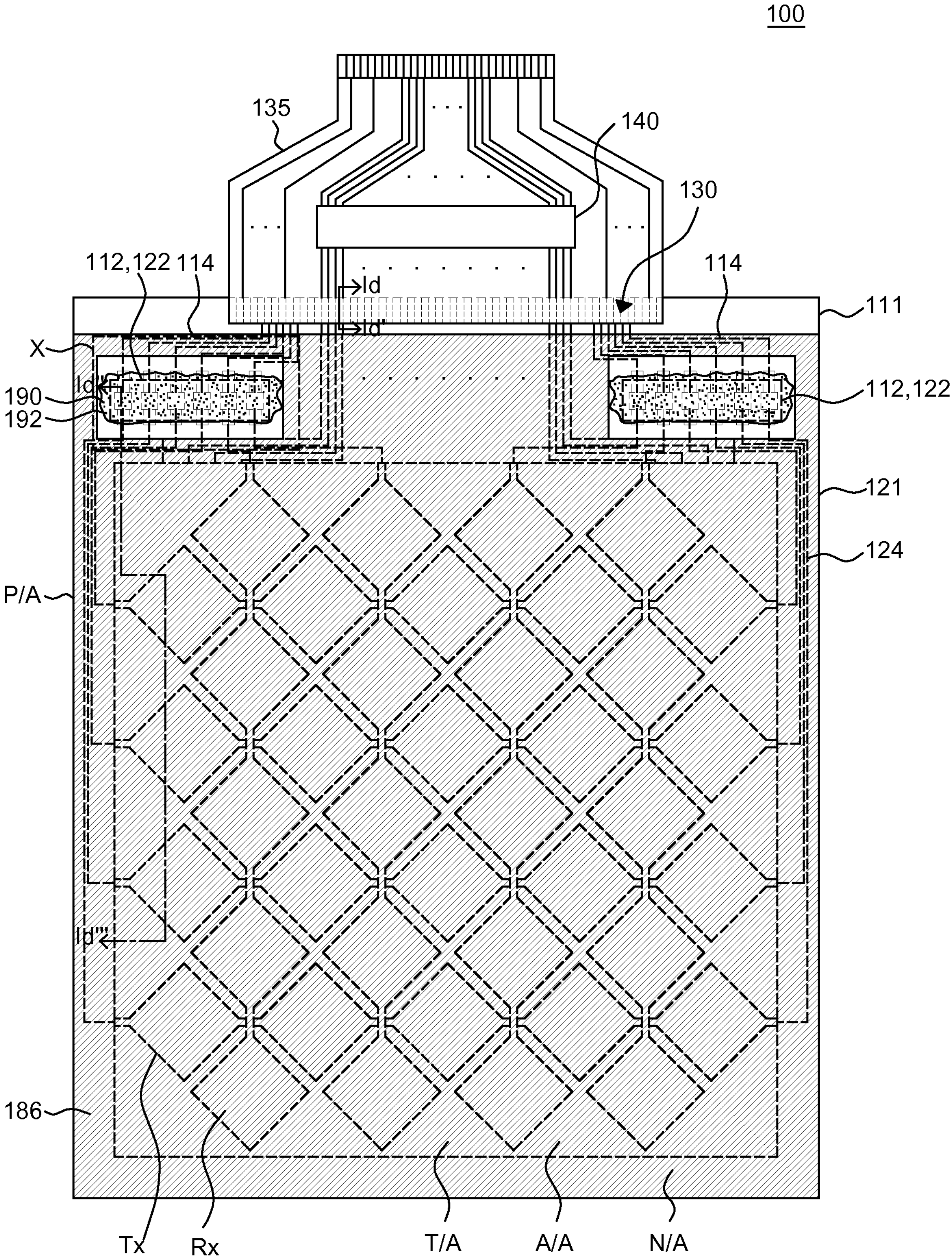
100
135
140
130
112,122
114
114
111
Id
Id'
X
190
192
Id''
112,122
121
124
P/A
Id'''
186
Tx
Rx
T/A
A/A
N/A

FIG. 1C

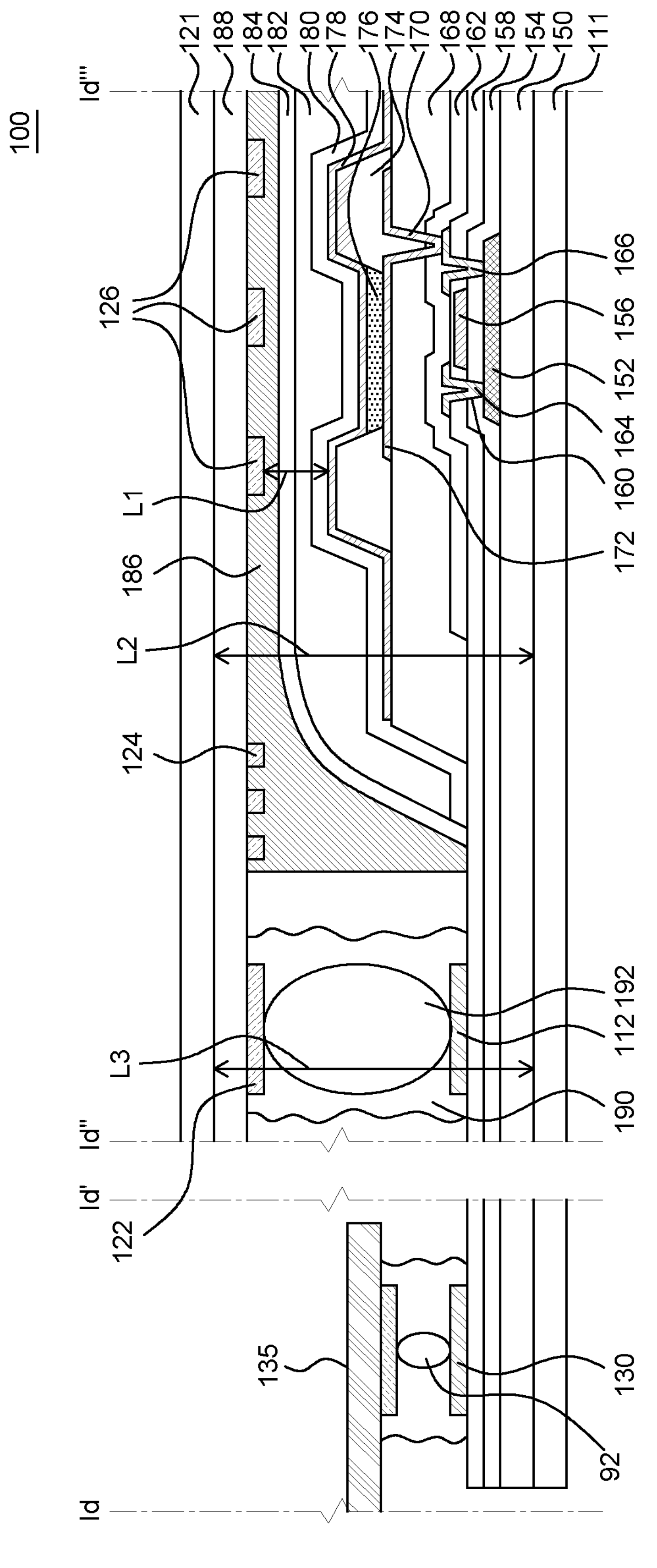
100
Id'''
Id''
Id'
Id
121
188
184
182
180
178
176
174
170
168
162
158
154
150
111
126
L1
186
L2
124
L3
122
135
166
156
152
164
160
172
192
112
190
130
92

FIG. 1D

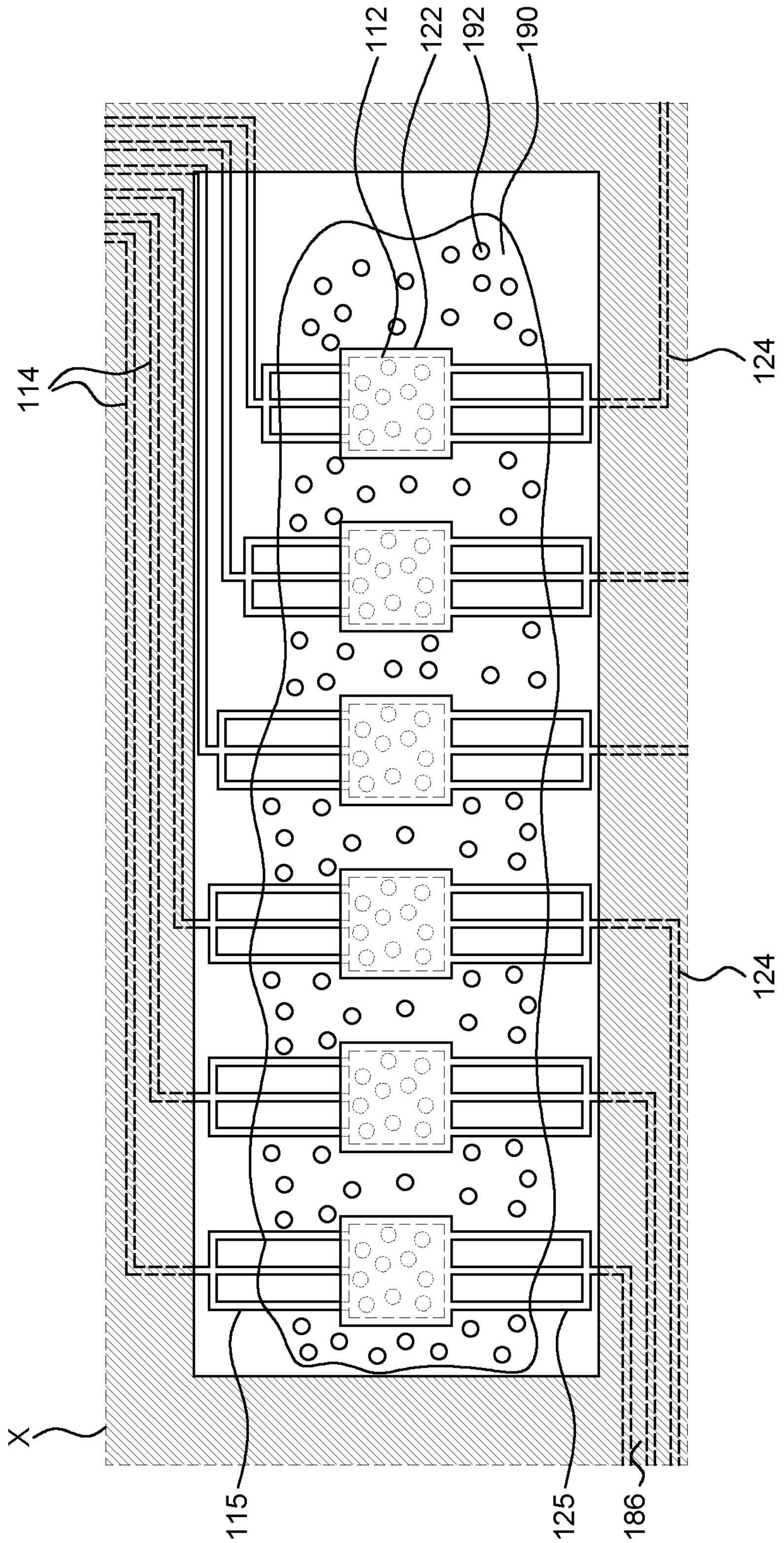

FIG. 2

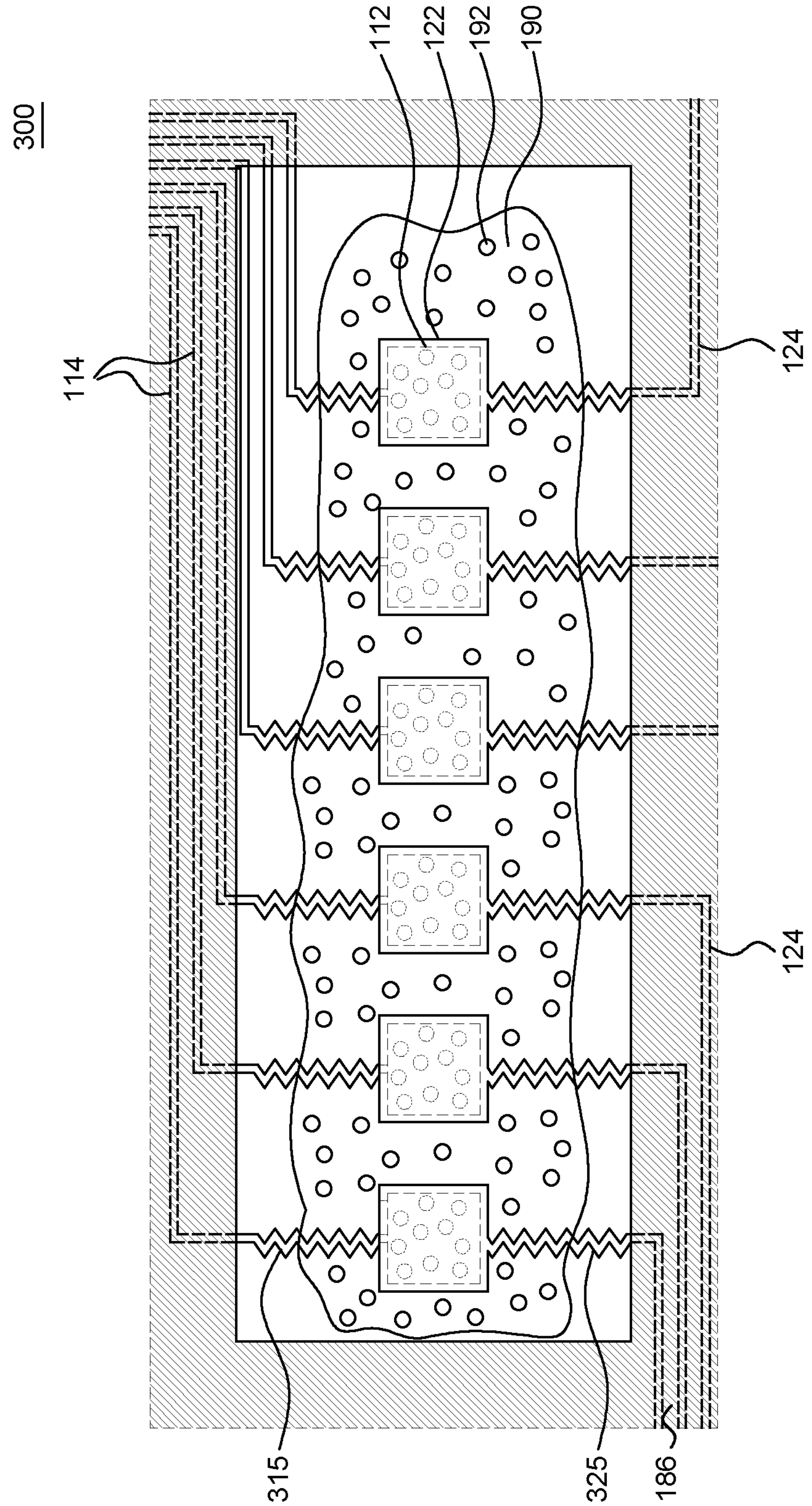

FIG. 3

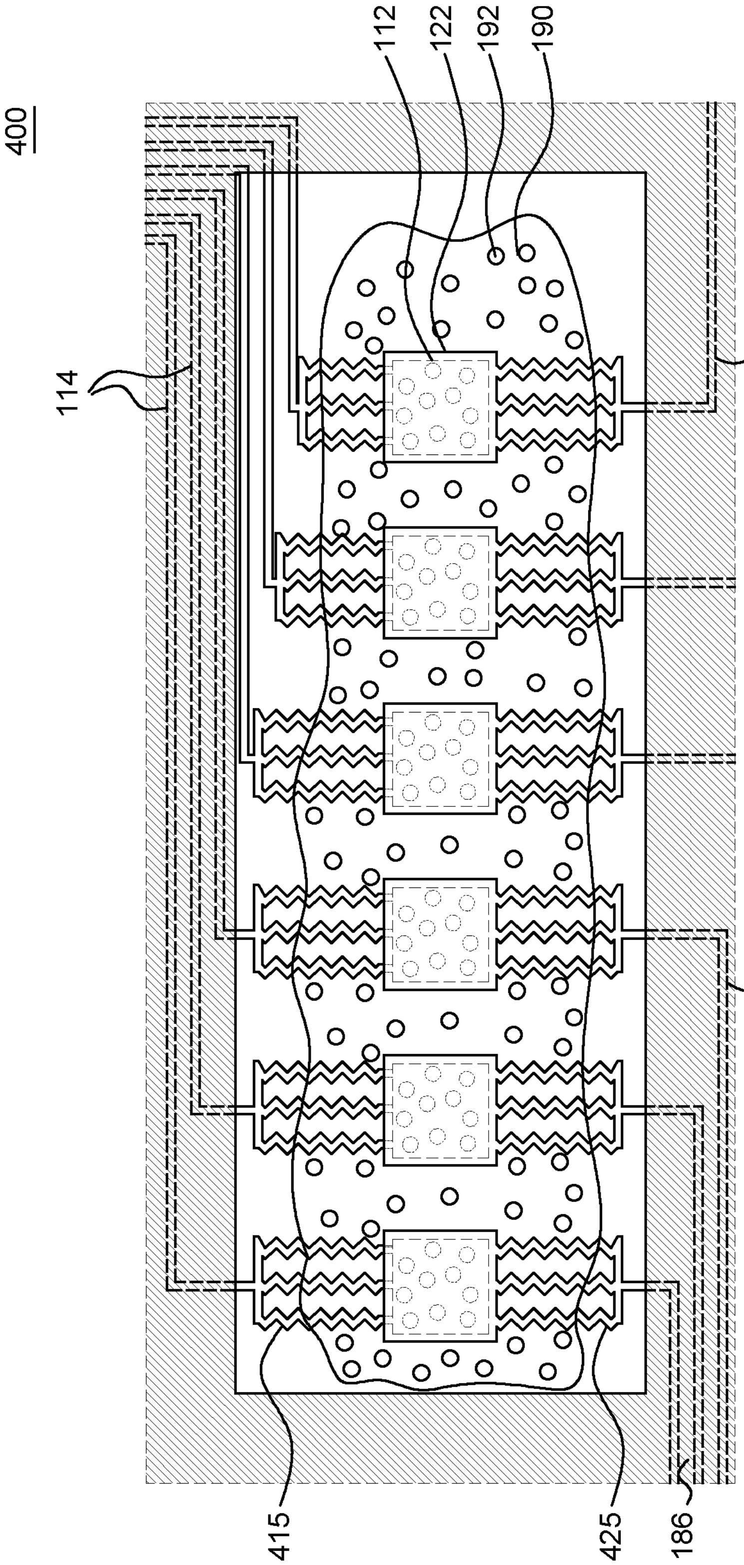

FIG. 4

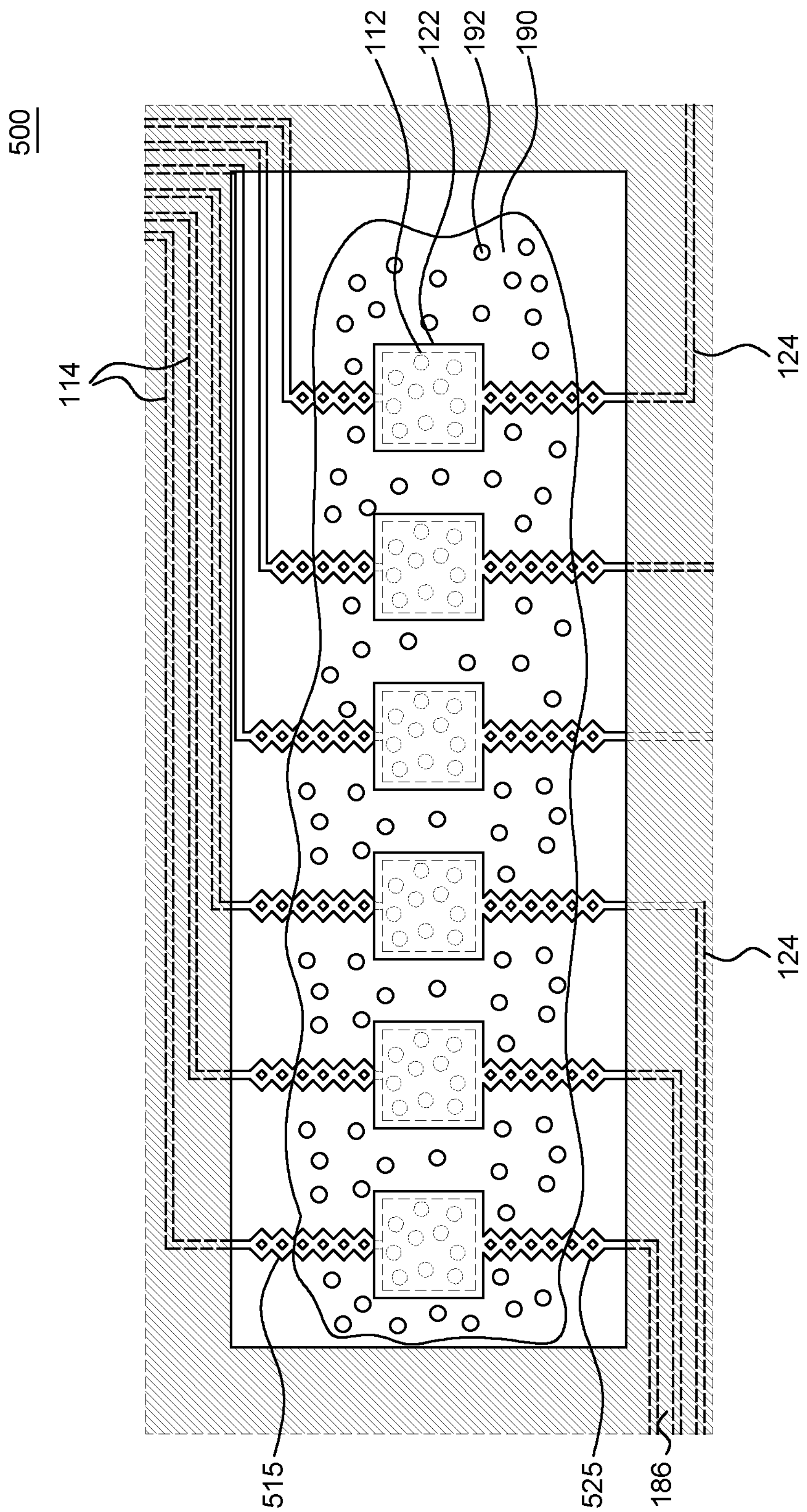

FIG. 5

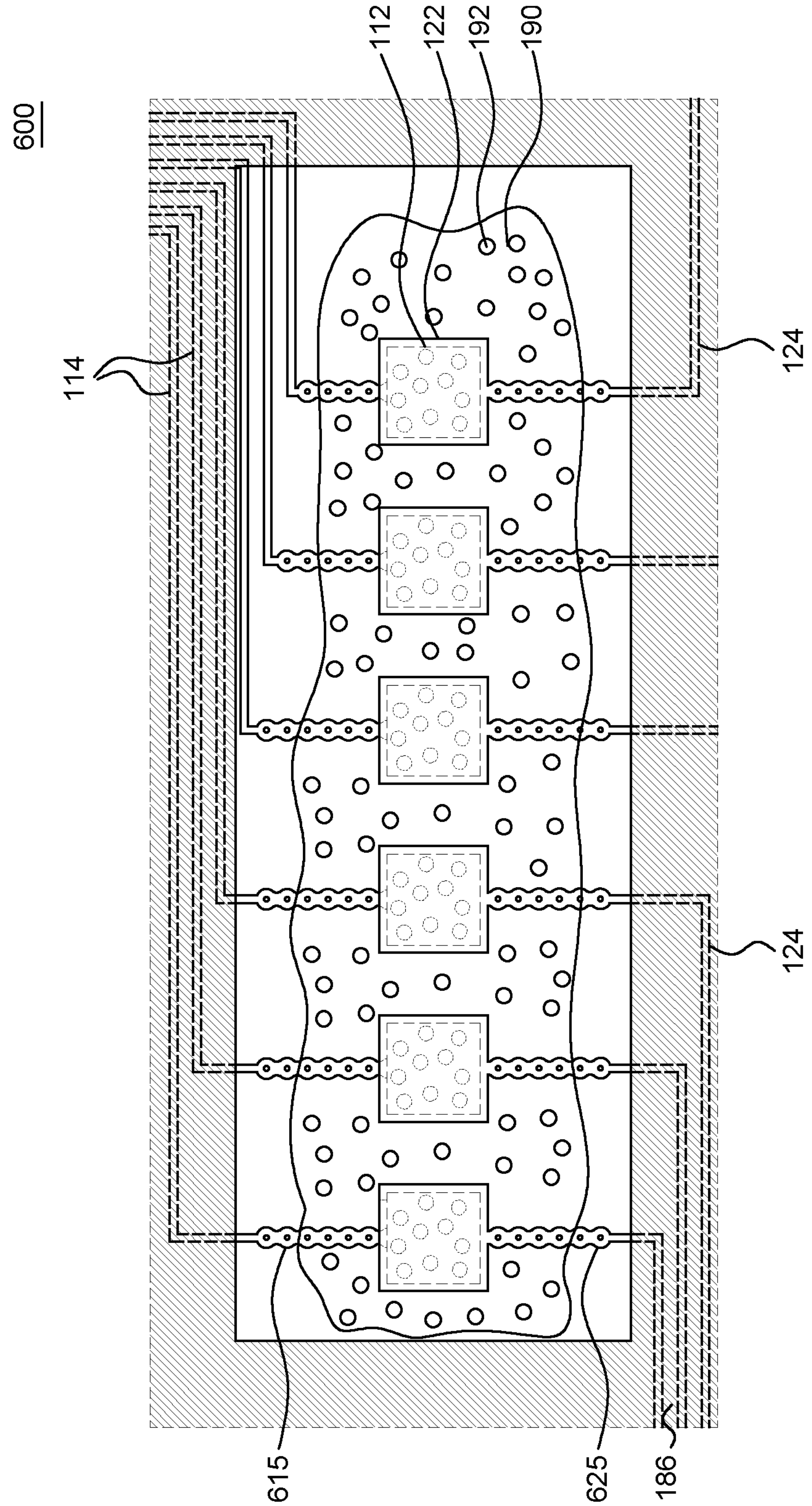

FIG. 6

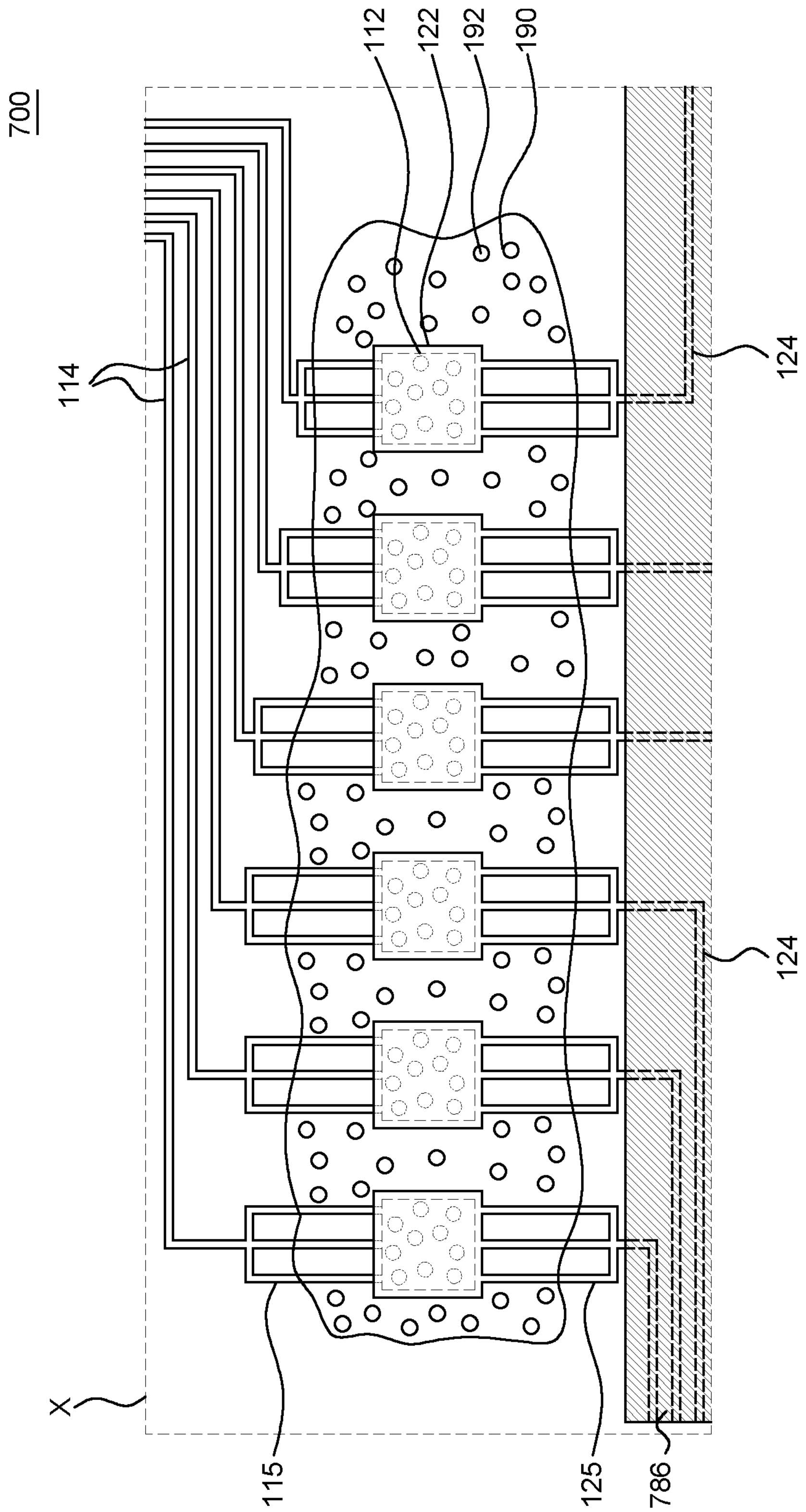

FIG. 7

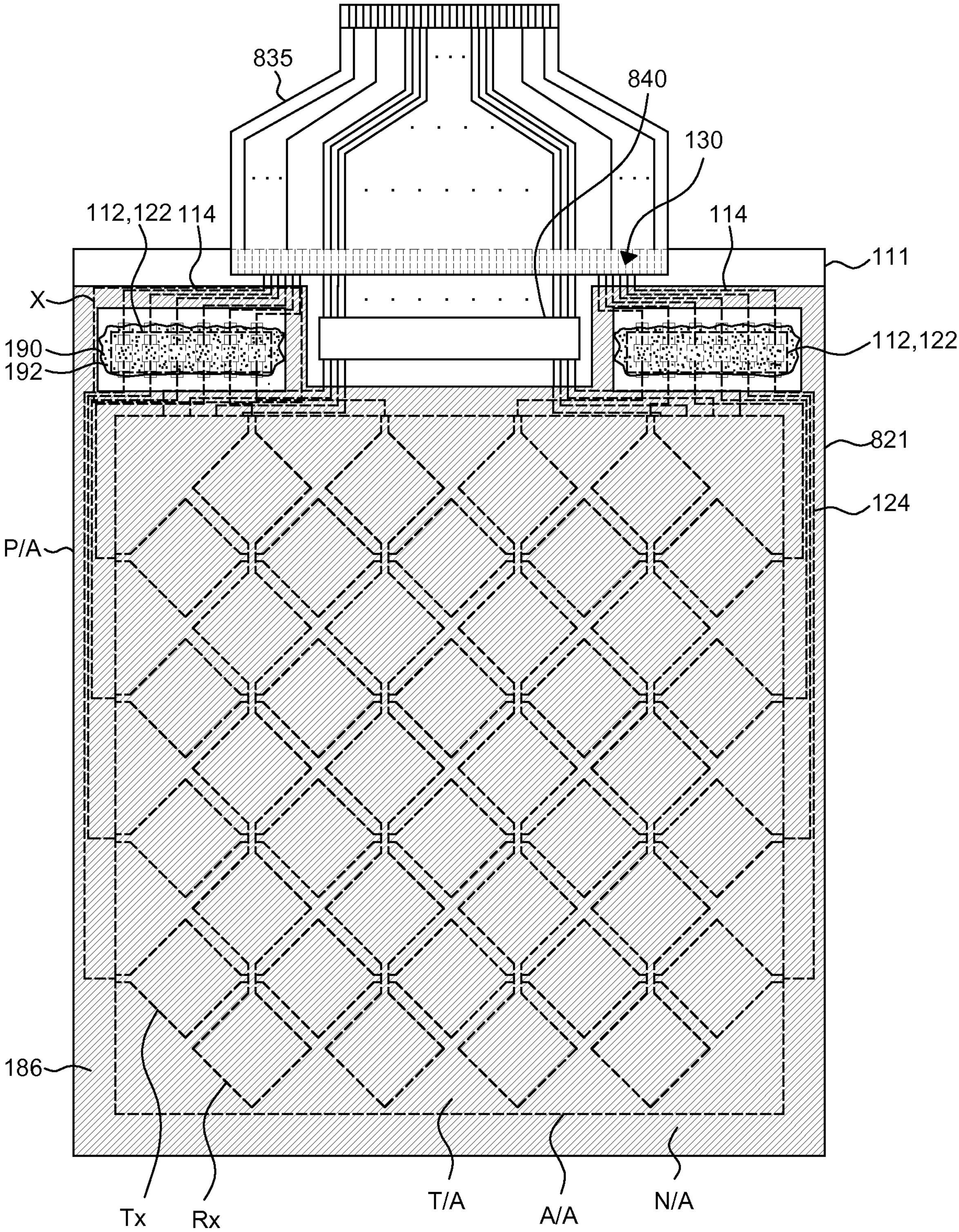
835
840
130
112,122
114
114
111
X
190
192
112,122
821
124
P/A
186
Tx
Rx
T/A
A/A
N/A

FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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专利名称(译)	集成在电池式触摸屏中的柔性有机发光显示设备		
公开(公告)号	EP2991116B1	公开(公告)日	2020-01-22
申请号	EP2015182874	申请日	2015-08-28
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IPC分类号	H01L27/32 H01L51/00 G06F3/041 H01L51/52 G09G5/00 G06F3/044		
CPC分类号	G06F3/0412 G06F3/0443 G06F3/0446 G06F2203/04102 H01L27/323 H01L27/3276 H01L51/0097 H01L51/5246 H01L2251/5338 G06F3/044 G06F3/047 G09G5/003 G09G2300/0426 G09G2380/02 H01L27/3248 H01L51/56 H01L2227/323		
优先权	1020140114179 2014-08-29 KR		
其他公开文献	EP2991116A1		
外部链接	Espacenet		

摘要(译)

提供了一种柔性有机发光显示装置。 柔性有机发光显示装置包括第一柔性基板（111）和与第一柔性基板（111）间隔开的第二柔性基板（121），第一柔性基板（111）和第二柔性基板（121）构造为 第一触摸线单元（114）在显示区域（A/A）具有第一间隙（L2），在围绕显示区域（A/A）的周边区域（P/A）具有第二间隙（L3））与外围区域（P/A）上的第一挠性基板（111）上的第一焊盘单元（112）连接，第二触线单元（124）与第二挠性基板上的第二焊盘单元（122）连接。（121）在外围区域（P/A）和包括在导电粘合层（190）中的间隙平衡导电元件（192），该导电粘合层（192）被配置为电连接第一焊盘单元（112）和第二焊盘单元（122），并且 用于基于第一间隙（L2）保持第二间隙（L3）。

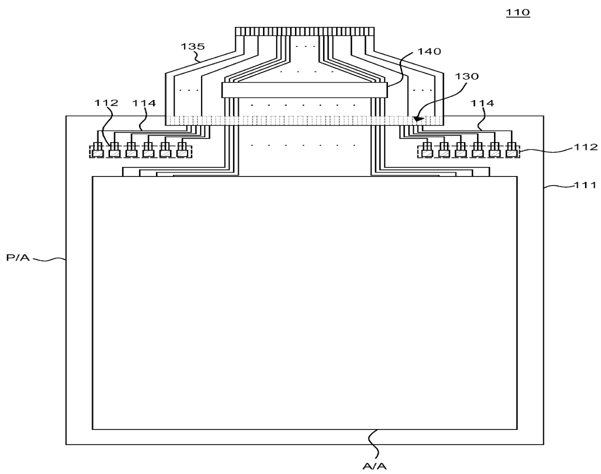

FIG. 1A