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

(11) **EP 2 471 341 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
27.03.2019 Bulletin 2019/13

(21) Application number: **10749796.8**

(22) Date of filing: **27.08.2010**

(51) Int Cl.:
H05B 33/04 *(2006.01)* ***B32B 17/10*** *(2006.01)*
B32B 27/06 *(2006.01)* ***B42D 15/00*** *(2006.01)*
B42D 25/465 *(2014.01)* ***G06K 19/067*** *(2006.01)*
G07D 7/00 *(2016.01)* ***H01L 51/52*** *(2006.01)*

(86) International application number:
PCT/EP2010/005274

(87) International publication number:
WO 2011/023397 (03.03.2011 Gazette 2011/09)

(54) DEVICE COMPRISING AN ORGANIC LIGHT EMITTING DISPLAY

VORRICHTUNG, DIE EINE OLED-ANZEIGE ENTHÄLT

DISPOSITIF COMPRENANT UN PANNEAU D'AFFICHAGE ÉLECTROLUMINESCENT ORGANIQUE

(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 SE SI SK SM TR

(30) Priority: **29.08.2009 DE 102009038904**

(43) Date of publication of application:
04.07.2012 Bulletin 2012/27

(73) Proprietors:
- **Bundesdruckerei GmbH**
  10969 Berlin (DE)
- **Samsung Display Co., Ltd.**
  Gyeonggi-do (KR)

(72) Inventors:
- **FISCHER, Jörg**
  13053 Berlin (DE)
- **MUTH, Oliver**
  12277 Berlin (DE)
- **PAESCHKE, Manfred**
  16348 Wandlitz OT Basdorf (DE)
- **HAGEMANN, Michael**
  13465 Berlin (DE)
- **KIM, SungChul**
  Ansan-si
  Gyoenggi-do 425-180 (KR)
- **LEE, JongHyuk**
  Seocho-gu
  Seoul 137-070 (KR)
- **HAN, DongWon**
  Kangseo-gu
  Seoul 157-864 (KR)
- **KWACK, JinHo**
  Gyeonggi-do (KR)
- **LEE, JaeHo**
  Gyeonggi-do (KR)
- **KANG, DongHun**
  Suwon-si
  Gyoenggi-do 441-400 (KR)
- **SHIN, DaeBeom**
  Geochang-gun
  Kyoengnam 670-822 (KR)
- **KIM, HyoJin**
  Gyeonggi-do (KR)

(74) Representative: **Jungblut, Bernhard Jakob et al**
Jungblut & Seuss
Patentanwälte
Max-Dohrn-Strasse 10
10589 Berlin (DE)

(56) References cited:
EP-A1- 2 130 672
EP-A2- 1 439 741
WO-A1-2005/110741
DE-A1- 19 959 084
DE-A1-102006 030 406
US-A- 3 881 043
US-A1- 2002 155 302
US-A1- 2003 015 123
US-A1- 2005 236 985
US-A1- 2005 269 943
US-A1- 2007 273 281
US-A1- 2008 035 736
US-A1- 2010 159 221
US-B1- 6 281 525
US-B1- 6 815 070

EP 2 471 341 B1

Description

Field of the invention

[0001] The invention relates to sandwich structures comprising Organic Light Emitting Displays (OLED), wherein the opposite outer surfaces of said OLED consist of a sealing or barrier layer e.g. consisting of a glass material. The invention further relates to devices comprising such sandwich structures and processes for manufacturing such sandwich structures and devices.

Background of the invention

[0002] OLEDs and displays comprising OLEDs have become increasingly interesting for display purposes, in particular for small devices, like hand held devices, including value and security documents, because they may be produced as very thin layers. Additionally, OLED displays may be flexible (sometimes called FOLEDs for Flexible Organic Light Emitting Diode) due to the fact that they can be made from films of organic materials on flexible substrates, including flexible drive circuits, thus being capable to be adapted to non-plane surfaces and/or incorporated into structures, which themselves need to have flexible properties, like bank notes (bills) and the like. Furthermore, the efficiency is higher, as compared e.g. to Liquid Crystal Displays (LCD) due to the fact that they actively emit light by way of luminescence, whereas LCDs typically need background illumination. Furthermore, OLEDs have very small response times, 0,01 ms and less, compared with LCDs (about 2 ms). Finally, OLEDs and displays with pixels made of OLEDs may be produced in a very simple manner, e.g. using conventional printing techniques. OLEDs typically comprise an anode, a conductive layer, an emissive layer and a cathode, wherein at least the layer(s) adjacent to one side of the emissive layer is transparent or semi-transparent. Often the anode material is Indium tin oxide, which is sufficiently transparent. Drive circuits as used for active matrix displays are, for example made of low temperature polysilicon.

[0003] However, one problem is the sensitivity of the OLED materials to oxygen and/or moisture resulting in rather low lifetimes. This may e.g. be handled by placing the actual OLED components between two glass layers, which are essentially free of oxygen and/or vapor diffusion. Another possibility is to use OLED display on glass substrate with a barrier layer. These barrier layers e.g. can be build up of Silicon-Oxides (SiO_2), (Boro-)Silicates, aluminates (Al_2O_3) or metal layer (Al, Ag, Au, Rh) or other corresponding materials. Such OLED structures or devices remain flexible, provided that the glass layers have a thickness below certain limits. Typically, OLEDs comprising glass layers and having a thickness of 100 μm or less still have the required flexibility for most purposes. But such thin glass layers, i.e. below 50 μm, or even below 20 μm, have the problem that they become very fragile and tend to break due to their brittleness. Thus, it is from this aspect desirable to bond such OLEDs to mechanically tough (flexible or non-flexible) substrates for stabilization purposes.

[0004] OLEDs with the above-mentioned structures, however, have the further problem that glass is a material which exhibits rather poor adhesion properties. For example bonding of such a glass armed OLED display to a polymeric substrate or lamination thereof within a stack of polymeric layers leads to poor bonding durability. In particular in case of lamination, delamination readily takes place, which is of particular disadvantage, if the OLED display is integrated into e.g. a value and/or security document, since separation of components of such documents may be utilized for making counterfeits by integration of obtained authentic components into such counterfeits.

[0005] The document WO2005/110741 A1 discloses optical electronic devices, wherein glas and polymeric layers are bonded using adhesives. The document US 6 281 525 B1 discloses adhesives useful for such purposes. Further useful adhesives are disclosed in the documents US2010/0159221, US2002/0155302 and US 3 881 043.

Technical problem of the invention

[0006] The technical problem underlying the instant invention comprises to provide a structure comprising a glass armed OLED or OLED display, which is less fragile, may retain flexibility and has improved durability with respect to monolithic properties.

Summary of the invention and preferred embodiments

[0007] For achieving these objects, the invention teaches the subject matter of claim 1.a

[0008] The phrase OLED in this context includes displays which comprise a matrix of OLEDs and related drive circuits.

[0009] An OLED may, in addition, comprise one or several additional layers arranged between the electrode layers and/or drive circuits and the opposite outer surfaces of glass. Of course, the opposite outer surfaces are constituted by respective outermost layers made of the materials outlined above for the surfaces.

[0010] By providing a bonding layer between the glass material and the layer comprising an organic polymeric material a structure is formed, which is less fragile, but still flexible. Furthermore, the bonding layer ensures that the sandwich structure remains durable and resists delamination.

[0011] The glass material may by any glass material used in the art. It may, in particular be selected from the group consisting of silica glasses, phosphates, borates, chalcogenides, fluorides (fluorozirconates, fluoroaluminates), germanates, antimonates, arsenates, titanates, tantalates, nitrates, carbonates, and blends of such ma-

terials. Preferred, glass materials are silica glasses, which may comprise usual additives like sodium carbonate, calcium oxide, magnesium oxide, aluminum oxide, barium, thorium oxide, lanthanium oxide, cerium(IV) oxide, calumite, sodium sulfate, sodium chloride, and/or antimony oxide and the like.

[0012] The OLED may be of any kind, including polymeric OLEDs or a small molecule OLEDs. The specific structure of the OLEDs employed within the invention is irrelevant and any variant known in the art may be used.

[0013] With respect to durability it is arranged that two of said layers comprising said organic polymer material are provided and one thereof is bonded to a first of said outer surfaces of said OLED, and the other is bonded to a second of said outer surfaces of said OLED, each by a first bonding layer and a second bonding layer. This provides a sandwich structure, which has a polymeric layer on each of its main surfaces. The circumference of the layers comprising the organic polymeric material is larger than the circumference of the OLED, thereby contacting the two layers comprising the organic polymeric material adjacent to all edges of the OLED. This leads to a complete encapsulation of the OLED between the layers comprising the organic polymeric material. Then it is preferred, that the organic polymeric materials of both layers either blend into each other, are solvable in each other, or even react with each other, thus obtaining a tight bond around the edges of the OLED and providing a monolithic structure, which is of even further improved resistance against delamination. This is, in particular provided within the invention because the organic polymer materials covering different outer surfaces of said OLED are the same.

[0014] Said bonding layer may comprise a bonding compound having the structure A-C or A-B-C, wherein A is a group reactive with said glass material, B is a spacer group, and C is a group reactive with said organic polymer material. This provides chemical bonds between the different layers leading to a monolithic structure, which is essentially secure against delamination. Any attempt of delamination for obtaining components from the laminated structure, in particular the OLED, with the purpose of making counterfeits is useless, since this will lead to irreversible damages of the OLED, rendering it useless for the counterfeit.

[0015] The group A is preferably reactive with silica based glass. It may, as an example, be selected from the group of multifunctional silyl-compounds like e.g. trihalidesilyl, and trichlorosilyl.

[0016] The group B, which is not necessarily present, may be a spacer group. This is of advantage for compensating mechanical stress between the polymeric layer and the glass layer due to differences in the thermal expansion coefficients, since the spacer group may impart elasticity to some extent. The spacer group may a C1 to C20 alkyl, - $(CH_2)_n$-, substituted or not substituted, linear or branched in particular methdiyl (methylene), ethdiyl, propdiyl, isopropdiyl, butdieyl or isobutdiyl.

[0017] The group C may, for example, be selected from the group consisting of vinyl, chloride, bromide, iodide, amino, aminoalkyl, aminoalkylamine, aminoalkylalkylamine, mercapto, polysulfide, epoxy, 7-oxabicyclo[4.1.0]heptyl, methacryl, styryl, cyano, isocyano, hydroxy, carboxy, carboxyester, alkylketo, trialkoxysilyl, diakloxyalkylsilyl, and trichlorosilyl. Other groups include -OCN, -NCO, -NCS, -SCN, $-N^{2+}$, S_x, Trifluorsulfate (Triflat, $CF_3SO_3^-$), Toluenesulfate (Tosylat, $C_7H_7SO_3^-$), MethylSulfate (Mesylate, $CH_3SO_3^-$) and -CHO.

[0018] In the sandwich structure the OLED (i.e. including the glass layers) typically has a thickness of less than 100 μm, in particular less than 80 μm, preferably less than 50 μm. The total thickness of the sandwich structure may be in the range from 70 μm to 1000 μm, preferably from 70 μm to 300 μm.

[0019] A specific embodiment of the invention comprises a sandwich structure comprising the following layer structure: a polymer layer, a bonding layer, an OLED, a bonding layer, a polymer layer, wherein both outer opposite surfaces of said OLED consist of a glass material, and both layers provided on the outer opposite surfaces of said OLED comprise an organic polymer material (PC) and are bonded to each other in a stacking manner by an intermediate bonding layer. It is a feature of the invention that two of said layers comprising said organic polymer material are provided and one thereof is bonded to a first of said outer surfaces of said OLED, and the other is bonded to a second of said outer surfaces of said OLED, each by a first bonding layer and a second bonding layer. This provides a sandwich structure, which has a polymeric layer on each of its main surfaces.

[0020] The sandwich structures of use within the invention may be employed in various manners and in various devices. It may be used for manufacturing a display, wherein the sandwich structure is attached to a substrate, integrated into a substrate, or supported on a substrate, and wherein electric contacts of the drive circuits of the OLED are connected to electronic circuits for driving the OLED. Support or attachment on a substrate comprises to fix the sandwich structure either mechanically or by way of adhesives to said substrate, which may be any kind and material and plane or with a curved surface. Integration essentially means lamination into further layers of various materials, preferably organic polymeric materials of the kind outlined above in other context. These materials will at least on one side of the OLED be transparent or semi-transparent.

[0021] Value and/or security documents in particular comprise identity cards, passports, access control cards, visa, tax stamps, tickets, driver licenses, vehicle papers, bills, checks, postal stamps, credit cards, any kind of chip cards, and product labels.

[0022] Within the lamination procedures described above, the elevated temperature preferably is in the range from 20°C to 200°C, preferably from 50°C to 160 °C, in particular from 50°C to 100°C. The elevated pressure typically is in the range from 10 to 400 N/cm^2, pref-

erably from 50 to 100 N/cm^2, e.g., but not limited thereto, in case of elevated temperatures and from 100 to 600 N/cm^2 in the case of non-elevated temperatures, i.e. room temperature in the range from 15°C to 25°C. The period of time employed may be in the range from 1 s to 600 s, preferably from 1 s to 100 s, more preferably from 1 s to 30 s.

[0023] In cases where components are described as comprising materials or other components, they may as well consist thereof as an alternative.

[0024] In the following the invention is described by way of examples and figures.

Figure 1: a sandwich structure useful for the invention, and
Figure 2: a security document showing some features of the invention

[0025] Figure 1 shows a sandwich structure 1 comprising an OLED display 2 with glass surfaces 3, 4 on each side. The OLED display 2 is embedded between two layers 5, 6 comprising or consisting of carboxy-modified PC. Between two bonding layers 7, 8 are evident, which bond the two layers 5, 6 comprising the organic polymeric material to the glass surfaces 3, 4. The bonding layers 7, 8 comprise a reactive component A-B-C, wherein A e.g. is trimethoxysilyl, B e.g. is ethyl, and C e.g. is epoxy. The trimethoxysilyl group has reacted with the glass creating a chemical bond between the glass and the reactive component. The epoxy group has reacted with carboxyl groups of the modified PC creating a chemical bond between the PC layer and the reactive group. As a result, the PC layer and the glass are chemically bonded to each over via the reactive agent and delamination by simple thermal exposure is not longer possible.

[0026] Figure 2 shows a security document 15 comprising a sandwich structure 1 of the invention, in this case a chip card. Evident is a chip 9 comprising electronic circuits, like RFID circuits, processors, memorys, crypto controllers and the like, including drivers for the OLED display 2. The chip 9 is embedded between layers 10, 11, 12, 13, and 14, e.g. made of PC, together with the OLED display 2. The OLED display 2 is electrically contacted with the chip 9 (not shown). One or several of the layers 10, 11, 12, 13, and/or 14 may carry printed images and/or characters, provided that the OLED display 2 may still be viewed at least from one side of the document 15.

Claims

1. Value- and/or security document (15) comprising a sandwich structure(1) comprising:

   an Organic Light Emitting Diode (OLED) (2), wherein both outer opposite surfaces (3, 4) of said OLED (2) consists of a glass material, and one layer (5, 6) provided on each of the outer opposite surfaces of said OLED (2) consisting of glass, wherein said layers (5, 6) comprise polycarbonate as an organic polymer material, wherein said layers (5, 6) comprising polycarbonate and said outer surfaces (3, 4) consisting of glass are bonded to each other in a stacking manner by an intermediate bonding layer (7, 8), wherein said bonding layer (7, 8) comprises a bonding compound having the structure A-C or A-B-C, wherein A is a group reactive with said glass material, B is a spacer group, and C is a group reactive with said organic polymer material, and
   wherein the circumference of the two layers (5, 6) comprising polycarbonate is larger than the circumference of the OLED, thereby contacting the two layers (5, 6) comprising polycarbonate adjacent to all edges of the OLED, and thereby completely encapsulating the OLED between the two layers comprising polycarbonate.

2. Value- and/or security document (15) according to claim 1, wherein the glass material is selected from the group consisting of silica glasses, phosphates, borates, chalcogenides, fluorides (fluorozirconates, fluoroaluminates), germanates, antimonates, arsenates, titanates, tantalates, nitrates, carbonates, and blends of such materials.

3. Value- and/or security document (15) according to one of the claims 1 or 2, wherein the OLED (2) is a polymeric OLED or a small molecule OLED.

4. Value- and/or security document (15) according to one of the claims 1 to 3, wherein the group A is reactive with silica based glass, preferably being selected from the group consisting of trihalidesilyl and trichlorosilyl, and wherein the group B is a spacer group, preferably is a C1 to C20 alkandiyl, substituted or not substituted, in particular methdiyl (methylene), ethdiyl, propdiyl, isopropdiyl, butdiyl or isobutdiyl and wherein the group C is selected from the group consisting of vinyl, fluoride, chloride, bromide, iodide, amino, aminoalkyl, aminoalkylamine, aminoalkylalkylamine, mercapto, polysulfide, epoxy, 7-oxabicyclo[4.1.0]heptyl, methacryl, styryl, cyano, isocyano, hydroxy, carboxy, carboxyester, alkylketo, trialkoxysilyl, dialkoxyalkylsilyl, and trichlorosilyl.

5. Value- and/or security document (15) according to one of the claims 1 to 4, wherein said OLED (2) has a thickness of less than 100 μm, in particular less than 80 μm, preferably less than 50 μm.

6. Value- and/or security document (15) according to one of the claims 1 to 5, wherein the total thickness of the sandwich structure is in the range from 70 μm to 1000 μm, preferably from 70 μm to 300 μm.

Patentansprüche

1. Wert- und/oder Sicherheitsdokument (15), umfassend eine Sandwichstruktur (1), die Folgendes umfasst:

   eine Organic Light Emitting Diode (OLED) (2), wobei beide entgegengesetzten Außenflächen (3, 4) der OLED (2) aus einem Glasmaterial bestehen, und
   eine auf jeder der aus Glas bestehenden, entgegengesetzten Außenflächen der OLED (2) vorgesehene Schicht (5, 6), wobei die Schichten (5, 6) Polycarbonat als organisches Polymermaterial umfassen,
   wobei die Polycarbonat umfassenden Schichten (5, 6) und die aus Glas bestehenden Außenflächen (3, 4) miteinander in einer gestapelten Weise durch eine zwischenliegende Verbindungsschicht (7, 8) verbunden sind,
   wobei die Verbindungsschicht (7, 8) eine Verbindungszusammensetzung mit der Struktur A-C oder A-B-C umfasst, wobei A eine mit dem Glasmaterial reaktive Gruppe ist, B eine Abstandshaltergruppe ist, und C eine mit dem organischen Polymermaterial reaktive Gruppe ist, und
   wobei der Umfang der beiden Polycarbonat umfassenden Schichten (5, 6) größer ist als der Umfang der OLED, wodurch die beiden Polycarbonat umfassenden Schichten (5, 6) benachbart zu allen Kanten der OLED kontaktieren, und wodurch die OLED vollständig zwischen den beiden Polycarbonat umfassenden Schichten eingekapselt ist.

2. Wert- und/oder Sicherheitsdokument (15) nach Anspruch 1, wobei das Glasmaterial ausgewählt ist aus der Gruppe bestehend aus Kieselgläsern, Phosphaten, Boraten, Chalcogeniden, Fluoriden (Fluorzirconaten, Fluoraluminaten), Germanaten, Antimonaten, Arsenaten, Titanaten, Tantalaten, Nitraten, Carbonaten und Mischungen derartiger Materialien.

3. Wert- und/oder Sicherheitsdokument (15) nach einem der Ansprüche 1 oder 2, wobei die OLED (2) eine polymere OLED oder eine Kleinmolekül-OLED ist.

4. Wert- und/oder Sicherheitsdokument (15) nach einem der Ansprüche 1 bis 3, wobei die Gruppe A mit Glas auf Basis von Siliciumdioxid reaktiv ist, bevorzugt ausgewählt aus der Gruppe bestehend aus Trihalidesilyl und Trichlorosilyl, und wobei die Gruppe B eine Abstandshaltergruppe ist, bevorzugt ein C1- bis C20-Alkandiyl, substituiert oder nicht substituiert, insbesondere Methdiyl (Methylen), Ethdiyl, Propdiyl, Isopropdiyl, Butdiyl oder Isobutdiyl und wobei die Gruppe C ausgewählt ist aus der Gruppe bestehend aus Vinyl, Fluorid, Chlorid, Bromid, Iodid, Amino, Aminoalkyl, Aminoalkylamin, Aminoalkylalkylamin, Mercapto, Polysulfid, Epoxy, 7-Oxabicyclo[4.1.0]heptyl, Methacryl, Styryl, Cyano, Isocyano, Hydroxy, Carboxy, Carboxyester, Alkylketo, Trialkoxysilyl, Dialkoxyalkylsilyl und Trichlorosilyl.

5. Wert- und/oder Sicherheitsdokument (15) nach einem der Ansprüche 1 bis 4, wobei die OLED (2) eine Dicke von weniger als 100 μm aufweist, insbesondere weniger als 80 μm, bevorzugt weniger als 50 μm.

6. Wert- und/oder Sicherheitsdokument (15) nach einem der Ansprüche 1 bis 5, wobei die Gesamtdicke der Sandwichstruktur in dem Bereich von 70 μm bis 1000 μm liegt, bevorzugt von 70 μm bis 300 μm.

Revendications

1. Document de valeur et/ou de sécurité (15) comportant une structure sandwich (1), comprenant:

   une diode d'émission lumineuse organique (OLED) (2), les deux surfaces extérieures opposées (3, 4) de l'OLED (2) consistant en un matériau de verre, et
   une couche (5, 6) prévue sur chacune des surfaces extérieures opposées de l'OLED (2) consistant en verre, les couches (5, 6) comprenant du polycarbonate comme matériau organique polymérique,
   dans lequel les couches (5, 6) comprenant du polycarbonate et les surfaces extérieures (3, 4) consistant en verre sont liées les unes aux autres d'une façon empilée par une couche de liaison intermédiaire (7, 8),
   dans lequel la couche de liaison (7, 8) comprend un composé de liaison ayant la structure A-C ou A-B-C, dans lequel A est un groupe réactif avec le matériau de verre, B est un groupe espaceur, et C est un groupe réactif avec le matériau organique polymérique, et
   dans lequel la circonférence des deux couches (5, 6) comprenant du polycarbonate est supérieure à la circonférence de l'OLED, donc contactant les deux couches (5, 6) comprenant du polycarbonate voisines à tous les bords de l'OLED, et donc complètement encapsulant l'OLED entre les deux couches comprenant du polycarbonate.

2. Document de valeur et/ou de sécurité (15) selon la revendication 1, dans lequel le matériau de verre est choisi à partir du groupe consistant en des verres de silice, phosphates, borates, chalcogénides, fluori-

des (fluorozirconates, fluoroaluminates), germanates, antimonates, arsénates, titanates, tantalates, nitrates, carbonates, et mélanges de tels matériaux.

3. Document de valeur et/ou de sécurité (15) selon une des revendications 1 ou 2, dans lequel l'OLED (2) est une OLED polymérique ou une OLED à petite molécule.

4. Document de valeur et/ou de sécurité (15) selon une des revendications 1 à 3, dans lequel le groupe A est réactif avec du verre sur la base de silice, de préférence choisi à partir du groupe consistant en trihalidesilyle et trichlorosilyle, et dans lequel le groupe B est un groupe espaceur, de préférence alkandiyle en C1 à C20, substitué ou non substitué, en particulier méthdiyle (méthylène}, éthdiyle, propdiyle, isopropdiyle, butdiyle ou isobutdiyle et dans lequel le groupe C est choisi à partir du groupe consistant en vinyle, fluoride, chloride, bromide, iodide, amino, aminoalkyle, aminoalkylamine, aminoalkylalkylamine, mercapto, polysulfide, époxy, 7-oxabicyclo[4.1.0]heptyle, méthacryle, styryle, cyano, isocyano, hydroxy, carboxy, carboxyester, alkylkéto, trialkoxysilyle, dialkoxyalkylsilyle et trichlorosilyle.

5. Document de valeur et/ou de sécurité (15) selon une des revendications 1 à 4, dans lequel l'OLED (2) a une épaisseur inférieure à 100 μm, en particulier inférieure à 80 μm, de préférence inférieure à 50 μm.

6. Document de valeur et/ou de sécurité (15) selon une des revendications 1 à 5, dans lequel l'épaisseur totale de la structure sandwich est comprise dans la gamme entre 70 μm et 1000 μm, de préférence entre 70 μm et 300 μm.

FIG.1

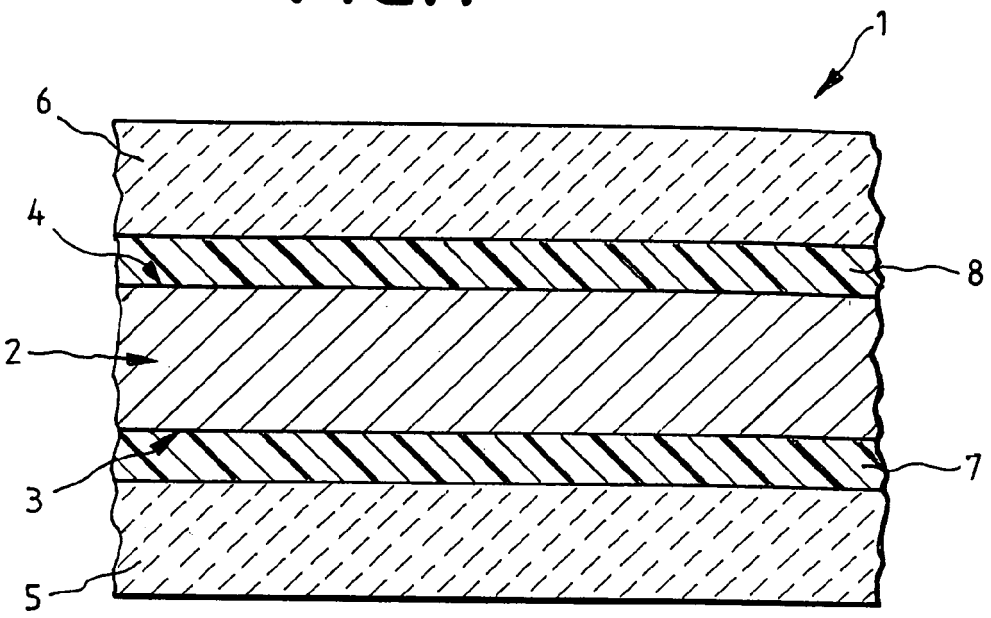
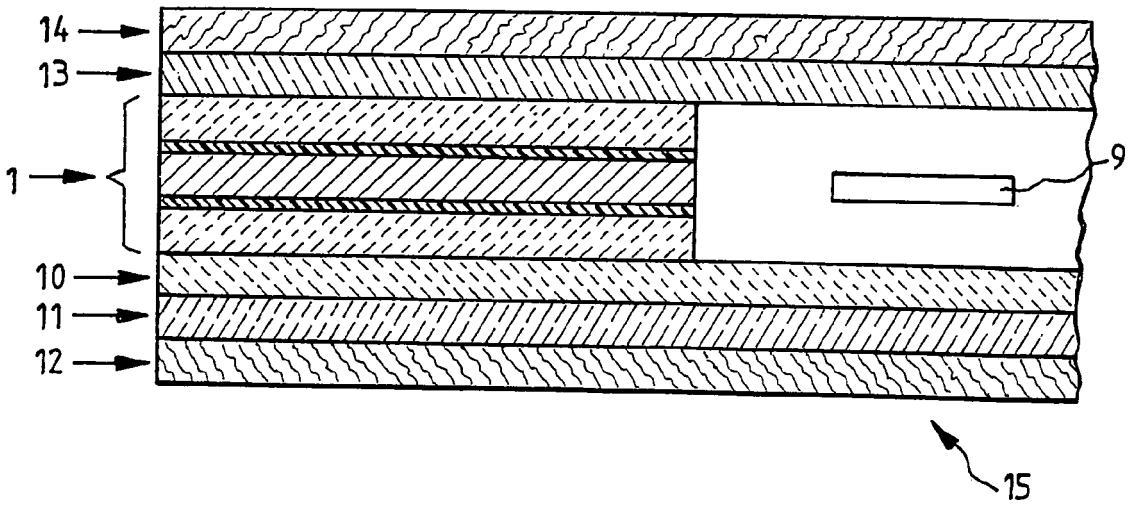


FIG.2



REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- WO 2005110741 A1 **[0005]**
- US 6281525 B1 **[0005]**
- US 20100159221 A **[0005]**
- US 20020155302 A **[0005]**
- US 3881043 A **[0005]**

专利名称(译)	包括有机发光显示器的装置		
公开(公告)号	EP2471341B1	公开(公告)日	2019-03-27
申请号	EP2010749796	申请日	2010-08-27
[标]申请(专利权)人(译)	联邦印刷有限公司 三星MOBLE显示		
申请(专利权)人(译)	Bundesdruckerei股份有限公司 三星移动显示有限公司		
当前申请(专利权)人(译)	Bundesdruckerei股份有限公司 三星DISPLAY CO.，LTD.		
[标]发明人	FISCHER JORG MUTH OLIVER PAESCHKE MANFRED HAGEMANN MICHAEL KIM SUNGCHUL LEE JONGHYUK HAN DONGWON KWACK JINHO LEE JAEHO KANG DONGHUN SHIN DAEBEOM KIM HYOJIN		
发明人	FISCHER, JÖRG MUTH, OLIVER PAESCHKE, MANFRED HAGEMANN, MICHAEL KIM, SUNGCHUL LEE, JONGHYUK HAN, DONGWON KWACK, JINHO LEE, JAEHO KANG, DONGHUN SHIN, DAEBEOM KIM, HYOJIN		
IPC分类号	H05B33/04 B32B17/10 B32B27/06 B42D15/00 B42D25/465 G06K19/067 G07D7/00 H01L51/52		
CPC分类号	B32B17/10073 B32B17/1077 B32B27/06 B42D25/00 B42D25/45 B42D25/465 B42D2033/44 B42D2033/46 C09K11/06 C09K2211/14 H01L51/524 H01L51/5256 H05B33/10		
优先权	102009038904 2009-08-29 DE		
其他公开文献	EP2471341A1		
外部链接	Espacenet		

摘要(译)

本发明涉及一种夹层结构（1），包括柔性有机发光二极管（OLED）（2），其中所述OLED（2）的相对的外表面（3,4）由玻璃材料和至少一个构成。层（5,6）设置在所述OLED（2）的至少一个所述外表面（3,4）上并包含有机聚合物材料，其中所述层（5,6）包括有机聚合物材料和所述外表面由玻璃构成的（3,4）通过粘合层（7,8）以堆叠方式彼此粘合。

FIG.1

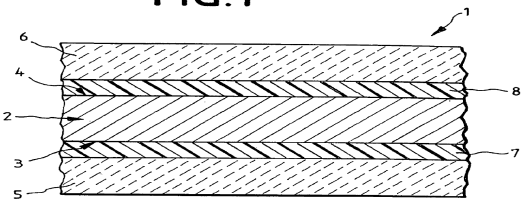


FIG.2