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(54) **Flexible display device and method of fabricating the same**

Flexible Anzeigevorrichtung und Verfahren zur Herstellung davon

Dispositif d'affichage flexible et son procédé de fabrication

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Description

CROSS-REFERENCE TO RELATED APPLICATION

BACKGROUND

1. FIELD OF THE DISCLOSURE

[0001] The present disclosure relates to a flexible display device and a method of fabricating the same.

2. DISCUSSION OF THE PRIOR ART

[0002] Recently, flexible display devices using organic light emitting diodes (OLEDs) have been widely developed.

[0003] In more detail, categories of OLEDs include a passive matrix type and an active matrix type according to a driving method.

[0004] Further, OLEDs may be categorized into a top emission type emitting light to a top surface, a bottom emission type emitting light to a substrate where a thin film transistor (TFT) is formed (e.g., to a bottom surface), and a dual emission type emitting light to both the top surface and the bottom surface.

[0005] The flexible display device generally includes a plastic substrate that is flexible and capable of being bent, an OLED element, and a passivation element that can endure bending.

[0006] Further, the flexible display device is designed to have a structure that can endure a specific bending radius according to the purpose of application and the field of application.

[0007] The bending radius is a radius of a bent surface when bending the flexible display device, and as the bending radius becomes smaller, the fields of application are various and the quality of the flexible display device increases. However, currently, the OLED element, the passivation element, and the materials thereof are limited, and thus reliability is reduced.

[0008] FIG. 1 is a cross-sectional view illustrating a flexible display device 10 according to the prior art.

[0009] Referring to FIG. 1, the flexible display device 10 includes a plastic substrate 11, a TFT and OLED element layer 12 formed on the plastic substrate 11, an encapsulation portion 13 protecting the TFT and OLED element layer 12, a circuit portion 14 applying a power signal and a data signal, which are supplied from an external portion, to the element layer 12, and a bottom film 15 protecting a bottom of the plastic substrate 11.

[0010] The circuit portion 14 includes an IC (integrated circuit) pad portion 14a of a COF (chip on film) type, which is formed on the plastic substrate 11, a resin layer 14b protecting the IC pad portion 14a, and a flexible printed circuit substrate 14c connected to the IC pad portion 14a.

[0011] An upper peripheral area A1 and a circuit portion area A2 of the flexible display device 10 are generally in a non-luminous area, and the non-luminous areas A1 and A2 are bent to achieve a thin profile and miniaturization of the display device.

[0012] However, a bending stress is applied to the non-luminous area A1 and A2 in the bending process, and thus the circuit portion 14 , the plastic substrate 11, or the OLED element layer 12 is destroyed.

[0013] Further, in the bending process, the bent area does not maintain a constant bending radius.

[0014] US 2011/050657 A1 relates to an electro-optical device including a display panel obtained by forming an electro-optical layer, in which a plurality of pixels is formed, on a glass substrate having a thickness of 50 [mu]m or less; and a support frame supporting the display panel, wherein the display panel has at least a display region in which the plurality of pixels is formed and frame regions formed outside the display region, and wherein at least one side of each of the frame regions is bent from the vicinity of a circumference of the display region to the support frame side and is fixed to the support frame.

[0015] EP 1 933 196 A2 relates to an image display device comprising a display part configured with a plurality of pixels and a peripheral integrated circuit which controls the display part, the display device is provided on a support substrate which has high durability for the impact and the bending, the pixel circuit is configured with an organic semiconductor TFT, the peripheral integrated circuit is configured with a low-temperature poly Si-TFT, this peripheral integrated circuit is provided on a support substrate of the display device being removed the support substrate when being manufactured, and the pixel circuit and the peripheral integrated circuit are connected with the same wire layer.

[0016] KR 101 190 630 B1 relates to an OLED display having an electromagnetic interference shielding sheet between an electric component and the OLED display substrate.

SUMMARY OF THE INVENTION

[0017] Accordingly, the present invention is directed to a flexible display device including a support member capable of easily bending a plastic substrate, and a method of fabricating the same.

[0018] Additional features and advantages of the invention will be set forth in the description that follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims herein as well as the appended drawings.

[0019] The objects are solved by the features of the independent claims. According to an aspect of the present disclosure, a flexible display device includes a display panel including a plastic substrate where an organic light emitting diode and a thin film transistor are formed; a circuit portion applying a power signal and a data signal, which are supplied from an external portion,

to the display panel; and a support member coupled to the plastic substrate, wherein the display panel and the circuit portion are bent around the support member.

[0020] In another aspect, a method of fabricating a flexible display device includes preparing a display panel including a plastic substrate on which an organic light emitting diode and a thin film transistor are formed; preparing a support member; coupling the display panel to the support member; and bending the display panel along a side surface of the support member.

[0021] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention. In the drawings:

FIG. 1 is a cross-sectional view illustrating a flexible display device according to the prior art;

FIGs. 2 and 3 are a plan view and a cross-sectional view, respectively, illustrating a flexible display device before the device is bent according to an embodiment of the present invention, respectively;

FIGs. 4A to 4D are cross-sectional views illustrating various examples of a support member, some of them being according to an embodiment of the present invention;

FIG. 5 is a cross-sectional view illustrating the flexible display device after the device is bent according to an embodiment of the present invention;

FIG. 6 is a schematic flow chart illustrating a method of fabricating the flexible display device according to an embodiment of the present invention;

FIGs. 7A to 7F are views illustrating a method of fabricating the flexible display device according to an embodiment of the present invention;

FIGs. 8 and 9 are a plan view and a cross-sectional view, respectively, illustrating a flexible display device before the device is bent according to another embodiment not forming part of the present invention;

FIG. 10 is a cross-sectional view illustrating the support member according to another embodiment not forming part of the present invention; and

FIG. 11 is a cross-sectional view illustrating the flexible display device after the device is bent according to another embodiment not forming part of the present invention.

DETAILED DESCRIPTION

[0023] Reference will now be made in detail to exemplary embodiments, which are illustrated in the accompanying drawings.

[0024] FIGs. 2 and 3 are a plan view and a cross-sectional view, respectively, illustrating a flexible display device 100 before the device is bent according to an embodiment of the present invention, respectively. FIG. 4 is a cross-sectional view illustrating various examples of a support member, some of them being according to an embodiment of the present invention, and FIG. 5 is a cross-sectional view illustrating the flexible display device 100 after the device is bent according to an embodiment of the present invention.

[0025] As shown in the drawings, the flexible display device 100 includes a display panel 110, a circuit portion 120, and a support member 130. The display panel 110 and the circuit portion 120 are bent around the support member 130 to make the flexible display panel 100.

[0026] In more detail, the display panel 110 is formed of a plastic substrate where an OLED and a TFT are formed, and non-luminous areas such as non-active areas N/A, N/A1, and N/A2 may be formed at peripheral areas of the display panel 110.

[0027] The circuit portion 120 is for applying a power signal and a data signal, which are supplied from the external portion, to the display panel 110.

[0028] The circuit portion 120 is formed as a COF, and an IC element is formed on the COF.

[0029] In more detail, referring to FIG. 3, the circuit portion 120 includes a COF 121 electrically connected to the display panel 110, an IC element 122 coupled to the COF 121 on a surface of the COF 121, and a FPCB (flexible printed circuit board) 123 supplied with the power signal and the data signal from the external portion.

[0030] The IC element 122 may be a drive-IC (D-IC) element.

[0031] The support member 130 is coupled to the plastic substrate that forms the display panel 110.

[0032] In more detail, referring to FIG. 3, the support member 130 includes a flat surface 131 coupled to the plastic substrate, a side surface (132) with an outer rounded surface having a constant bending radius R, and an accommodation portion 133a accommodating the IC element 122.

[0033] The support member 130 may be made of stainless steel (SUS), magnesium (Mg), rubber, graphene, Teflon, PDMS (polydimethylsiloxane), urethane, or PVC (polyvinyl chloride) films, for example.

[0034] The ratio of the bending radius R to the thickness t of the support member 130 may be between 0.2 and 0.8, and preferably 0.5.

[0035] For example, if the thickness t of the support member 130 is 100μm (micrometers), the radius R may be 0.05mm (millimeters).

[0036] The support member 130 may be formed in various forms, as shown in FIG. 4.

[0037] In more detail, referring to FIG. 4A, according to the invention, the accommodation portion 133a of the support member 130a is formed in a groove shape to accommodate the IC element 122.

[0038] Alternatively and not according to the invention, referring to FIG. 4B, the accommodation portion 133b of the support member 130b may be formed in a hole shape to accommodate the IC element 122.

[0039] Referring to FIG. 4C, according to the invention, an insulator 134 is coupled to the inner surface of the accommodation portion 133a formed in the groove shape.

[0040] Alternatively and not according to the invention, referring to FIG. 4D, an insulator 134 may be coupled to the accommodation portion 133b formed in the hole shape.

[0041] Referring to Fig. 4C, according to the embodiment, the insulator 134 is coupled to the accommodation portion 133a in the support member 130a to advantageously prevent transfer of electromagnetic waves from the IC element 122 to the support member 130a when the IC element 122 is inserted into the accommodation portion 133a.

[0042] FIG. 6 is a schematic flow chart illustrating a method of fabricating the flexible display device according to an embodiment of the present invention, and FIGs. 7A to 7F are views illustrating the method of fabricating the flexible display device according to an embodiment of the present invention.

[0043] The flexible display device 100 is fabricated with four steps (S1 to S4).

[0044] First, the display panel 110, including the plastic substrate where the OLED and TFT are formed, is prepared (step S1).

[0045] Then, the support member 130 having the side surface 132 of the constant bending radius R is prepared (step S2).

[0046] Then, the display panel 110 is coupled to the support member 130 (step S3).

[0047] Then, the non-active areas N/A, N/A1, and N/A2 of the display panel 110 may be selectively bent around the side surface 132 of the support member 130 (step S4).

[0048] In this regard, at least one area of the non-display areas N/A, N/A1, and N/A2 may be selectively bent.

[0049] In more detail, the step S2 of preparing the support member 130 is as follows.

[0050] First, referring to FIG. 7A, a base support member 330 that becomes the support member 130 having the constant bending radius R at the side surface 132 later is prepared.

[0051] A first optically transparent adhesive 136 is coated on a surface of the base support member 330, and a second optically transparent adhesive 137 is coated on an opposite surface of the base support member 330.

[0052] The first optically transparent adhesive 136 may have an adhesion strength higher than the second optically transparent adhesive 137 so that the first optically transparent adhesive 136 is coupled to the display panel 110. The first and second optically transparent adhesives 136 and 137 may be made of OCA (optical clear adhesive).

[0053] Then, protective films 138a and 138b are attached to the first and second optically transparent adhesives 136 and 137, respectively.

[0054] Then, referring to FIGs. 7B and 7C, the constant bending radius is formed at the side surface of the base support member 330.

[0055] In more detail, the side surface of the base support member 330 is cut round such that the area of the base support member 330 corresponds to a luminous area (i.e., an active area A/A) of the display panel 110. To do this, a platen die cutting apparatus C may be used, which selectively cuts films.

[0056] In other words, referring to FIG. 7B, the area of the base support member 330 may correspond to the area of the display panel 110 except for the non-active areas N/A1 and N/A2.

[0057] Further, the support member 130 may extend to the direction of the non-active area N/A2 where the circuit portion 120 is formed.

[0058] Accordingly, the support member 130 may cover a part of the non-active area N/A2 for the circuit 120.

[0059] Referring to FIG. 7C, the cutting apparatus C makes round cuts along the cutting lines C/L in order to form the constant bending radius at the side surface of the base support member 330.

[0060] The above explanation relates to bending the non-active areas N/A1 and N/A2 located at the top and bottom side of the flexible display device 100. Alternatively, as shown in FIG. 7D, other non-active areas N/A may be bent in a similar manner.

[0061] Then, referring to FIG. 7E, after cutting the side surface of the base support member 330, the protective film 138a attached to the first optically transparent adhesive 136 and the protective film 138b attached to the second optically transparent adhesive 137 are removed.

[0062] Accordingly, the support member 130 having the constant bending radius R at the side surface 132 is prepared.

[0063] The step S3 of coupling the display panel 110 and the support member 130 is finished by coupling the display panel 110 and the circuit portion 120 to the first optically transparent adhesive 136.

[0064] Then, referring to FIG. 7E, when coupling the display panel 110 to the support member 130 is finished, an optically polarizing member 113 is coupled to the display panel 110.

[0065] A vacuum auto roller VR, on the surface of which vacuum holes are formed, is coupled to the display panel 110, and then the display panel 110 is bent around the side surface having the bending radius R of the support member 130.

[0066] Accordingly, referring to FIGs. 2 and 7F, the non-active areas N/A1 and N/A2 of the display panel 110

may be selectively bent.

[0067] Besides the non-active areas N/A1 and N/A2, other non-active areas N/A of the display panel 110 shown in FIGs. 2 and 7D may be also bent.

[0068] A flexible display device according to another embodiment not forming part of the invention but useful for understanding the invention, is explained as below, and explanations of parts similar to parts of the previous embodiment may be omitted.

[0069] FIGs. 8 and 9 are a plan view and a cross-sectional view illustrating a flexible display device 200 before the device is bent.

[0070] As shown in the drawings, the flexible display device 200 includes a display panel 110, a circuit portion 220, and a support member 230. The display panel 110 and the circuit portion 220 are bent around the support member 230 so that the flexible display device 100 can be realized.

[0071] In more detail, the display panel 110 may be formed of a plastic substrate where an OLED and a TFT are formed, and non-luminous areas such as non-active areas N/A, N/A3, and N/A4 may be formed at a peripheral area of the display panel 110.

[0072] The circuit portion 220 applies a power signal and a data signal, which are supplied from the external portion, to the display panel 110.

[0073] According to an example useful for understanding the invention, the circuit portion 220 may be formed as a COG, and an IC element may be formed at the COG.

[0074] In more detail, referring to FIG. 9, the -circuit portion 220 according to an example useful for understanding the invention includes an IC element 221 coupled to the COG on a surface of the COG and a FPCB 223 supplied with the power signal and the data signal from the external portion.

[0075] The IC element 221 may be a drive-IC (D-IC) element.

[0076] Referring to FIG. 10, which is a cross-sectional view illustrating the support member 230 not according to the present invention, the support member 230 is coupled to the plastic substrate that forms the display panel 110.

[0077] In more detail, the support member 230 includes a flat surface 231 coupled to the plastic substrate of the display panel 110 and a side surface 232 having a bending radius R at an outer rounded surface.

[0078] The display device 200 may be fabricated using the method described above with reference to FIGs. 7A to 7F, and at least one of the non-active areas N/A, N/A3 and N/A4 of the display panel 110 may be selectively bent.

[0079] Accordingly, referring to FIG. 11, which is a cross-sectional view illustrating the flexible display device 200 after the device is bent the non-active area N/A4 formed by the circuit portion 220 and the non-active area N/A3 formed at the top portion of the display panel 110 can be bent.

[0080] Besides the non-active areas N/A3 and N/A4, other non-display areas N/A of the display panel 110 may also be bent, similarly to FIG. 8.

[0081] As described above, in the flexible display device of the present invention, the plastic substrate is bent around the outer rounded surface of the support member, which advantageously prevents destruction of the bent portion.

[0082] Further, bending the non-active area (e.g., the bezel area) of the display device advantageously obtains a zero-bezel display device (i.e., a display device with substantially no bezel).

[0083] Further, since the non-active area (e.g., a bezel area) of the display device is bent, there is an advantage of miniaturizing the display device.

[0084] It will be apparent to those skilled in the art that various modifications and variations can be made in a display device of the present disclosure without departing from the scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims.

Claims

1. A flexible display device comprising:

a display panel (110) including a plastic substrate where an organic light emitting diode and a thin film transistor are formed;
a circuit portion (120) applying a power signal and a data signal, which are supplied from an external portion, to the display panel (110); and
a support member (130a) coupled to the plastic substrate, the display panel (110) and the circuit portion (120) bent around the support member (130a), the support member (130a) includes a flat surface (131) coupled to the plastic substrate,
the circuit portion (120) is formed as a COF, and the COF includes an IC element (122), **characterized in that**
the support member (130a) includes a side surface (132) with an outer rounded surface having a constant bending radius, and the support member (130a) includes an accommodation portion (133a) accommodating the IC element (122), wherein the support member (130a) includes an insulator (134) formed on an inner surface of the accommodation portion (133a) to prevent transfer of electromagnetic waves from the IC element (122) to the support member (130a), the accommodation portion (133a) being formed in a groove shape having an opening opposite to the display panel (110), thereby a part of the support member (130a) is disposed between the IC element (122) and the display panel (110).

2. The device of claim 1, wherein the support member (130a) is made of one of SUS, Mg, rubber, graphene, Teflon, PDMS, urethane, and PVC films.

3. The device of claim 1, wherein a ratio of the bending radius to a thickness of the support member (130a) is between 0.5 and 0.8.

4. The device of claim 1, further comprising:
an optically transparent adhesive (136) between the plastic substrate and the support member (130a).

5. A method of fabricating a flexible display device according to claim 1, the method comprising:

preparing (S1) a display panel (110) including a plastic substrate on which an organic light emitting diode and a thin film transistor are formed;
preparing (S2) a support member (130a) including forming a constant bending radius at a side surface of a base support member (330);
coupling (S3) the display panel (110) to the support member (130a); and
bending (S4) the display panel (110) and a circuit portion (120) around the side surface (132) of the support member (130a),
wherein the circuit portion (120) is formed as a COF, and the COF includes an IC element (122), and wherein the support member (130a) includes an accommodation portion (133a) for accommodating the IC element (122), wherein the support member (130a) includes an insulator (134) formed on an inner surface of the accommodation portion (133a) to prevent transfer of electromagnetic waves from the IC element 122 to the support member (130a), the accommodation portion (133a) being formed in a groove shape having an opening opposite to the display panel (110), thereby a part of the support member (130a) is disposed between the IC element (122) and the display panel (110).

6. The method of claim 5, wherein bending the display panel (110) includes selectively bending at least one area of non-active areas of the display panel (110).

7. The method of claim 5, wherein forming the bending radius at the side surface (132) of the base support member includes cutting round the side surface of the base support member such that an active-area of the display panel (110) corresponds to the base support member.

8. The method of claim 5, wherein preparing (S2) the support member (130a) includes:

coating a first optically transparent adhesive (136) on a first surface of the base support member (330) before forming the bending radius at the base support member;
coating a second optically transparent adhesive (137) on a second surface of the base support member, the second surface opposite the first surface; and
attaching protective films (138a, 138b) to the first and second optically transparent adhesives (136, 137), respectively.

9. The method of claim 8, further comprising:

removing the protective film (138a) attached to the first optically transparent adhesive (136) after cutting around the side surface of the base support member; and removing the protective film (138b) attached to the second optically transparent adhesive (137),
wherein coupling the display panel (110) to the support member (130a) includes coupling the display panel (110) to the first optically transparent adhesive (136).

10. The method of claim 5, further comprising:
coupling an optically polarizing member (113) to the display panel (110) after coupling the display panel (110) to the support member (130a).

Patentansprüche

1. Flexible Anzeigevorrichtung, die Folgendes umfasst:

eine Anzeigetafel (110), die ein Plastiksubstrat enthält, in dem eine organische Leuchtdiode und ein Dünnschichttransistor gebildet sind;
einen Schaltungsteil (120), der ein Leistungssignal und ein Datensignal, die von einem externen Teil geliefert werden, an die Anzeigetafel (110) anlegt; und
ein Tragelement (130a), das an das Plastiksubstrat, die Anzeigetafel (110) und den Schaltungsteil (120), der um das Tragelement (130) gebogen ist, gekoppelt ist,
wobei das Tragelement (130a) eine ebene Fläche (131) enthält, die an das Plastiksubstrat gekoppelt ist,
wobei der Schaltungsteil (120) als ein COF gebildet ist und der COF ein IC-Element (122) enthält,
dadurch gekennzeichnet, dass
das Tragelement (130a) eine Seitenfläche (132) mit einer äußeren gerundeten Fläche mit einem konstanten Biegeradius enthält und das Tragelement (130a) einen Aufnahmeteil (133a) enthält, der das IC-Element (122) aufnimmt, wobei das Tragelement (130a) einen Isolator (1324)

enthält, der auf einer inneren Fläche des Aufnahmeteils (133a) gebildet ist, um eine Übertragung elektromagnetischer Wellen von dem IC-Element (122) auf das Tragelement (130a) zu verhindern, wobei der Aufnahmeteil (133a) in einer Fugenform mit einer Öffnung gegenüber der Anzeigetafel (110) gebildet ist, wodurch ein Teil des Tragelements (130a) zwischen dem IC-Element (122) und der Anzeigetafel (110) angeordnet ist.

2. Vorrichtung nach Anspruch 1, wobei das Tragelement (130a) aus einem der folgenden Materialien hergestellt ist: SUS, Mg, Gummi, Graphen, Teflon, PDMS, Urethan und PVC-Folien.

3. Vorrichtung nach Anspruch 1, wobei ein Verhältnis des Biegeradius zu einer Dicke des Tragelements (130a) zwischen 0,5 und 0,8 liegt.

4. Vorrichtung nach Anspruch 1, die ferner Folgendes umfasst:
einen optisch transparenten Kleber (136) zwischen dem Plastiksubstrat und dem Tragelement (130a).

5. Verfahren zum Herstellen einer flexiblen Anzeigevorrichtung nach Anspruch 1, wobei das Verfahren umfasst:

Erstellen (S1) einer Anzeigetafel (110), die ein Plastiksubstrat enthält, auf dem eine organische Leuchtdiode und ein Dünnschichttransistor gebildet sind;
Erstellen (S2) eines Tragelements (130a), das enthält, einen konstanten Biegeradius an einer Seitenfläche eines Basistragelements (330) zu bilden;
Koppeln (S3) der Anzeigetafel (110) an das Tragelement (130a); und
Biegen (S4) der Anzeigetafel (110) und eines Schaltungsteils (120) um die Seitenfläche (132) des Tragelements (130a),
wobei der Schaltungsteil (120) als ein COF gebildet ist und der COF ein IC-Element (212) enthält und wobei das Tragelement (130a) einen Aufnahmeteil (133a) zum Aufnehmen des IC-Elements (122) enthält, wobei das Tragelement (130a) einen Isolator (134) enthält, der auf einer inneren Fläche des Aufnahmeteils (133a) gebildet ist, um eine Übertragung elektromagnetischer Wellen von dem IC-Element 122 auf das Tragelement (130a) zu verhindern, wobei der Aufnahmeteil (133a) in einer Fugenform mit einer Öffnung gegenüber der Anzeigetafel (110) gebildet ist, wodurch ein Teil des Tragelements (130a) zwischen dem IC-Element (122) und der Anzeigetafel (110) angeordnet ist.

6. Verfahren nach Anspruch 5, wobei das Biegen der Anzeigetafel (110) enthält, wahlweise mindestens einen Bereich von nicht aktiven Bereichen der Anzeigetafel (110) zu biegen.

7. Verfahren nach Anspruch 5, wobei das Bilden des Biegeradius an der Seitenfläche (132) des Basistragelements enthält, um die Seitenfläche des Basistragelements so zu schneiden, dass ein aktiver Bereich der Anzeigetafel (110) dem Basistragelement entspricht.

8. Verfahren nach Anspruch 5, wobei das Erstellen (S2) des Tagelements (130a) enthält:

Auftragen eines ersten optisch transparenten Klebers (136) auf eine erste Fläche des Basistragelements (330) vor dem Bilden des Biegeradius an dem Basistragelement;
Auftragen eines zweiten optisch transparenten Klebers (137) auf eine zweite Fläche des Basistragelements, wobei die zweite Fläche der ersten Fläche gegenüberliegt; und
Anbringen von Schutzschichten (138a, 138b) jeweils an den ersten und den zweiten optisch transparenten Kleber (136, 137).

9. Verfahren nach Anspruch 8, das ferner Folgendes umfasst:

Entfernen des Schutzfilms (138a), der an dem ersten optisch transparenten Kleber (136) angebracht ist, nach dem Schneiden um die Seitenfläche des Basistragelements; und
Entfernen des Schutzfilms (138b), der an dem zweiten optisch transparenten Kleber (137) angebracht ist,
wobei das Koppeln der Anzeigetafel (110) an das Tragelement (130a) enthält, die Anzeigetafel (110) an den ersten optisch transparenten Kleber (136) zu koppeln.

10. Verfahren nach Anspruch 5, das ferner Folgendes umfasst:
Koppeln eines optisch polarisierenden Elements (113) an die Anzeigetafel (110) nach dem Koppeln der Anzeigetafel (110) an das Tragelement (130a).

Revendications

1. Dispositif d'affichage souple comprenant :

un panneau d'affichage (110) incluant un substrat en plastique où une diode électroluminescente organique et un transistor à film mince sont formés ;
une portion de circuit (120) appliquant un signal

de puissance et un signal de données, qui sont fournis depuis une portion externe, au panneau d'affichage (110) ; et
un organe de support (130a) couplé au substrat en plastique, le panneau d'affichage (110) et la portion de circuit (120) étant pliés autour de l'organe de support (130a),
l'organe de support (130a) inclut une surface plate (131) couplée au substrat en plastique,
la portion de circuit (120) est formée en tant qu'un COF, et le COF inclut un élément IC (122),
caractérisé en ce que
l'organe de support (130a) inclut une surface latérale (132) avec une surface arrondie extérieure ayant un rayon de courbure constant, et l'organe de support (130a) inclut une portion de logement (133a) logeant l'élément IC (122), dans lequel l'organe de support (130a) inclut un isolant (134) formé sur une surface intérieure de la portion de logement (133a) pour empêcher tout transfert d'ondes électromagnétiques de l'élément IC (122) à l'organe de support (130a), la portion de logement (133a) étant formée dans une forme de rainure ayant une ouverture à l'opposé du panneau d'affichage (110), de telle manière qu'une partie de l'organe de support (130a) soit disposée entre l'élément IC (122) et le panneau d'affichage (110).

2. Dispositif selon la revendication 1, dans lequel l'organe de support (130a) est constitué de l'un de SUS, Mg, caoutchouc, graphène, téflon, PDMS, uréthane, et films de PVC.

3. Dispositif selon la revendication 1, dans lequel un rapport du rayon de courbure sur une épaisseur de l'organe de support (130a) est entre 0,5 et 0,8.

4. Dispositif selon la revendication 1, comprenant en outre :
un adhésif optiquement transparent (136) entre le substrat en plastique et l'organe de support (130a).

5. Procédé de fabrication d'un dispositif d'affichage souple selon la revendication 1, le procédé comprenant :

la préparation (S1) d'un panneau d'affichage (110) incluant un substrat en plastique sur lequel une diode électroluminescente organique et un transistor à film mince sont formés ;
la préparation (S2) d'un organe de support (130a) incluant la formation d'un rayon de courbure constant à une surface latérale d'un organe de support de base (330) ;
le couplage (S3) du panneau d'affichage (110) à l'organe de support (130a) ; et
le pliage (S4) du panneau d'affichage (110) et d'une portion de circuit (120) autour de la surface latérale (132) de l'organe de support (130a), dans lequel la portion de circuit (120) est formée en tant qu'un COF, et le COF inclut un élément IC (122), et dans lequel l'organe de support (130a) inclut une portion de logement (133a) pour loger l'élément IC (122), dans lequel l'organe de support (130a) inclut un isolant (134) formé sur une surface intérieure de la portion de logement (133a) pour empêcher tout transfert d'ondes électromagnétiques de l'élément IC (122) à l'organe de support (130a), la portion de logement (133a) étant formée dans une forme de rainure ayant une ouverture à l'opposé du panneau d'affichage (110), de telle manière qu'une partie de l'organe de support (130a) soit disposée entre l'élément IC (122) et le panneau d'affichage (110).

6. Procédé selon la revendication 5, dans lequel le pliage du panneau d'affichage (110) inclut le pliage sélectif d'au moins une zone de zones non actives du panneau d'affichage (110).

7. Procédé selon la revendication 5, dans lequel la formation du rayon de courbure à la surface latérale (132) de l'organe de support de base inclut le découpage autour de la surface latérale de l'organe de support de base de sorte qu'une zone active du panneau d'affichage (110) corresponde à l'organe de support de base.

8. Procédé selon la revendication 5, dans lequel la préparation (S2) de l'organe de support (30a) inclut :

le revêtement d'un premier adhésif optiquement transparent (136) sur une première surface de l'organe de support de base (330) avant la formation du rayon de courbure à l'organe de support de base ;
le revêtement d'un deuxième adhésif optiquement transparent (137) sur une deuxième surface de l'organe de support de base, la deuxième surface étant à l'opposé de la première surface ; et
l'attachement de films protecteurs (138a, 138b) respectivement aux premier et deuxième adhésifs optiquement transparents (136, 137).

9. Procédé selon la revendication 8, comprenant en outre :

l'enlèvement du film protecteur (138a) attaché au premier adhésif optiquement transparent (136) après le découpage autour de la surface latérale de l'organe de support de base ; et
l'enlèvement du film protecteur (138b) attaché au deuxième adhésif optiquement transparent

(137),
dans lequel le couplage du panneau d'affichage (110) à l'organe de support (130a) inclut le couplage du panneau d'affichage (110) au premier adhésif optiquement transparent (136).

10. Procédé selon la revendication 5, comprenant en outre :
le couplage d'un organe de polarisation optique (113) au panneau d'affichage (110) après le couplage du panneau d'affichage (110) à l'organe de support (130a) .

FIG. 1
PRIOR ART

FIG. 2

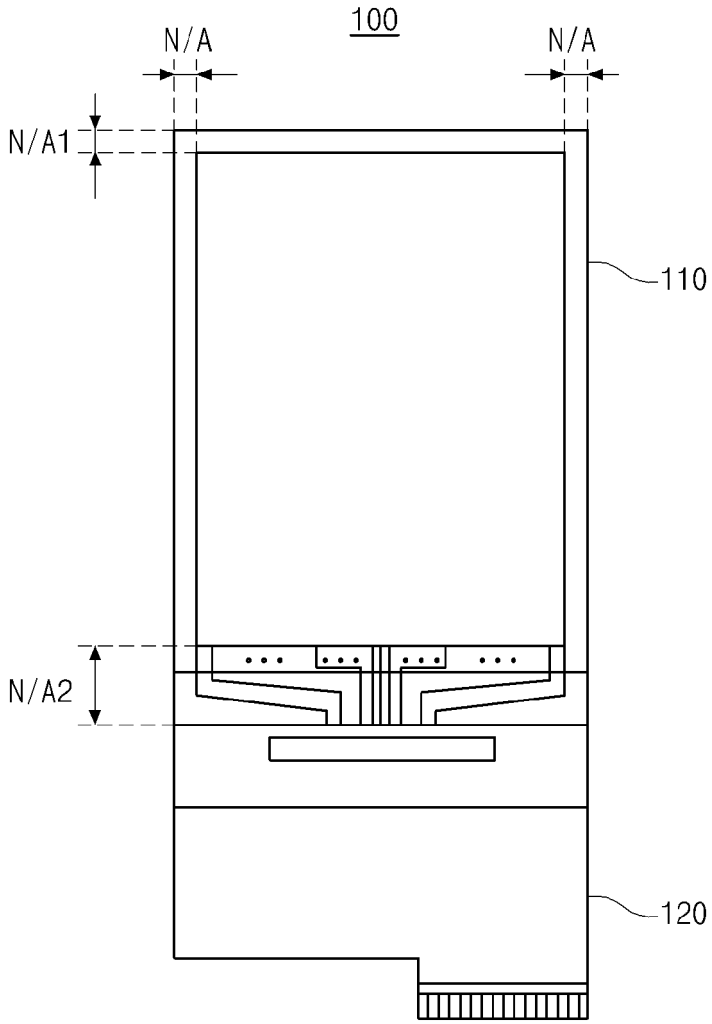


FIG. 3

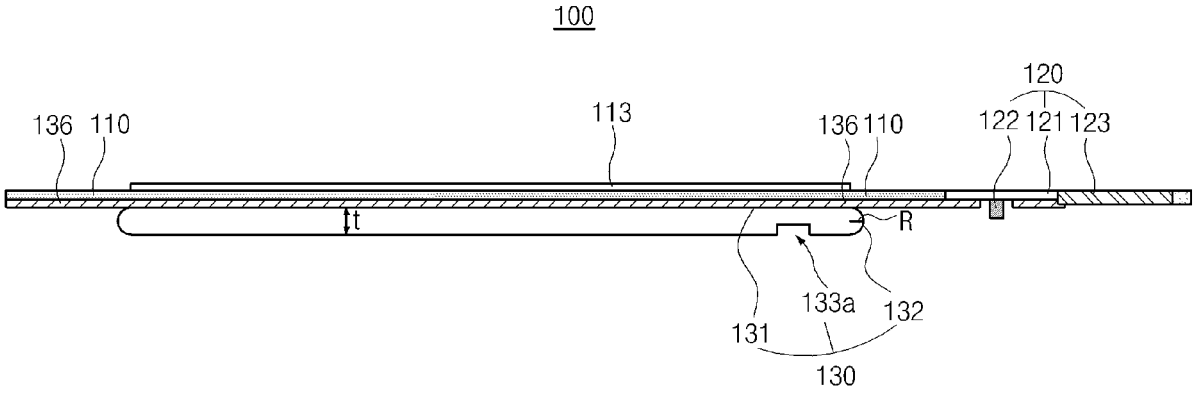


FIG. 4A

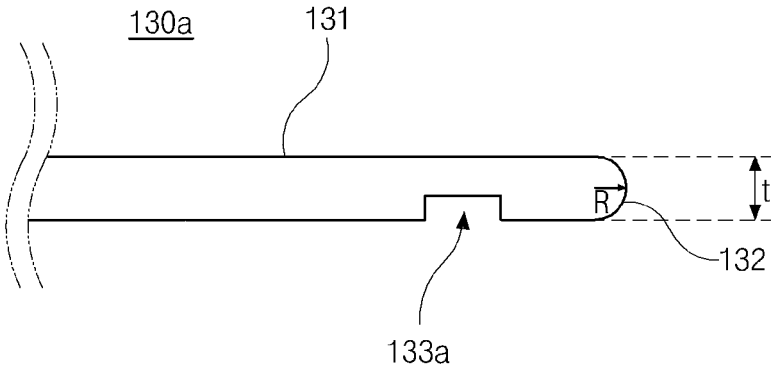


FIG. 4B

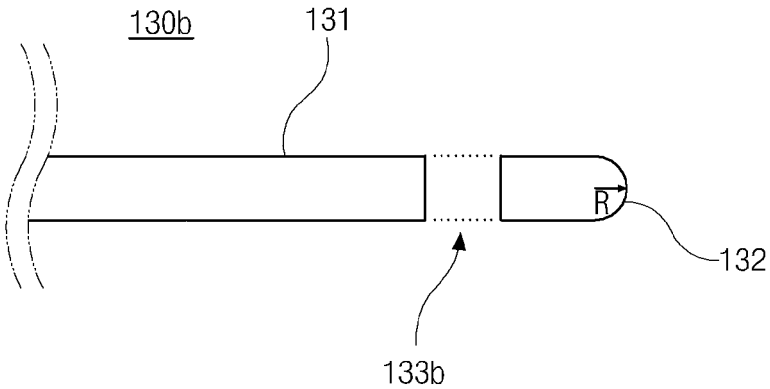


FIG. 4C

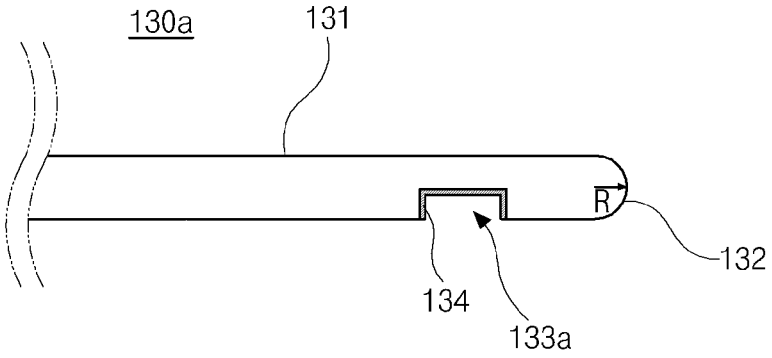


FIG. 4D

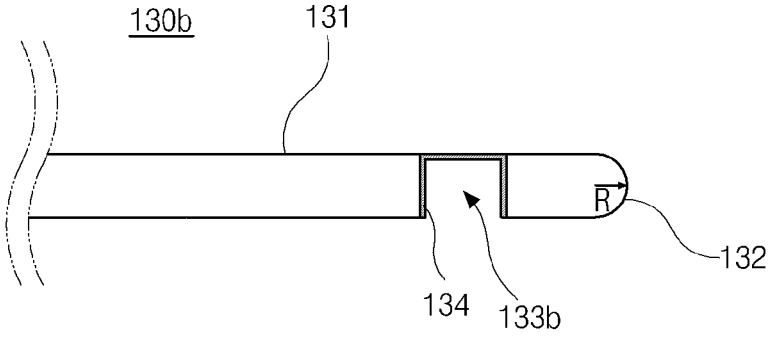


FIG. 5

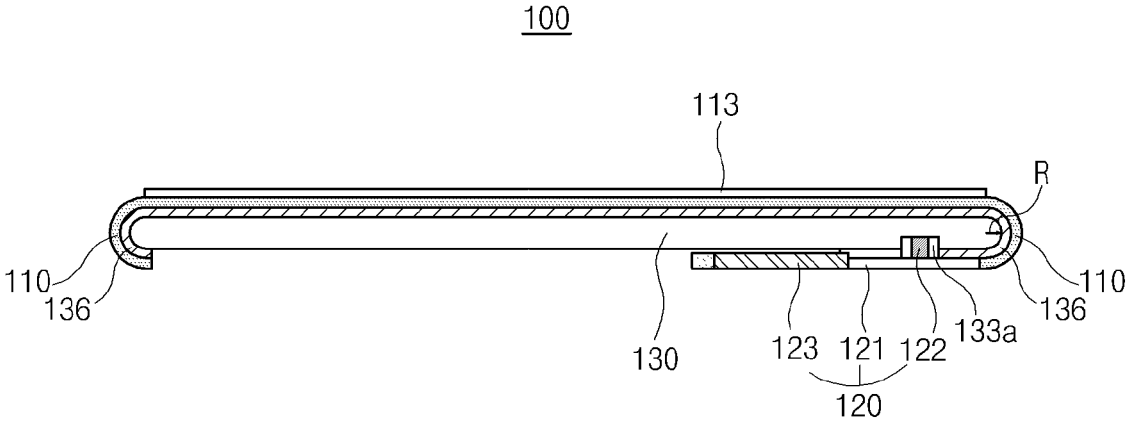


FIG. 6

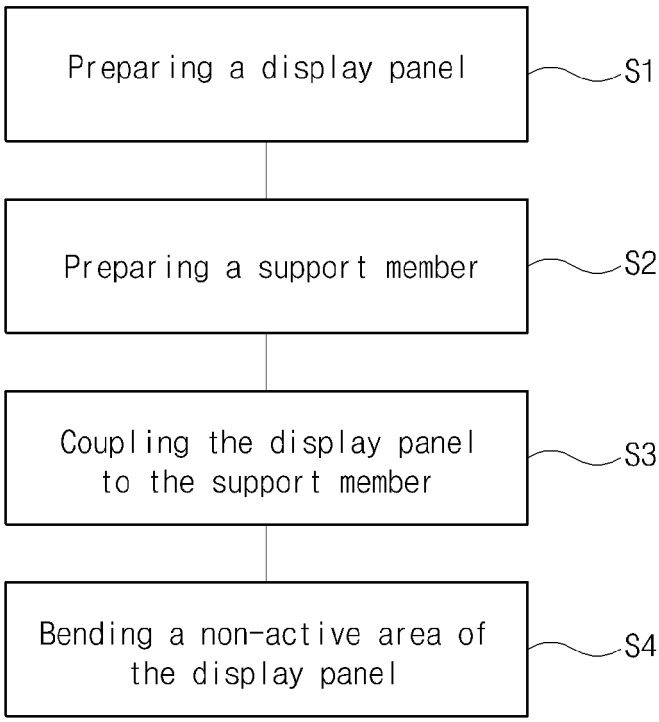


FIG. 7A

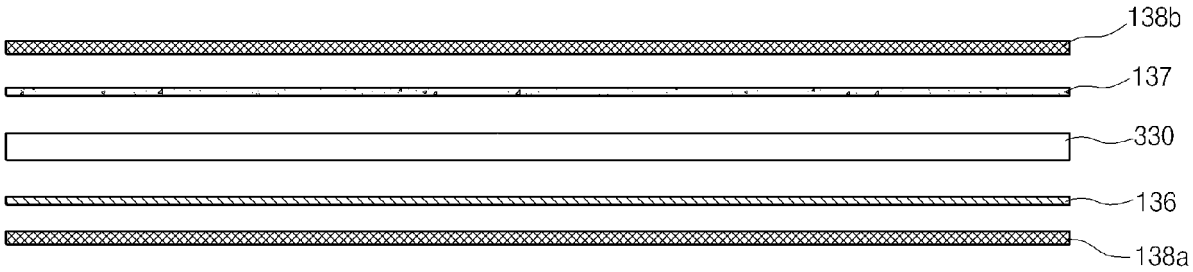


FIG. 7B

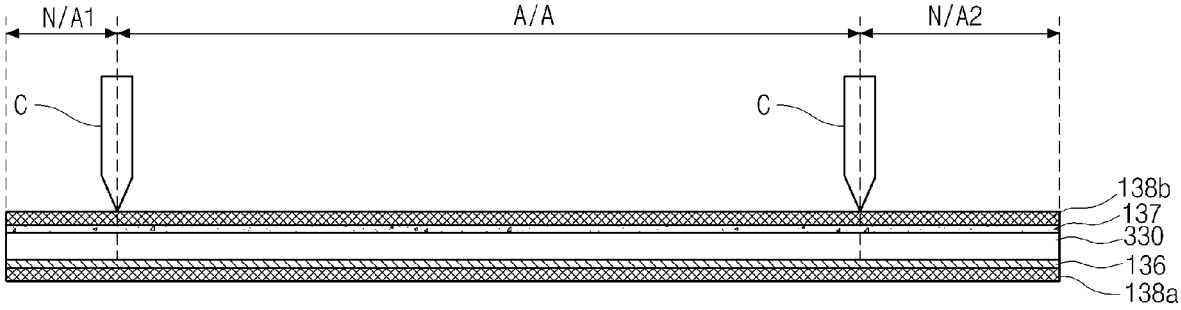


FIG. 7C

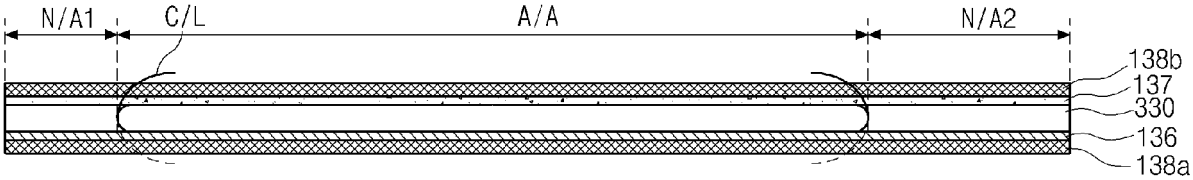


FIG. 7D

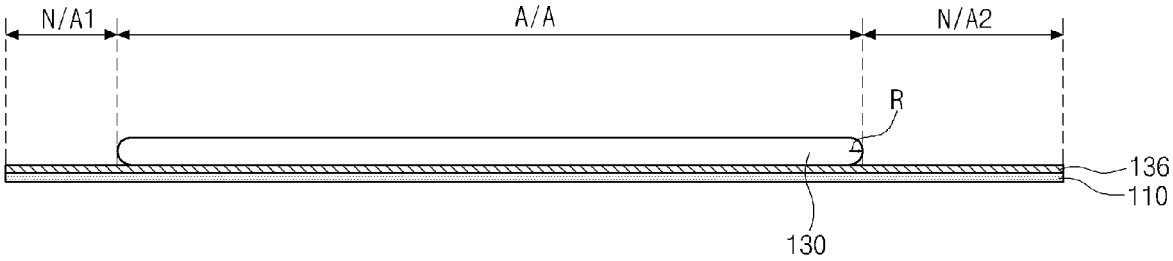


FIG. 7E

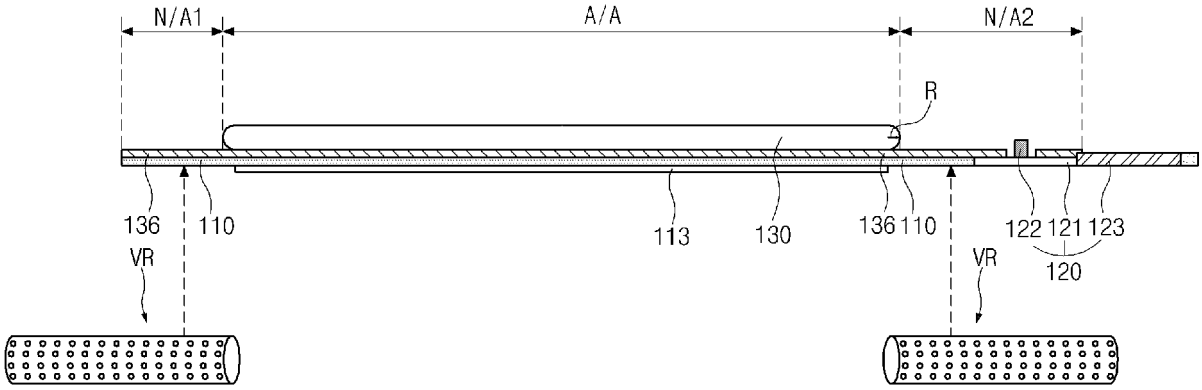


FIG. 7F

100

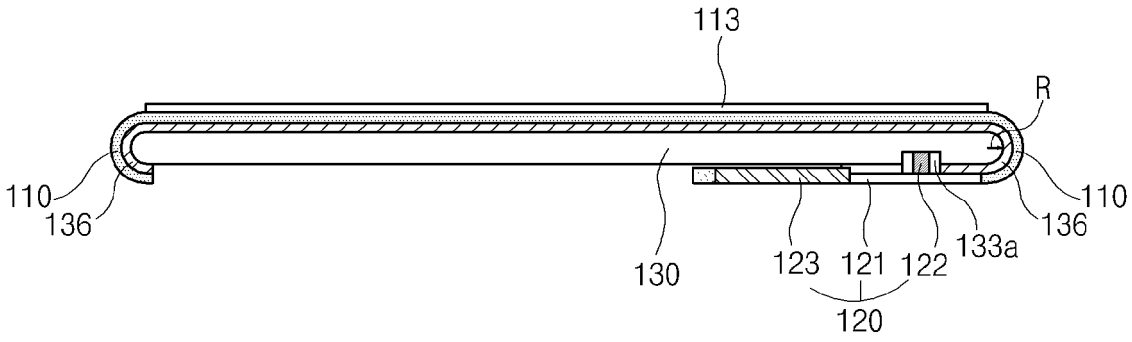


FIG. 8

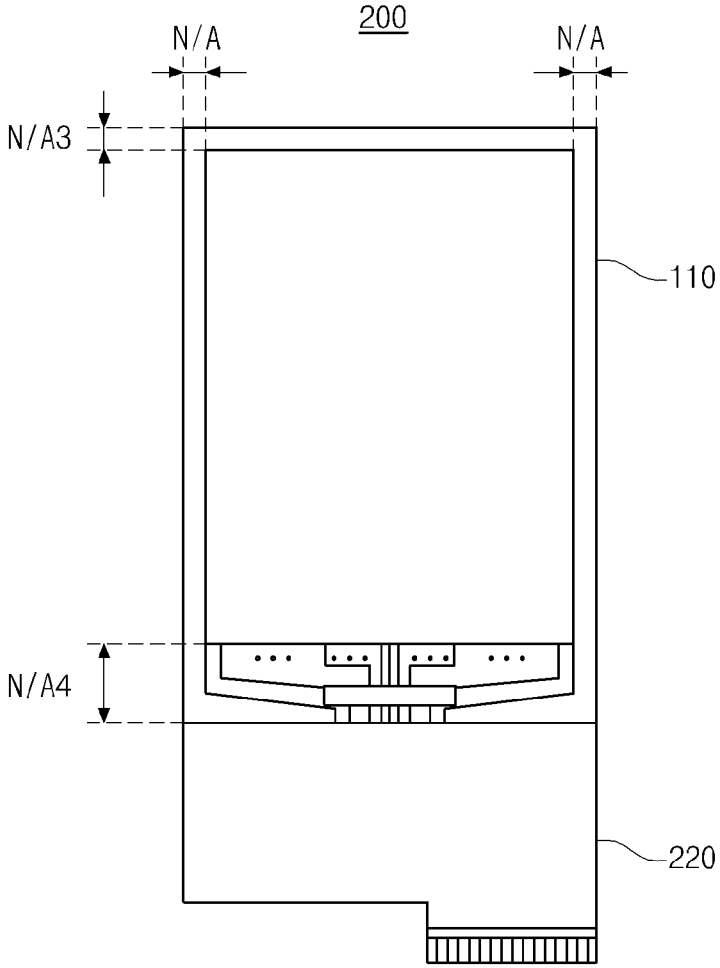


FIG. 9

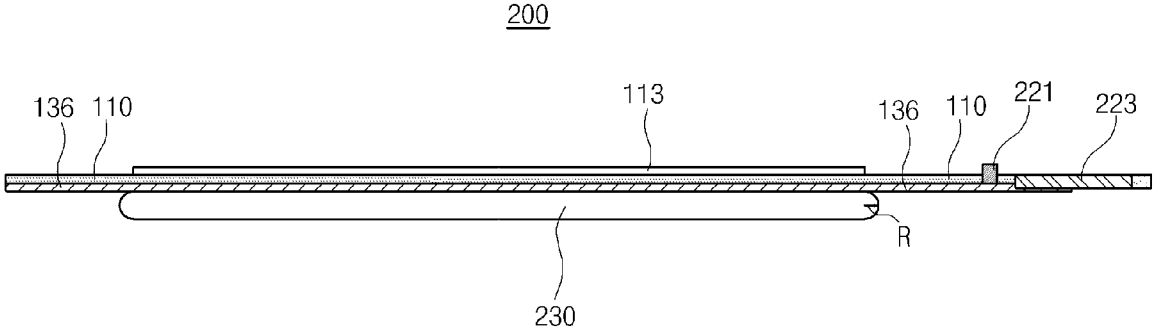


FIG. 10

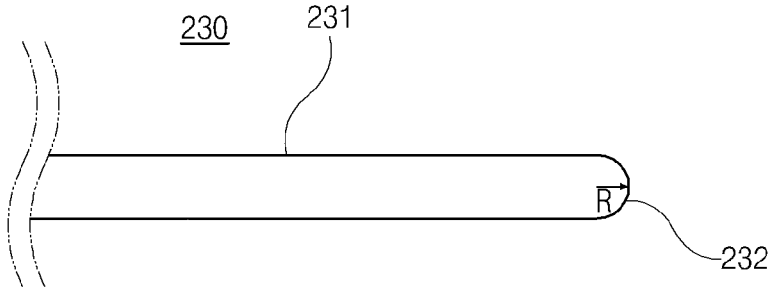
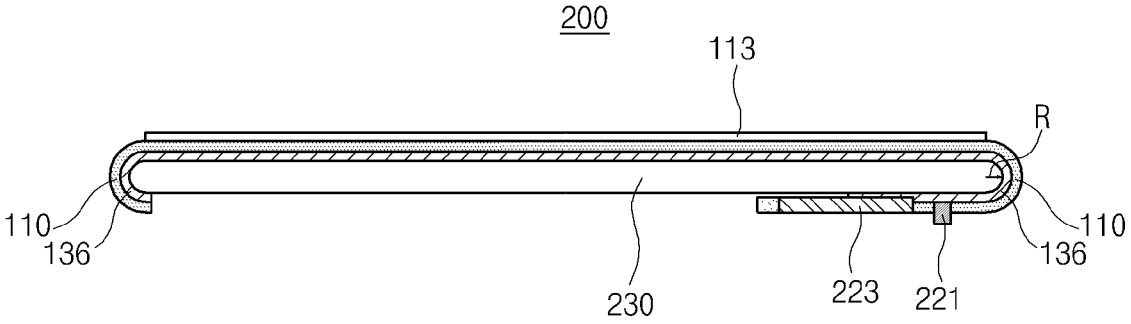


FIG. 11



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2011050657 A1 **[0014]**
- EP 1933196 A2 **[0015]**
- KR 101190630 B1 **[0016]**

专利名称(译)	柔性显示装置及其制造方法		
公开(公告)号	EP2827372B1	公开(公告)日	2019-09-11
申请号	EP2014173390	申请日	2014-06-23
[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	KIM JONG MOO YOO JUHN SUK		
发明人	KIM, JONG-MOO YOO, JUHN-SUK		
IPC分类号	H01L27/32		
CPC分类号	G09F9/301 H01L27/3276 H01L51/0097 H01L51/5281 H01L2251/5338 Y02E10/549 H01L51/56 H01L51/5293		
优先权	1020130085412 2013-07-19 KR		
其他公开文献	EP2827372A2 EP2827372A3		
外部链接	Espacenet		

摘要(译)

一种柔性显示装置（100），包括显示面板（110），所述显示面板包括塑料基板，所述塑料基板形成有机发光二极管和薄膜晶体管;电路部分（120），将从外部提供的电源信号和数据信号施加到显示面板（110）;连接到塑料基板的支撑构件（130），其中显示面板（110）和电路部分（120）围绕支撑构件（130）弯曲。

FIG. 1
PRIOR ART

FIG. 2