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(54) **LIGHT-EMITTING DISPLAY PANEL AND MANUFACTURING METHOD THEREFOR**

(57) Embodiments of the invention disclose a light emitting display panel. The light emitting display panel comprises a cover plate, a substrate disposed opposite to each other, a plurality of light emitting devices located between the cover plate and the substrate, and a packaging structure surrounding the light emitting devices. The packaging structure comprises at least three rows of protruded frames and a first packaging material which is located between adjacent protruded frames, wherein four sides of each of the protruded frames are looped and the at least three rows of protruded frames are adjacent to and embedded in each other in an inward and outward direction. Adjacent ones of the at least three rows of protruded frames are alternately disposed on the cover plate and the substrate and protrude in opposite directions, and non-adjacent ones of the at least three rows of protruded frames are disposed on the same one of the cover plate and the substrate and protrude in the same direction. In the above light emitting display panel, resin adhesive or desiccant is filled in gaps between the frames so as to prolong an invasion path by water vapor and oxygen gas spatially, an effect of preventing water vapor and oxygen gas is thus increased. The light emitting display panel has advantages of good sealing property, simple manufacturing process and the like.

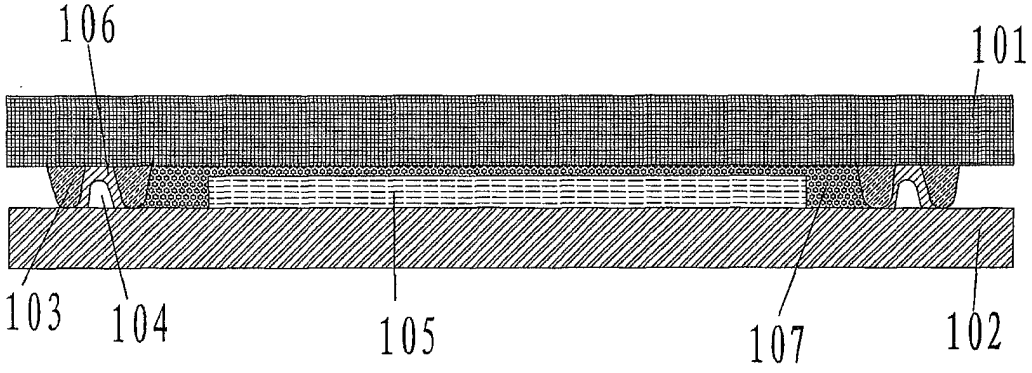

FIG.1

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] Embodiments of the present invention relate to a technical field of electronic components, in particular, to a light emitting display panel and a manufacturing method thereof.

Description of the Related Art

[0002] An OLED device is an electroluminescent device that is formed by an organic semiconductor material and a luminous material and is caused to emit light through injection and recombination of carriers upon it being driven by an electric field. OLED devices have many advantages and possess bright prospects in the field of display. OLED devices are very sensitive to water vapor and oxygen gas, and water vapor and oxygen gas that permeate into the OLED devices are main factors that reduce lifetime of the OLED devices. Thus, OLED devices are usually packaged by a packaging structure so as to prevent the water vapor and oxygen gas from permeating.

[0003] In the prior art, a common packaging structure is to package the OLED devices using resin adhesive. However, the water vapor and oxygen gas may still permeate into the OLED devices through the packaging adhesive when only the resin adhesive is used to package. In addition, a distance from an outer edge of the packaging adhesive to OLED is typically increased in order to enhance the water vapor and oxygen gas resistance. However, widening the packaging adhesive region is conventionally conducted in a plane in a traditional OLED substrate and cover plate, which will increase an area of non-luminous region, and goes against to manufacture a narrow-bezel display panel. Another common packaging structure is to package the OLED devices using glass cement which may achieve an excellent packaging effect. However, laser is needed during curing the glass cement and it may damage the OLED layer. Moreover, if only the glass cement is used to package the OLED devices, a manufacture of large-size OLED devices cannot be achieved because a glass plate would collapse in its central portion.

SUMMARY OF THE INVENTION

[0004] To this end, embodiments of the present invention provide a light emitting display panel in order to prolong an invasion path by the water vapor and oxygen gas and increase water vapor and oxygen gas resistance, thereby prolonging lifetime of the OLED devices.

[0005] According to one aspect of the present invention, a light emitting display panel is provided, comprising: a cover plate and a substrate disposed opposite to each other; a plurality of light emitting devices located between the cover plate and the substrate; and a packaging structure surrounding the plurality of light emitting devices; wherein the packaging structure comprises at least three rows of protruded frames and a first packaging material which is located between adjacent protruded frames, wherein four sides of each of the protruded frames are looped and the at least three rows of protruded frames are adjacent to and embedded into each other in an inward and outward direction, and adjacent ones of the at least three rows of protruded frames are alternately disposed on the cover plate and the substrate and protrude in opposite directions, and non-adjacent ones of the at least three rows of protruded frames are disposed on the same one of the cover plate and the substrate and protrude in the same direction.

[0006] Optionally, a convex surface of one or more of the at least three rows of protruded frames is a surface with a certain radian.

[0007] Optionally, two rows of the at least three rows of protruded frames are disposed on the cover plate and another row is disposed on the substrate and is embedded between the two rows of protruded frames; or two rows of the at least three rows of protruded frames are disposed on the substrate and another row is disposed on the cover plate and is embedded between the two rows of protruded frames.

[0008] Optionally, the packaging structure further comprises a second packaging material which is located between the cover plate and the substrate, located inside an innermost one of the at least three rows of protruded frames and filled in gaps between the cover plate and the substrate.

[0009] Optionally, the first packaging material and the second packaging material are UV curing and/or thermal curing resin adhesive.

[0010] Optionally, the packaging structure further comprises a third packaging material which is located between the cover plate and the substrate, and located outside an outermost one of the at least three rows of protruded frames and inside an innermost one of the at least three rows of protruded frames.

[0011] Optionally, the first packaging material is desiccant, and the third packaging material is UV curing and/or thermal curing resin adhesive.

[0012] Optionally, the at least rows of protruded frames include glass material.

[0013] Optionally, non-adjacent two rows of the at least three rows of protruded frames disposed on one of the cover plate and the substrate have the same height, and another row of the at least three rows of protruded frames, which is disposed on the other one of the cover plate and the substrate and disposed between the non-adjacent two rows in the inward and outward direction, has a height less than the height of non-adjacent two rows, and the another row is spaced from both the non-adjacent two rows in the inward and outward direction.

[0014] Optionally, each of the at least three rows of

protruded frames has a height of 10μm to 100μm and a width of 10μm to 50μm.

[0015] Optionally, the number of the protruded frames is 2N+1, wherein the number of the protruded frames disposed on the cover plate is N+1 and the number of the protruded frames disposed on the substrate is N, or wherein the number of the protruded frames disposed on the cover plate is N and the number of the protruded frames disposed on the substrate is N+1, wherein N is a natural number.

[0016] Optionally, the light emitting display panel further comprises a circuit structure of the plurality of light emitting devices, the circuit structure extending from underneath the protruded frames disposed on the substrate to an exterior of the packaging structure.

[0017] Further, at least one of the protruded frames underneath which the circuit structure extends from is disposed on an inorganic portion of the circuit structure.

[0018] Optionally, the light emitting display panel further comprises a circuit structure of the plurality of light emitting devices, the circuit structure being paved on a convex surface of the protruded frames disposed on the substrate and extending to an exterior of the packaging structure.

[0019] Further, a convex surface of one or more of the at least three rows of protruded frames is a surface with a certain radian.

[0020] According to another aspect of the present invention, a manufacturing method of a light emitting display panel is provided, the light emitting display panel comprising a cover plate and a substrate disposed opposite to each other, a plurality of light emitting devices located between the cover plate and the substrate, and a packaging structure surrounding the plurality of light emitting devices; wherein the manufacturing method comprises steps of:

forming a first portion of the packaging structure on the cover plate and forming a second portion of the packaging structure on the substrate, wherein the first portion is formed as at least two rows of protruded frames, with each having looped four sides and having a certain gap therebetween, and the second portion is formed as at least one row of protruded frame with looped four sides; or wherein the second portion is formed as at least two rows of protruded frames, with each having looped four sides and having a certain gap therebetween, and the first portion is formed as at least one row of protruded frame with looped four sides;

filling a first packaging material between the at least two rows of protruded frames;

pressing and assembling the cover plate and the substrate so that the at least three rows of protruded frames of the packaging structure are adjacent to and embedded into each other in an inward and outward direction.

[0021] Optionally, the forming a second portion of the packaging structure on the substrate comprises:

manufacturing a circuit structure of the plurality of light emitting devices on an upper surface of the substrate;

coating glass cement on the periphery of the upper surface of the substrate on which the circuit structure of the plurality of light emitting devices is manufactured;

curing the glass cement with laser to form at least one row or two rows of protruded frames, with each having looped four sides.

[0022] Optionally, the forming a second portion of the packaging structure on the substrate comprises:

forming integrally at least one row or two rows of protruded frames, with each having looped four sides, on the substrate;

paving a circuit structure of the plurality of light emitting devices on a convex surface of the at least one row or two rows of protruded frames and extending it to an exterior of the packaging structure.

[0023] Optionally, the manufacturing method further comprises: filling a second packaging material inside an innermost one of the at least two rows of protruded frames after filling the first packaging material between the at least two rows of protruded frames.

[0024] Optionally, the manufacturing method further comprises: filling a third packaging material outside an outermost one of the at least two rows of protruded frames and inside an innermost one thereof after filling the first packaging material between the at least two rows of protruded frames.

[0025] Optionally, the manufacturing method further comprises: curing the first packaging material and the second packaging material or curing the first packaging material and the third packaging material, with UV light after pressing and assembling the cover plate and the substrate.

[0026] Optionally, the first packaging material and the second packaging material are UV curing and/or thermal curing resin adhesive.

[0027] Optionally, the first packaging material is desiccant, and the third packaging material is UV curing and/or thermal curing resin adhesive.

[0028] Optionally, non-adjacent two rows of the at least three rows of protruded frames disposed on one of the cover plate and the substrate have the same height, and another row of the at least three rows of protruded frames disposed on the other one of the cover plate and the substrate and disposed between the non-adjacent two rows in the inward and outward direction has a height less than the height of non-adjacent two rows, and the another row is spaced from both the non-adjacent two rows in the inward and outward direction.

[0029] Optionally, convex surfaces of the at least two rows of protruded frames and/or at least one row of protruded frames are surfaces with a certain radian.

[0030] Embodiments of the present invention achieve an effect of prolonging an invasion path by the water vapor and oxygen gas spatially and thus increasing an effect of preventing the water vapor and oxygen gas by forming at least two rows of protruded frames on a cover plate of liquid crystal display panel and forming a row of protruded frame on a substrate correspondingly which can be embedded between the at least two rows of protruded frames on the cover plate and by filling resin adhesive or desiccant in gaps between these frames.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

FIG.1 is a structural schematic view of a light emitting display panel according to an embodiment of the present invention;

FIG.2 is a structural schematic view of a light emitting display panel according to another embodiment of the present invention;

FIG.3 is a flow chart of a manufacturing method of a light emitting display panel according to an embodiment of the present invention;

FIG.4 is a flow chart of a manufacturing method of a light emitting display panel according to another embodiment of the present invention;

FIG.5 is a flow chart of a manufacturing method of a light emitting display panel according to another further embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0032] In order to make objectives, technical solutions and advantages of embodiments of the invention more clear and apparent, hereinafter, the technical solutions of the invention will be described in detail in connection with the specific embodiments and by reference to the accompanying drawings.

[0033] Embodiments of the invention provide a light emitting display panel. The light emitting display panel comprises a cover plate and a substrate disposed opposite to each other, a plurality of light emitting devices located between the cover plate and the substrate, and a packaging structure surrounding the light emitting devices. The packaging structure comprises at least three rows of protruded frames and a first packaging material which is located between adjacent protruded frames, wherein four sides of each of the protruded frames are looped and the at least three rows of protruded frames are adjacent to and embedded in each other in an inward and outward direction. Adjacent ones of the at least three rows of protruded frames are alternately disposed on the cover plate and the substrate and protrude in opposite directions, and non-adjacent ones of the at least three rows of protruded frames are disposed on the same one of the cover plate and the substrate and protrude in the same direction. In the embodiments of the present invention, the inward and outward direction is a direction from an inside of a part enclosed by the packaging structure to an outside thereof.

[0034] FIG.1 is a structural schematic view of a light emitting display panel according to an embodiment of the present invention. As shown in FIG.1, the light emitting display panel comprises a cover plate 101 and a substrate 102 disposed opposite to each other, a plurality of light emitting devices 105 located between the cover plate and the substrate, and a packaging structure surrounding the light emitting devices 105. The packaging structure comprises at least three rows of protruded frames and a first packaging material 106 which is located between protruded frames, wherein four sides of each of the protruded frames are looped and the at least three rows of protruded frames are embedded in each other in an inward and outward direction. The at least three rows of protruded frames comprise at least two rows of first protruded frames 103 with a certain gap therebetween disposed on a lower surface of the cover plate 101 and at least one row of second protruded frame 104 disposed on an upper surface of the substrate 102. The second protruded frame 104 is embedded between the at least two rows of first protruded frames 103. And the cover plate and the substrate are sealed at the protruded frames by packaging material. The plurality of light emitting devices 105 are located in an interior region of the second protruded frame 104. Adjacent ones of the at least three rows of protruded frames are alternately disposed on the cover plate and the substrate and protrude in opposite directions, and non-adjacent ones of the at least three rows of protruded frames are disposed on the same one of the cover plate and the substrate and protrude in the same direction.

[0035] Optionally, the at least two rows of first protruded frames 103 may also be disposed on the substrate 102 and the at least one row of second protruded frame 104 may also be disposed on the cover plate 101.

[0036] Optionally, convex surfaces of the first protruded frames 103 and/or the second protruded frame 104 may be formed as any shape, preferably, as a surface having a certain radian with a range of 0.52rad to 1.57rad.

[0037] Optionally, a second packaging material 107 may also be filled inside an innermost one of the at least two rows of first protruded frames 103 and filled in gaps between the cover plate and the substrate.

[0038] Optionally, the first packaging material 106 and the second packaging material 107 may be transparent packaging material with low water permeability, such as UV curing and thermal curing resin adhesive. The UV curing adhesive includes light-sensitive resin, such as homopolymer or copolymer of monomer, for example, epoxy resin, glycidyl acrylate, glycidyl methacrylate, methyl methacrylate, ethyl methacrylate, n-butyl methacr-

ylate, metacrylic acid- 6,7- epoxy- heptyl ester, or 2-hydroxyethyl methacrylate, etc. The thermal curing resin adhesive includes melamine-formaldehyde resin, unsaturated polyester resin, organic silicon resin, furan resin, etc. The first packaging material 106 is preferably a material with a high viscosity (100000-400000 mPa•s) and the second packaging material 107 is preferably a material with a low viscosity (100-2000 mPa•s).

[0039] Optionally, the cover plate 101 and the substrate 102 may be formed from glass or quartz, etc.

[0040] Optionally, the second protruded frame 104 is formed before manufacturing the plurality of light emitting devices 105.

[0041] Optionally, the first protruded frames 103 and the second protruded frame 104 are formed by curing the glass cement with laser, that is, they contain glass material.

[0042] Optionally, the first protruded frames 103 are formed integrally while the cover plate is formed, or formed by coating and curing the glass cement on the cover plate after having formed the cover plate.

[0043] Optionally, a circuit structure of the plurality of light emitting devices 105 is further formed on the substrate 102, and the circuit structure extends from underneath the protruded frames disposed on the substrate to an exterior of the packaging structure.

[0044] Alternatively, a circuit structure of the plurality of light emitting devices 105 is further formed on the substrate 102, and the circuit structure is paved on the convex surface of the protruded frames disposed on the substrate and extends to an exterior of the packaging structure, so as to facilitate lightening the plurality of light emitting devices 105 by an external power supply.

[0045] Optionally, the second protruded frame 104 may be formed while the substrate is formed, that is, before the circuit structure of the plurality of light emitting devices is formed, or may be formed after the circuit structure of the plurality of light emitting devices is formed. If the latter and the second protruded frame 104 is formed from glass cement, because an organic portion of the circuit structure of the plurality of light emitting devices may be damaged during curing the glass cement with laser, it is necessary to try to avoid the organic portion of the circuit structure of the plurality of light emitting devices and to form the second protruded frame 104 on an inorganic portion thereof. The organic portion of the circuit structure of the plurality of light emitting devices includes a metal electrode, an ITO electrode, etc.

[0046] Optionally, in the embodiments of the present invention, non-adjacent two rows of the at least three rows of protruded frames disposed on one of the cover plate and the substrate have the same height, and another row of the at least three rows of protruded frames, which is disposed on the other one of the cover plate and the substrate and disposed between the non-adjacent two rows in the inward and outward direction, has a height less than the height of non-adjacent two rows, and the another row is spaced from both the non-adjacent two rows in the inward and outward direction. Specifically, any of the first protruded frames 103 and the second protruded frame 104 has a height of 10μm to 100μm and a width of 10μm to 50μm.Moreover, the two rows of first protruded frames 103 have the same height and the second protruded frame 104 has a height less than the height of the first protruded frames 103, in order to prevent granules from producing during pressing and assembling the first and second protruded frames and to reserve space for the first packaging material 106 between the first protruded frames 103 and the second protruded frame 104.

[0047] Optionally, the first protruded frames 103 include more than two rows and are arranged in a spaced distribution. The second protruded frames 104 include more than one row and the number thereof is one less than the number of the first protruded frames 103. In other words, the number of the second protruded frames 104 is N if the number of the first protruded frames 103 is N+1, wherein N is a natural number. The bigger the number of the first protruded frames 103 and the second protruded frames 104 is, the better a packaging effect is, obviously, the larger an area occupied by the protruded frames. Thus, the number of the protruded frames may be suitably selected according to an actual requirement during the manufacture.

[0048] The circuit structure of the light emitting devices needs to extend from the light emitting devices to the exterior of the packaging structure and the light emitting devices is lightened by the external power supply, thus the circuit structure needs to be paved on the convex surface of the second protruded frames 104 if it is manufactured after the second protruded frames 104 is formed. The convex surface of the second protruded frames 104 is preferably formed as a curved surface if the circuit structure is paved thereonwhich may prevent the circuit from opening/breaking off as the curved surface achieves a smoother transition. The light emitting devices may be organic light emitting devices (OLED).

[0049] FIG.2 is a structural schematic view of a light emitting display panel according to another embodiment of the present invention. As shown in FIG.2, the light emitting display panel comprises a cover plate 201 and a substrate 202 disposed opposite to each other, a plurality of light emitting devices205 located between the cover plate and the substrate, and a packaging structure surrounding the light emitting devices205. The packaging structure comprises at least three rows of protruded frames and a first packaging material206 which is located between adjacent protruded frames, wherein four sides of each of the protruded frames are looped and the at least three rows of protruded frames are adjacent to and embedded in each other in an inward and outward direction. The at least three rows of protruded frames comprise at least two rows of first protruded frames203 with a certain gap therebetween disposed on a lower surface of the cover plate 201 and at least one row of second protruded frame 204 disposed on an upper surface of the substrate 202. The second protruded frame 204 is em-

bedded between the at least two rows of first protruded frames 203. And the cover plate and the substrate are sealed at the protruded frames by packaging material. The plurality of light emitting devices 205are located an interior region of the second protruded frame 204.

[0050] Optionally, the at least two rows of first protruded frames 203 may also be disposed on the substrate 202 and the at least one row of second protruded frame 204 may also be disposed on the cover plate 201.

[0051] Wherein, a third packaging material 207 is coated both outside an outer one of the at least two rows of first protruded frames 203 and inside an inner one thereof.

[0052] Optionally, the first packaging material 206 may be desiccant, and the third packaging material 207 may be transparent packaging material with low water permeability, such as UV curing and/or thermal curing resin adhesive.

[0053] Optionally, the desiccant may be selected as a material which can react with water and oxygen, for example, a combination of one or more of calcium oxide, barium oxide, magnesium oxide and zinc oxide. The desiccant may not only prevent water vapor from invading, but also improve the packaging effect while keeping a smaller bezel, because an invasion path by water vapor is prolonged spatially when the first protruded frames 203 and the second protruded frame 204 are assembled upward and downward

[0054] The details of this embodiment are the same as that of the above embodiment and are not explained here.

[0055] In addition, the packaging structure may also comprise all the first, second and third packaging material. Specifically, the first packaging material is disposed between the protruded frames, the second packaging material is disposed inside an innermost one of the at least three rows of protruded frames and filled in gaps between the cover plate and the substrate, and the third packaging material is disposed outside an outermost one of the at least three rows of protruded frames.

[0056] Embodiments of the present invention further provide a manufacturing method of a light emitting display panel, wherein the light emitting display panel comprises a cover plate and a substrate disposed opposite to each other, a plurality of light emitting devices located between the cover plate and the substrate, and a packaging structure surrounding the plurality of light emitting devices; and the manufacturing method comprises steps of:

forming a first portion of the packaging structure on the cover plate and forming a second portion of the packaging structure on the substrate, wherein the first portion is formed as at least two rows of protruded frames, with each having looped four sides and having a certain gap therebetween, and the second portion is formed as at least one row of protruded frame with looped four sides; or wherein the second portion is formed as at least two rows of protruded frames, with each having looped four sides and having a certain gap therebetween, and the first portion is formed as at least one row of protruded frame with looped four sides;

filling a first packaging material between the at least two rows of protruded frames;

pressing and assembling the cover plate and the substrate so as to the at least three rows of protruded frames of the packaging structure are adjacent to and embedded into each other in an inward and outward direction.

[0057] FIG.3 is a flow chart showing a manufacturing method of a light emitting display panel according to an embodiment of the present invention. As shown in FIG.3, the manufacturing method comprises steps of:

Step S301. manufacturing a glass cover plate 101, and manufacturing two rows of first protruded frames 103, with each having looped four sides, on a periphery of the glass cover plate 101 to form a first portion of the packaging structure.

In the step S301, alternatively, both an inner one and an outer one of the first protruded frames 103 have a width of 30μm, a height of 50μm and a gap of 20μm. The first protruded frames 103 may be formed integrally with the glass cover plate 101, or may also be formed by coating glass cement and curing it with laser thereafter.

Step S302. manufacturing a circuit structure of the plurality of light emitting devices on the substrate 102.

Wherein the circuit structure needs to extend to the exterior of the packaging structure and an output electrode thereof is formed from metal such as aluminum, magnesium, silver, etc.

Step S303. coating glass cement on edges of the substrate on which the circuit structure has been manufactured, with ensuring that the glass cement should try to avoid an organic portion of the circuit structure and cover an inorganic portion thereof such as a metal portion; then arranging a mask to shield the organic portion so as to prevent laser from irradiating on the organic portion; thereafter, curing the glass cement with laser to form one row of the second protruded frame 104 with looped four sides on the periphery of the substrate, so as to form a second portion of the packaging structure.

In the step S303, a position of the second protruded frame 104 is selected to be able to be just embedded between the inner one and the outer one of the first protruded frames 103 after the substrate and the cover plate are pressed and assembled. Alternatively, the second protruded frame 104 has a height of 30μm and a width of 20μm.

Step S304. forming a plurality of light emitting devices inside the second protruded frame 104 of the substrate 102.

Step S305. filling the first packaging material 106 between the inner one and the outer one of the first protruded frames 103 of the cover plate 101.

In the step S305, the height of the first packaging material is less than that of the first protruded frames 103, a UV curing second packaging material 107 with low viscosity is filled inside the inner one of the first protruded frames 103 and has the same height as the first protruded frames 103.

Step S306. pressing and assembling the cover plate 101 and the substrate 102, so that the second protruded frame 104 is just embedded between the inner one and the outer one of the first protruded frames 103.

Step S307. curing the first and second packaging material with UV light, so that the cover plate 101 and the substrate 102 form sealing at the protruded frames.

[0058] Obviously, in the above method, one row of the second protruded frame 104 may also be manufactured on the cover plate and two rows of the first protruded frames 103 may also be manufactured on the substrate.

[0059] FIG.4 is a flow chart showing a manufacturing method of a light emitting display panel according to another embodiment of the present invention. As shown in FIG.4, the manufacturing method comprises steps of:

Step S401. manufacturing a glass cover plate 101, and manufacturing two rows of first protruded frames 103, with each having looped four sides, on a periphery of the glass cover plate 101 at the same time.

In the step S401, both an inner one and an outer one of the first protruded frames 103 have a width of 50μm, a height of 60μm and a gap of 20μm.

Step S402. manufacturing a substrate 102, and manufacturing one row of second protruded frame 104 with looped four sides on a periphery thereof at the same time.

In the step S402, a position of the second protruded frame 104 is selected to be able to be just embedded between the inner one and the outer one of the first protruded frames 103 after the substrate and the cover plate are pressed and assembled. Wherein, the second protruded frame 104 has a height of 50μm and a width of 15μm.

Step S403. manufacturing a circuit structure of the plurality of light emitting devices so that it is paved on a convex surface of the second protruded frame 104 and extends to the exterior of the packaging structure, and forming a plurality of light emitting devices inside the second protruded frame 104.

Step S404. coating a UV curing first packaging material between the inner one and the outer one of the first protruded frames 103 of the cover plate 101, and filling a UV curing second packaging material with a low viscosity inside the inner one of the first protruded frames 103.

In the step S404, the first packaging material has a height less than the first protruded frames 103 and the second packaging material has the same height as the first protruded frames 103.

Step S405. pressing and assembling the cover plate 101 and the substrate 102, so that the second protruded frame 104 is just embedded between the inner one and the outer one of the first protruded frames 103.

Step S406. curing the first packaging material with UV light, so that the cover plate 101 and the substrate 102 form sealing at the protruded frames.

[0060] Obviously, in the above method, one row of the second protruded frame 104 may also be manufactured on the cover plate and two rows of the first protruded frames 103 may also be manufactured on the substrate.

[0061] FIG. 5 is a flow chart showing a manufacturing method of a light emitting display panel according to another further embodiment of the present invention. As shown in FIG.5, the manufacturing method comprises steps of:

Step S501 manufacturing a glass cover plate 201, and manufacturing two rows of first protruded frames 203, with each having looped four sides, on a periphery of the glass cover plate 201 to form a first portion of the packaging structure.

In the step S501, both an inner one and an outer one of the first protruded frames 203 have a width of 50μm, a height of 100μm and a gap of 50μm.

Step S502. manufacturing a circuit structure of the plurality of light emitting devices on the substrate 202.

Wherein the circuit structure needs to extend to the exterior of the packaging structure and an output electrode thereof is formed from metal.

Step S503. coating glass cement on edges of the substrate on which the circuit structure has been manufactured, with ensuring that the glass cement should try to avoid an organic portion of the circuit structure and cover an inorganic portion thereof such as a metal portion; then arranging a mask to shield the organic portion so as to prevent laser from irradiating on the organic portion; thereafter, curing the glass cement with laser to form one row of the second protruded frame 204 with looped four sides on the periphery of the substrate, so as to form a second portion of the packaging structure.

In the step S503, a position of the second protruded frame 204 is selected to be able to be just embedded between the inner one and the outer one of the first protruded frames 203 after the substrate and the cover plate are pressed and assembled. Wherein, the second protruded frame 204 has a height of 80μm and a width of 40μm.

Step S504. forming a plurality of light emitting devices inside the second protruded frame 204 of the sub-

strate 202.

Step S505. coating desiccant of calcium oxide between the inner one and the outer one of the first protruded frames 203 of the cover plate 201, and filling a UV curing third packaging material 207 with a high viscosity inside and outside an innermost one of the first protruded frames 203.

In the step S505, the desiccant has a height less than the first protruded frames 203, and the third packaging material has a height of 110μm which is larger than the height of the first protruded frames 203.

Step S506. pressing and assembling the cover plate 201 and the substrate 202, so that the second protruded frame 204 is just embedded between the inner one and the outer one of the first protruded frames 203.

Step S507. curing the third packaging material 207 with UV light, so that the cover plate 201 and the substrate 202 form sealing at the protruded frames.

[0062] Wherein, the number of the first protruded frames 203 may be more than two and the number of the second protruded frames 204 may be more than one. If the number of the second protrude frames 204 is more than one, the plurality of light emitting devices are always manufactured inside an innermost one of the second protruded frames 204 and the circuit structure thereof extends from an underneath or a surface of the innermost one of the second protruded frames 204 to the exterior of the packaging structure. Moreover, the plurality of second protruded frames 204 may be manufactured before or after the circuit structure of the plurality of light emitting devices is manufactured, and a detailed manufacturing method is the same as the manufacturing method for only one second protruded frame 104.

[0063] Because the first and second protruded frames are formed from glass material, the packaging structure according to the embodiments of the present invention is able to prolong the invasion path by water vapor and oxygen gas while decreasing an area occupied by the adhesive material, that is, to realize a good performance of preventing water vapor and oxygen gas with ensuring a narrow bezel. If glass cement is used as the protruded frames and a process of curing with laser is performed before manufacturing OLED, a damage to OLED may be decreased and the circuit may not be affected. In addition, the upper surface of the frame is preferably formed as a curved surface, if the circuit structure is paved thereon, the curved surface has a smoother transition and may prevent the circuit from opening. Thus, the above solutions described above have many advantages such as a better sealing performance and a simple manufacturing process.

[0064] Specific embodiments described above have explained objectives, technical solutions and advantages of the present invention in further detail, as it should be understood that the above description is only the specific embodiment of the present invention, but not to limit the present invention. Any modifications, equivalents, improvements made within the spirit and principle of the present invention should be included within the scope of the present invention.

Claims

1. A light emitting display panel comprising:

   a cover plate and a substrate disposed opposite to each other;
   a plurality of light emitting devices located between the cover plate and the substrate; and
   a packaging structure surrounding the plurality of light emitting devices;
   wherein the packaging structure comprises at least three rows of protruded frames and a first packaging material which is located between adjacent protruded frames, wherein four sides of each of the protruded frames are looped and the at least three rows of protruded frames are adjacent to and embedded into each other in an inward and outward direction, and adjacent ones of the at least three rows of protruded frames are alternately disposed on the cover plate and the substrate and protrude in opposite directions, and non-adjacent ones of the at least three rows of protruded frames are disposed on the same one of the cover plate and the substrate and protrude in the same direction.

2. The packaging structure of claim 1, wherein a convex surface of one or more of the at least three rows of protruded frames is a surface with a certain radian.

3. The packaging structure of claim 1, wherein, two rows of the at least three rows of protruded frames are disposed on the cover plate and another row is disposed on the substrate and is embedded between the two rows of protruded frames; or two rows of the at least three rows of protruded frames are disposed on the substrate and another row is disposed on the cover plate and is embedded between the two rows of protruded frames.

4. The light emitting display panel of any of claims 1 to 3, wherein, the packaging structure further comprises a second packaging material which is located between the cover plate and the substrate, located inside an innermost one of the at least three rows of protruded frames and filled in gaps between the cover plate and the substrate.

5. The light emitting display panel of claim 4, wherein the first packaging material and the second packaging material are UV curing and/or thermal curing res-

in adhesive.

6. The light emitting display panel of any of claims 1 to 3, wherein the packaging structure further comprises a third packaging material which is located between the cover plate and the substrate, and located outside an outermost one of the at least three rows of protruded frames and inside an innermost one of the at least three rows of protruded frames.

7. The light emitting display panel of claim 6, wherein the first packaging material is desiccant, and the third packaging material is UV curing and/or thermal curing resin adhesive.

8. The light emitting display panel of any of claims 1 to 3, wherein, the at least rows of protruded frames include glass material.

9. The packaging structure of any of claims 1 to 3, wherein non-adjacent two rows of the at least three rows of protruded frames disposed on one of the cover plate and the substrate have the same height, and another row of the at least three rows of protruded frames, which is disposed on the other one of the cover plate and the substrate and disposed between the non-adjacent two rows in the inward and outward direction, has a height less than the height of non-adjacent two rows, and the another row is spaced from both the non-adjacent two rows in the inward and outward direction.

10. The packaging structure of claim 9, wherein each of the at least three rows of protruded frames has a height of 10μm to 100μm and a width of 10μm to 50μm.

11. The light emitting display panel of claim 1, wherein the number of the protruded frames is 2N+1, wherein the number of the protruded frames disposed on the cover plate is N+1 and the number of the protruded frames disposed on the substrate is N, or wherein the number of the protruded frames disposed on the cover plate is N and the number of the protruded frames disposed on the substrate is N+1, wherein N is a natural number.

12. The light emitting display panel of claim 1 further comprising a circuit structure of the plurality of light emitting devices, the circuit structure extending from underneath the protruded frames disposed on the substrate to an exterior of the packaging structure.

13. The light emitting display panel of claim 12, wherein at least one of the protruded frames underneath which the circuit structure extends from is disposed on an inorganic portion of the circuit structure.

14. The light emitting display panel of claim 1 further comprising a circuit structure of the plurality of light emitting devices, the circuit structure being paved on a convex surface of the protruded frames disposed on the substrate and extending to an exterior of the packaging structure.

15. The light emitting display panel of claim 14, wherein a convex surface of one or more of the at least three rows of protruded frames is a surface with a certain radian.

16. A manufacturing method of a light emitting display panel, the light emitting display panel comprising a cover plate and a substrate disposed opposite to each other, a plurality of light emitting devices located between the cover plate and the substrate, and a packaging structure surrounding the plurality of light emitting devices; wherein the manufacturing method comprises steps of:

forming a first portion of the packaging structure on the cover plate and forming a second portion of the packaging structure on the substrate, wherein the first portion is formed as at least two rows of protruded frames, with each having looped four sides and having a certain gap therebetween, and the second portion is formed as at least one row of protruded frame with looped four sides; or wherein the second portion is formed as at least two rows of protruded frames, with each having looped four sides and having a certain gap therebetween, and the first portion is formed as at least one row of protruded frame with looped four sides;
filling a first packaging material between the at least two rows of protruded frames;
pressing and assembling the cover plate and the substrate so that the at least three rows of protruded frames of the packaging structure are adjacent to and embedded into each other in an inward and outward direction.

17. The manufacturing method of claim 16, wherein the forming a second portion of the packaging structure on the substrate comprises:

manufacturing a circuit structure of the plurality of light emitting devices on an upper surface of the substrate;
coating glass cement on the periphery of the upper surface of the substrate on which the circuit structure of the plurality of light emitting devices is manufactured;
curing the glass cement with laser to form at least one row or two rows of protruded frames, with each having looped four sides.

18. The manufacturing method of claim 16, wherein the forming a second portion of the packaging structure on the substrate comprises:

forming integrally at least one row or two rows of protruded frames, with each having looped four sides, on the substrate;
paving a circuit structure of the plurality of light emitting devices on a convex surface of the at least one row or two rows of protruded frames and extending it to an exterior of the packaging structure.

19. The manufacturing method of claim 16 further comprising: filling a second packaging material inside an innermost one of the at least two rows of protruded frames after filling the first packaging material between the at least two rows of protruded frames.

20. The manufacturing method of claim 16 further comprising: filling a third packaging material outside an outermost one of the at least two rows of protruded frames and inside an innermost one thereof after filling the first packaging material between the at least two rows of protruded frames.

21. The manufacturing method of claim 19, wherein the first packaging material and the second packaging material are UV curing and/or thermal curing resin adhesive.

22. The manufacturing method of claim 20, wherein the first packaging material is desiccant, and the third packaging material is UV curing and/or thermal curing resin adhesive.

23. The manufacturing method of claim 16, wherein, non-adjacent two rows of the at least three rows of protruded frames disposed on one of the cover plate and the substrate have the same height, and another row of the at least three rows of protruded frames disposed on the other one of the cover plate and the substrate and disposed between the non-adjacent two rows in the inward and outward direction has a height less than the height of non-adjacent two rows, and the another row is spaced from both the non-adjacent two rows in the inward and outward direction.

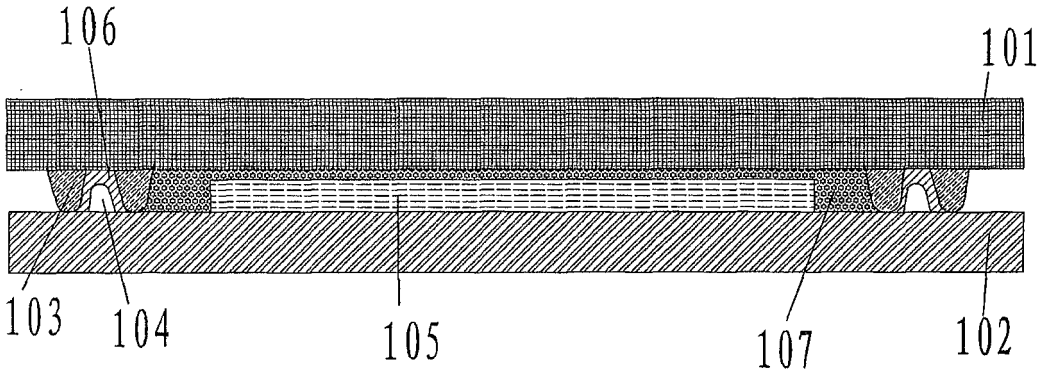

FIG.1

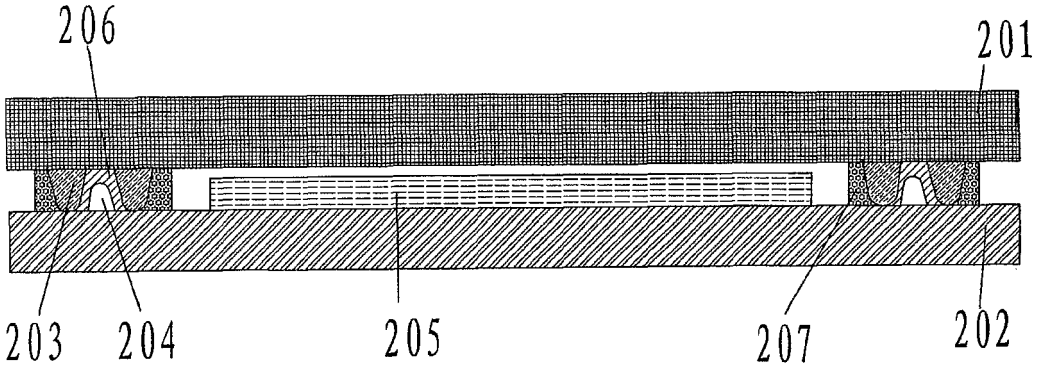

FIG.2

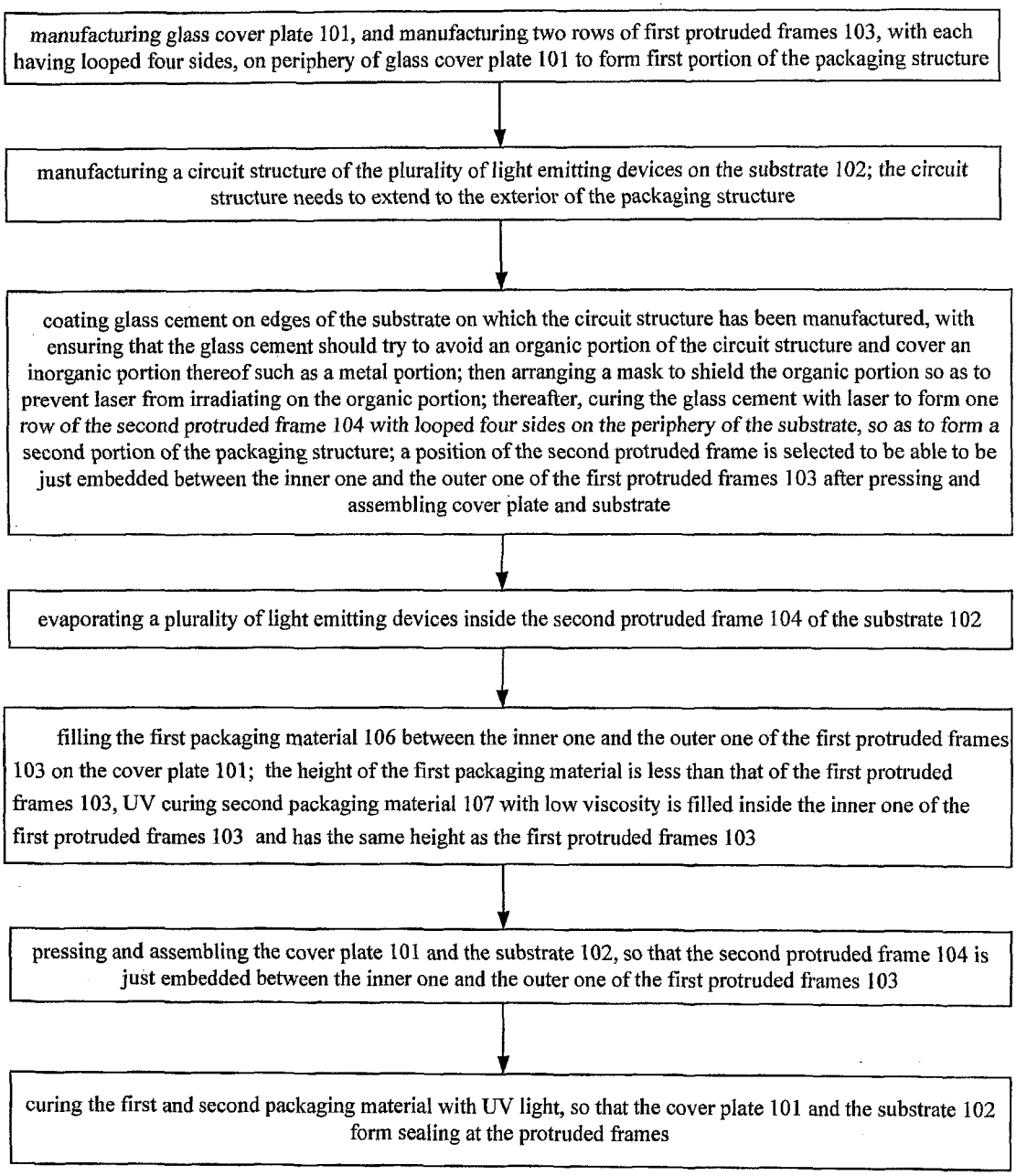
manufacturing glass cover plate 101, and manufacturing two rows of first protruded frames 103, with each having looped four sides, on periphery of glass cover plate 101 to form first portion of the packaging structure
manufacturing a circuit structure of the plurality of light emitting devices on the substrate 102; the circuit structure needs to extend to the exterior of the packaging structure
coating glass cement on edges of the substrate on which the circuit structure has been manufactured, with ensuring that the glass cement should try to avoid an organic portion of the circuit structure and cover an inorganic portion thereof such as a metal portion; then arranging a mask to shield the organic portion so as to prevent laser from irradiating on the organic portion; thereafter, curing the glass cement with laser to form one row of the second protruded frame 104 with looped four sides on the periphery of the substrate, so as to form a second portion of the packaging structure; a position of the second protruded frame is selected to be able to be just embedded between the inner one and the outer one of the first protruded frames 103 after pressing and assembling cover plate and substrate
evaporating a plurality of light emitting devices inside the second protruded frame 104 of the substrate 102
filling the first packaging material 106 between the inner one and the outer one of the first protruded frames 103 on the cover plate 101; the height of the first packaging material is less than that of the first protruded frames 103, UV curing second packaging material 107 with low viscosity is filled inside the inner one of the first protruded frames 103 and has the same height as the first protruded frames 103
pressing and assembling the cover plate 101 and the substrate 102, so that the second protruded frame 104 is just embedded between the inner one and the outer one of the first protruded frames 103
curing the first and second packaging material with UV light, so that the cover plate 101 and the substrate 102 form sealing at the protruded frames

FIG.3

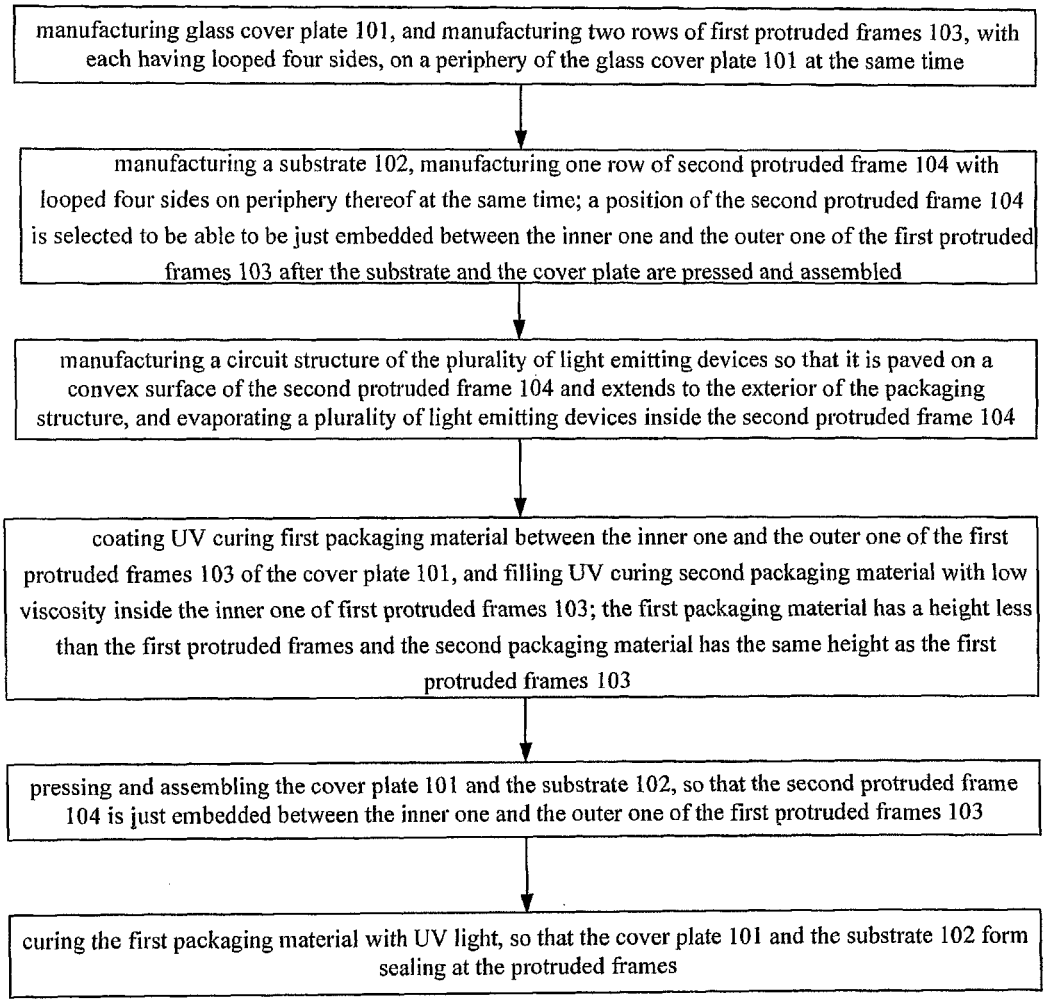
manufacturing glass cover plate 101, and manufacturing two rows of first protruded frames 103, with each having looped four sides, on a periphery of the glass cover plate 101 at the same time
manufacturing a substrate 102, manufacturing one row of second protruded frame 104 with looped four sides on periphery thereof at the same time; a position of the second protruded frame 104 is selected to be able to be just embedded between the inner one and the outer one of the first protruded frames 103 after the substrate and the cover plate are pressed and assembled
manufacturing a circuit structure of the plurality of light emitting devices so that it is paved on a convex surface of the second protruded frame 104 and extends to the exterior of the packaging structure, and evaporating a plurality of light emitting devices inside the second protruded frame 104
coating UV curing first packaging material between the inner one and the outer one of the first protruded frames 103 of the cover plate 101, and filling UV curing second packaging material with low viscosity inside the inner one of first protruded frames 103; the first packaging material has a height less than the first protruded frames and the second packaging material has the same height as the first protruded frames 103
pressing and assembling the cover plate 101 and the substrate 102, so that the second protruded frame 104 is just embedded between the inner one and the outer one of the first protruded frames 103
curing the first packaging material with UV light, so that the cover plate 101 and the substrate 102 form sealing at the protruded frames

FIG.4

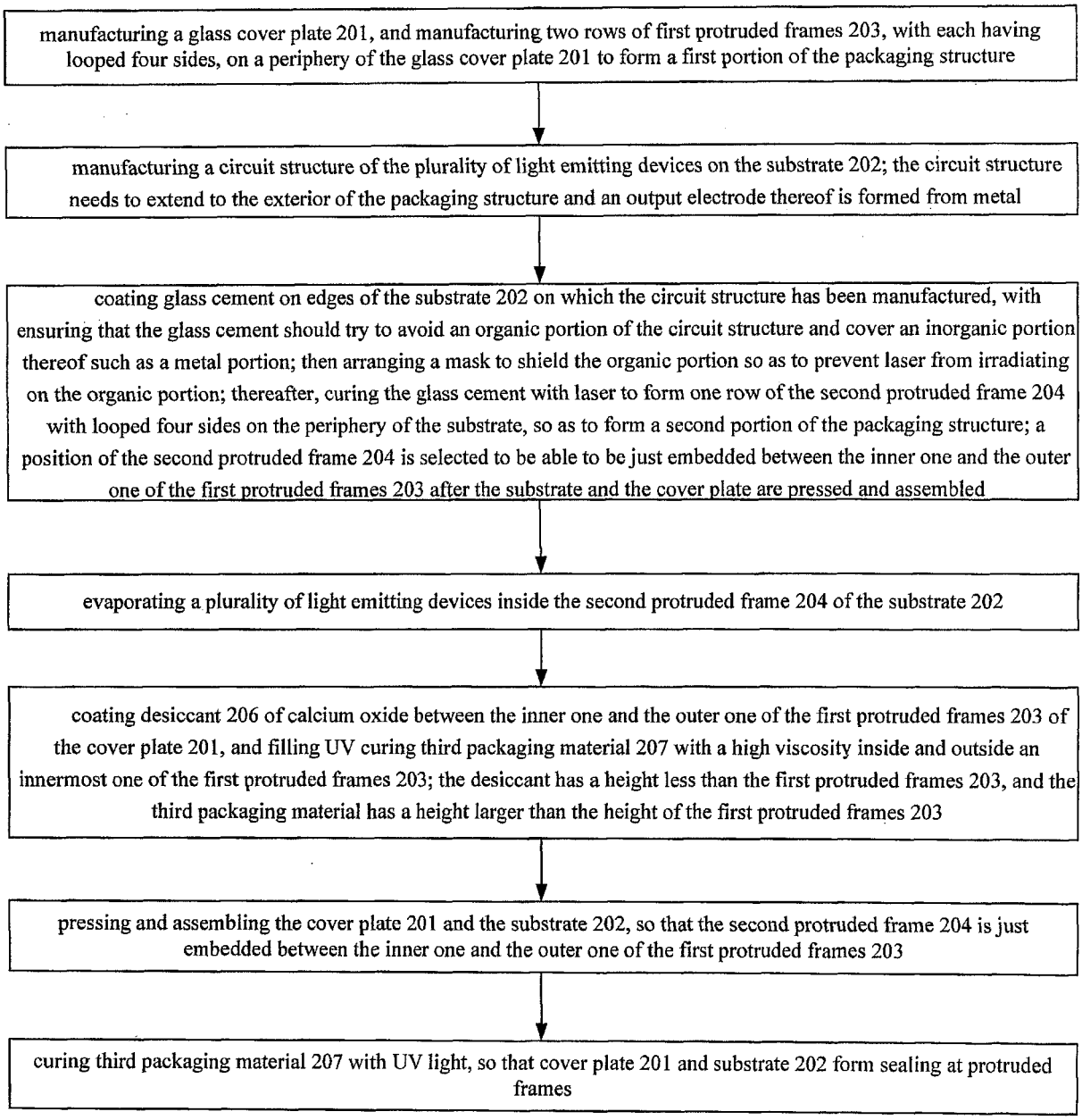
manufacturing a glass cover plate 201, and manufacturing two rows of first protruded frames 203, with each having looped four sides, on a periphery of the glass cover plate 201 to form a first portion of the packaging structure
manufacturing a circuit structure of the plurality of light emitting devices on the substrate 202; the circuit structure needs to extend to the exterior of the packaging structure and an output electrode thereof is formed from metal
coating glass cement on edges of the substrate 202 on which the circuit structure has been manufactured, with ensuring that the glass cement should try to avoid an organic portion of the circuit structure and cover an inorganic portion thereof such as a metal portion; then arranging a mask to shield the organic portion so as to prevent laser from irradiating on the organic portion; thereafter, curing the glass cement with laser to form one row of the second protruded frame 204 with looped four sides on the periphery of the substrate, so as to form a second portion of the packaging structure; a position of the second protruded frame 204 is selected to be able to be just embedded between the inner one and the outer one of the first protruded frames 203 after the substrate and the cover plate are pressed and assembled
evaporating a plurality of light emitting devices inside the second protruded frame 204 of the substrate 202
coating desiccant 206 of calcium oxide between the inner one and the outer one of the first protruded frames 203 of the cover plate 201, and filling UV curing third packaging material 207 with a high viscosity inside and outside an innermost one of the first protruded frames 203; the desiccant has a height less than the first protruded frames 203, and the third packaging material has a height larger than the height of the first protruded frames 203
pressing and assembling the cover plate 201 and the substrate 202, so that the second protruded frame 204 is just embedded between the inner one and the outer one of the first protruded frames 203
curing third packaging material 207 with UV light, so that cover plate 201 and substrate 202 form sealing at protruded frames

FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/087678

A. CLASSIFICATION OF SUBJECT MATTER

H01L 27/32 (2006.01) i; H01L 51/52 (2006.01) i; H01L 51/56 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
CNPAT; WPI; EPODOC, CNKI: BOE, luminescence, organic, frame, encapsula+, seal+, convex, protrud+, project+, oled, display+, dust+, water, damp+, moist+, oxygen

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 103426896 A (INNOCOM TECHNOLOGY (SHENZHEN) CO., LTD. et al.), 04 December 2013 (04.12.2013), description, paragraphs 0005, 0058-0059, 0063, 0068 and 0070-0072, and figures 2 and 7-8	1-12, 16, 19-23
Y	CN 103426896 A (INNOCOM TECHNOLOGY (SHENZHEN) CO., LTD. et al.), 04 December 2013 (04.12.2013), description, paragraphs 0005, 0058-0059, 0063, 0068 and 0070-0072, and figures 2 and 7-8	17
Y	CN 101847650 A (SAMSUNG MOBILE DISPLAY CO., LTD.), 29 September 2010 (29.09.2010), description, paragraphs 0025-0030 and 0033-0040, and figures 2 and 5A	17
PX	CN 104037196 A (BOE TECHNOLOGY GROUP CO., LTD.), 10 September 2014 (10.09.2014), claims 1-20, description, paragraphs 0056-0057, 0077 and 0081-0082, and figures 1-2	1-23
A	CN 102983290 A (BOE TECHNOLOGY GROUP CO., LTD.), 20 March 2013 (20.03.2013), the whole document	1-23
A	CN 101287314 A (SONY CORPORATION), 15 October 2008 (15.10.2008), the whole document	1-23
A	CN 101477997 A (LG DISPLAY CO., LTD.), 08 July 2009 (08.07.2009), the whole document	1-23

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 February 2015 (10.02.2015)	**26 February 2015 (26.02.2015)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **ZHANG, Yue** Telephone No.: (86-10) **62413582**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/087678

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7279063 B2 (EASTMAN KODAK COMPANY), 09 October 2007 (09.10.2007), the whole document	1-23

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/087678

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 103426896 A	04 December 2013	None	
CN 101847650 A	29 September 2010	KR 20100106796 A	04 October 2010
		US 2010244057 A1	30 September 2010
		EP 2234187 B1	20 June 2012
		JP 4981101 B2	18 July 2012
		JP 2010225569 A	07 October 2010
		TW I413444 B	21 October 2013
		CN 101847650 B	21 November 2012
		TW 201036480 A	01 October 2010
		EP 2234187 A1	29 September 2010
		US 8357929 B2	22 January 2013
		KR 100993415 B1	09 November 2010
CN 104037196 A	10 September 2014	None	
CN 102983290 A	20 March 2013	None	
CN 101287314 A	15 October 2008	US 7956537 B2	07 June 2011
		US 2008252839 A1	16 October 2008
		CN 101287314 B	23 June 2010
		JP 2008262796 A	30 October 2008
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		TW I377862 B	21 November 2012
		JP 5007598 B2	22 August 2012
		TW 200908781 A	16 February 2009
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		US 8264143 B2	11 September 2012
		KR 101307550 B1	12 September 2013
		US 2009167132 A1	02 July 2009
US 7279063 B2	09 October 2007	US 2005155704 A1	21 July 2005

Form PCT/ISA/210 (patent family annex) (July 2009)

专利名称(译)	发光显示面板及其制造方法		
公开(公告)号	EP3154088A1	公开(公告)日	2017-04-12
申请号	EP2014882177	申请日	2014-09-28
[标]申请(专利权)人(译)	京东方科技集团股份有限公司		
申请(专利权)人(译)	京东方科技集团股份有限公司.		
当前申请(专利权)人(译)	京东方科技集团股份有限公司.		
[标]发明人	LUO CHENGYUAN WANG CHUN JAN		
发明人	LUO, CHENGYUAN WANG, CHUN-JAN		
IPC分类号	H01L27/32 H01L51/52 H01L51/56		
CPC分类号	H01L51/525 H01L51/5237 H01L51/5246 H01L51/5259 H01L51/56 H01L2227/323		
代理机构(译)	POTTER CLARKSON LLP		
优先权	201410235708.5 2014-05-29 CN		
其他公开文献	EP3154088A4 EP3154088B1		
外部链接	Espacenet		

摘要(译)

本发明的实施例公开了一种发光显示面板。发光显示面板包括盖板，彼此相对布置的基板，位于盖板和基板之间的多个发光器件以及围绕发光器件的封装结构。包装结构包括至少三排突出框架和位于相邻突出框架之间的第一包装材料，其中每个突出框架的四个侧面环绕，并且至少三排突出框架邻近并嵌入彼此在向内和向外的方向。邻所述至少三排突出框架中的至少三排突出框架交替地设置在盖板和基板上并且沿相反方向突出，并且至少三排突出框架中的不相邻的突出框架布置在盖板的相同的一个和基板并沿相同的方向突出。在上述发光显示面板中，树脂粘合剂或干燥剂填充在框架之间的间隙中，从而在空间上延长水蒸汽和氧气的侵入路径，从而提高了防止水蒸气和氧气的效果。发光显示面板具有密封性好，制造工艺简单的优点喜欢。

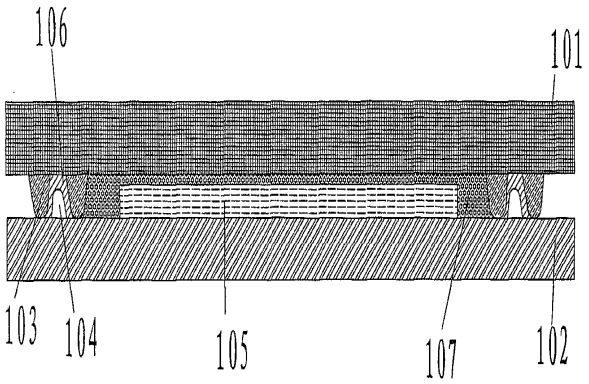

FIG.1