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**YU et al.**(10) **Pub. No.: US 2016/0254484 A1**(43) **Pub. Date: Sep. 1, 2016**(54) **ELECTROLUMINESCENT DEVICE AND  
DISPLAY DEVICE****Publication Classification**(71) Applicant: **BOE TECHNOLOGY GROUP CO.,  
LTD.**, Beijing (CN)(51) **Int. Cl.**  
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CPC ..... **H01L 51/5246** (2013.01)(73) Assignee: **BOE TECHNOLOGY GROUP CO.,  
LTD.**, Beijing (CN)(57) **ABSTRACT**(21) Appl. No.: **14/762,048**

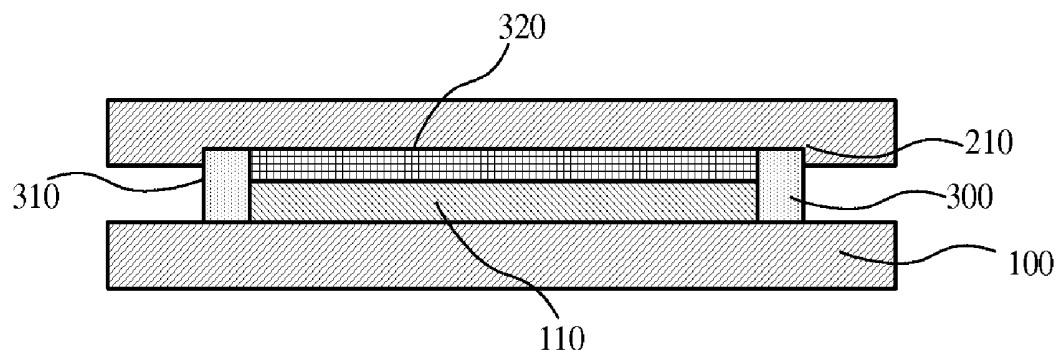
An electroluminescent device and a display device are provided. The electroluminescent device includes: a base substrate (100), a first surface of which is provided with a luminous element (110); a first substrate (210) having a first groove arranged to be opposed to the first surface of the base substrate (100); a sealing element (300) hermetically secured with a wall of the first groove, protruding from a notch of the first groove, and having a sealing groove provided to be opposed to a first surface of the base substrate (100); a part of the sealing element (300) protruding from the notch of the first groove is hermetically secured with the base substrate (100), and the luminous element (110) is arranged within the sealing groove. The electroluminescent device and display device depress the probability of the moisture in the air entering the sealing element and contacting with the luminous element, thus improving the performance and life of the electroluminescent device.

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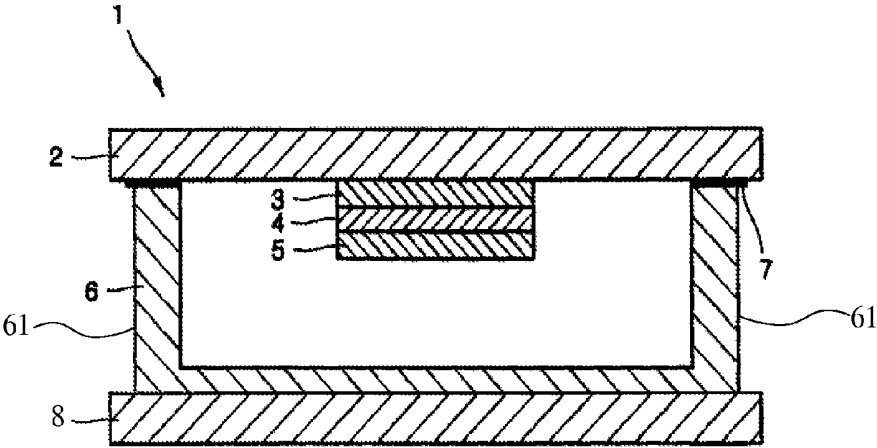


FIG. 1

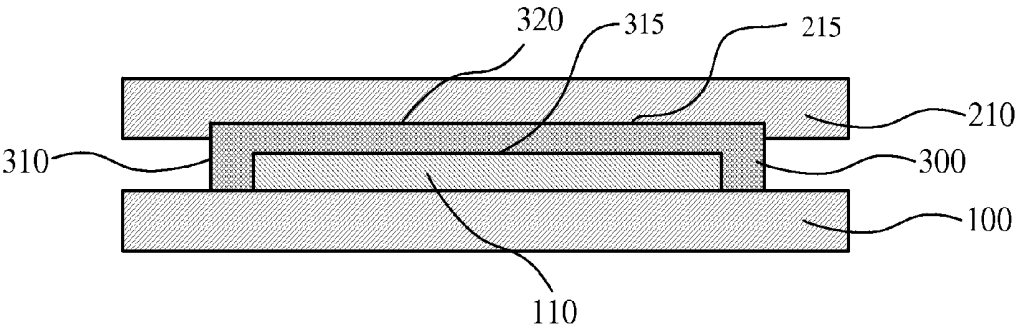


FIG. 2

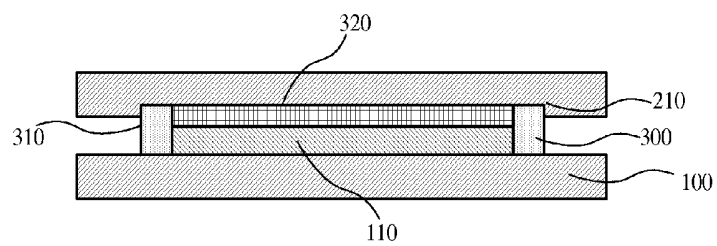


FIG. 3

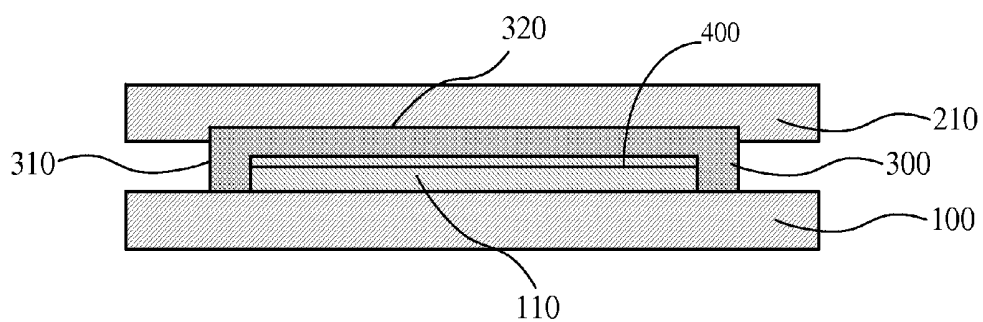


FIG. 4

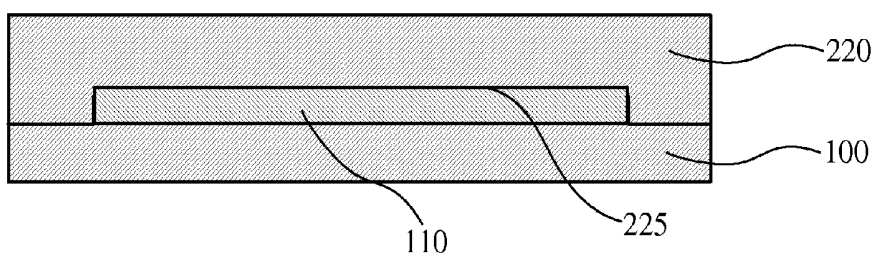


FIG. 5

## ELECTROLUMINESCENT DEVICE AND DISPLAY DEVICE

### TECHNICAL FIELD

[0001] The embodiments of the invention relate to an electroluminescent device and a display device.

### BACKGROUND

[0002] The electroluminescent device has beneficial properties, such as active luminescence, wider visual angle, higher contrast, high response speed and so on, and is praised as a new generation of display techniques. According to the materials employed for the luminescent layer, the electroluminescent device is classified as inorganic electroluminescent device and organic electroluminescent device. When the luminescent layer contacting with the moisture in the air, the performance and life of the luminescent layer within the electroluminescent device would be deteriorated, thus it is required to isolate the luminescent layer from the moisture in the air. FIG. 1 illustrates an organic electroluminescent device 1 comprising a base substrate 2, the base substrate 2 is provided thereon with an anode electrode 3, a cathode electrode 5 and a luminescent layer 4 located between the anode electrode 3 and cathode electrode 5, as well as a sealing element 6 for sealing the base substrate 2 onto which the sealing element 6 is attached with an adhesives 7, and a first substrate 8 used for packaging. The sealing element 6 may be a cover glass, or an insulating board or an insulating film. The entire side surface 61 of the sealing element 6 contacts with air, thus due to resultant larger contact area, the moisture in the air at the side surface of the sealing element may pass through the adhesives and into the sealing element 6, contact with the luminescent layer, which deteriorates the performance and life of the luminescent layer in the electroluminescent device.

### SUMMARY

[0003] At least one embodiment of the present invention provides an electroluminescent device and a display device, which allows for avoiding the undesired situation that, due to the large contact area between the air and the sealing element, the moisture in the air would have a higher probability of running into the sealing element and contacting with the luminous elements, thus deteriorating the performance and life of the electroluminescent device in a comparatively faster way.

[0004] At least one embodiment of the present invention provides an electroluminescent device comprising: a base substrate, a first surface of which is provided with a luminous element; a first substrate having a first groove arranged to be opposed to the first surface of the base substrate; a sealing element hermetically secured with a wall of the first groove, protruding from a notch of the first groove, and having a sealing groove provided to be opposed to the first surface of the base substrate; a part of the sealing element protruding from the notch of the first groove is hermetically secured with the base substrate, and the luminous element is arranged within the sealing groove.

[0005] For example, the sealing element covers and is hermetically secured with a bottom surface of the first groove.

[0006] For example, a first surface of the sealing element is hermetically secured with the first surface of the base substrate, wherein the first surface of the sealing element is a

surface where the part of the sealing element protruding from the notch of the first groove is opposed to the first surface of the base substrate.

[0007] For example, the sealing element is formed of a sealant material.

[0008] For example, the sealing element is a sealing element formed of epoxy resin, polyurethane, phenolic resin, unsaturated polyester or melamine resin materials.

[0009] For example, the sealing element is of an one-piece configuration.

[0010] For example, the sealing element comprises a sealing bottom plate covering the bottom of the first groove and sealing side plates enclosing around the bottom plate, the sealing bottom plate and the sealing side plates enclose to form the sealing groove.

[0011] For example, a blocking layer is formed between the luminous element and the sealing elements. For example, the blocking layer is formed of an organic film or an inorganic film.

[0012] At least one embodiment of the present invention provides an electroluminescent device comprising: a base substrate, a first surface of which is provided with a luminous element; a second substrate having a second groove arranged to be opposed to the first surface of the base substrate; the second substrate is hermetically secured with the base substrate, and the luminous element is provided within the second groove.

[0013] For example, a first surface of the second substrate is hermetically secured with a first surface of the base substrate, wherein the first surface of the second substrate is a surface of the second substrate facing the first surface of the base substrate.

[0014] At least one embodiment of the present invention provides a display device comprising any one of the above electroluminescent devices.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0015] In order to clearly illustrate the technical solution of the embodiments of the invention, the drawings of the embodiments will be briefly described in the following; it is obvious that the described drawings are only related to some embodiments of the invention and thus are not limitative of the invention.

[0016] FIG. 1 is a schematic view of an organic electroluminescent device;

[0017] FIG. 2 is a schematic view of an electroluminescent device according to an embodiment of the present invention;

[0018] FIG. 3 is a schematic view of an electroluminescent device according to an embodiment of the present invention;

[0019] FIG. 4 is a schematic view of an electroluminescent device according to an embodiment of the present invention;

[0020] FIG. 5 is a schematic view of an electroluminescent device according to an embodiment of the present invention.

### REFERENCE NUMERALS OF THE MAIN COMPONENTS

[0021] 1 organic electroluminescent device, 2 base substrate, 3 anode electrode, 4 luminescent layer, 5 cathode electrode, 6 sealing element, 61 entire side surface of the sealing element, 7 adhesives, 8 first substrate, 100 base substrate, 110 luminous element, 210 first substrate, 215 first groove, 220

second substrate, **225** second groove, **300** sealing element, **310** side surface of the sealing element, **320** bottom surface of the sealing element.

#### DETAILED DESCRIPTION

[0022] In order to make objects, technical details and advantages of the embodiments of the invention apparent, the technical solutions of the embodiment will be described in a clearly and fully understandable way in connection with the drawings related to the embodiments of the invention. It is obvious that the described embodiments are just a part but not all of the embodiments of the invention. Based on the described embodiments herein, those skilled in the art can obtain other embodiment(s), without any inventive work, which should be within the scope of the invention.

[0023] The electroluminescent device according to at least one embodiment of the present invention, as illustrated in FIGS. 2 and 3, comprises a base substrate **100**, an luminous element **110**, a first substrate **210** and a sealing element **300**.

[0024] The first surface of the base substrate **100** is provided with an luminous element **110**; the first substrate **210** has a first groove **215** arranged to be opposed to the first surface of the base substrate **100**; the sealing element **300** is hermetically secured with the wall of the first groove **215**, protruding from the notch of the first groove, and has a sealing groove **315** provided to be opposed to the first surface of the base substrate **100**; a part of the sealing element **300** protrudes from the notch of the first groove **215** is hermetically secured with the base substrate, and the luminous element **110** is arranged within the sealing groove **315**.

[0025] In the electroluminescent device according to at least one embodiment of the present invention, the first substrate **210** has a first groove **215**, the sealing element **300** is hermetically secured with the wall of the first groove **215** and protrudes from the notch of the first groove **215**. For convenience of description, the surface, where the part of the sealing element **300** being hermetically secured with the wall of the first groove **215** is located, is taken as the side surface **310** of the sealing element, that is to say, when the side surface **310** of the sealing element is hermetically secured with the wall of the first groove **215**, a part of the side surface **310** of the sealing element is hermetically secured with the wall of the first groove **215**; the part of the sealing element **300** protruding from the notch of the first groove **215** is hermetically secured with the base substrate **100**, and the luminous element **110** is arranged within the sealing groove **315**, that is to say, the luminous element **110** is sealed into the sealing groove **315** of the sealing element **300**. In this way, a part of the side surface **310** of the sealing element **300** is hermetically secured with the wall of the first groove **215**, thus can not touch the air; another part of the side surface **310** of the sealing element **300** contacts with air, that is, only a part of the side surface of the sealing element **300** could contact with air, thus decreasing contact area between the side surface of the sealing element **300** and the air, depressing probability of the moisture of air entering into the sealing element **300** and contacting with the luminous element **110**, which improves the performance and life of the electroluminescent device.

[0026] Further, as illustrated in FIGS. 2 and 3, the sealing element **300** could cover the bottom surface of the first groove **215** and be hermetically secured therewith. For convenience of description, the surface of the sealing element **300** covering the bottom surface of the first groove **215** is taken as the bottom surface **320** of the sealing element. In this way, the

bottom surface **320** of the sealing element **300** does not contact with the air, depressing the probability of the moisture in the air running through the bottom surface of the sealing element **300** into the sealing element **300** and contacting the luminous element **110**, thus improving the performance and life of the electroluminescent device.

[0027] For example, the part of the aforesaid sealing element **300** protruding from the notch of the first groove **215** may be hermetically secured with the base substrate **100** in a way as illustrated in FIGS. 2 and 3, in which the first surface of the sealing element **300** is hermetically secured with the first surface of the base substrate **100**; and the first surface of the sealing element **300** is the surface of the part of the sealing element **300** protruding from the notch of the first groove **215** facing the first surface of the base substrate **100**.

[0028] For example, the sealing element formed of sealant materials may be selected, and for example, the sealing element is formed of epoxy resin, polyurethane, phenolic resin, unsaturated polyester or melamine resin materials etc. With the sealing element formed with sealant materials, a better sealing quality could be obtained, it is possible to depress the probability of the moisture in the air entering the sealing element and contacting with the luminous element, thus improving the performance and life of the electroluminescent device.

[0029] The aforesaid sealing element could be the sealing element of one-piece configuration as illustrated in FIG. 2, and also could be the sealing element of a divided structure as illustrated in FIG. 3. As illustrated in FIG. 3, the sealing element **300** of the divided structure comprises a sealing bottom plate **320** covering the bottom of the first groove **215** and sealing side plates **310** enclosing around the bottom plate **320**, the sealing bottom plate **320** and the sealing side plates **310** enclose to form the sealing groove **315**. It is possible to chose the sealing element of one-piece configuration or sealing element of the divided structure according to the difficulty extent of actual technology, cost and other factors.

[0030] Further, in another embodiment, as illustrated in FIG. 4, it is also possible to form a blocking layer **400** between the luminous element **110** and the sealing element **300**, such a blocking layer **400** could be a blocking layer formed of organic film or inorganic film. With the blocking layer **400** between the luminous element **110** and the sealing element **300**, it is possible to further depress the probability of the moisture in the air running through the sealing element **300** and the blocking layer **400** and contacting the luminous element **110**, thus improving the performance and life of the electroluminescent device.

[0031] According to the luminescent materials employed, the aforesaid luminous element may be an organic electroluminescent element or an inorganic electroluminescent element.

[0032] An electroluminescent device according to another embodiment of the present invention, as illustrated in FIG. 4, comprises a base substrate **100**, a luminous element **110**, and a second substrate **220**.

[0033] The first surface of the base substrate **100** is provided with the luminous element **110**; the second substrate **220** has a second groove **215** arranged to be opposed to the first surface of the base substrate **100**; the second substrate **220** is hermetically secured with the base substrate **100**, and the luminous element **110** is provided within the second groove **225**.

[0034] In the electroluminescent device of this embodiment, the second substrate 220 comprises a second groove 225, and when the second substrate 220 is hermetically secured with the base substrate 100, the luminous element 110 is placed within the second groove 225 of the second substrate 220. The second substrate 220 is provided with the second groove 225, thereby the second substrate 220 is also taken as a sealing element used for packaging. The air could merely enter through the location where the second substrate 220 is hermetically secured with the base substrate 100, thus greatly depress the probability of the moisture in the air entering the second groove 225 and contacting with the luminous element 110, improving the performance and life of the electroluminescent device.

[0035] For example, regarding the way by which the second substrate 220 is hermetically secured with the base substrate 100, situation may be that the first surface of the second substrate 220 is hermetically secured with the first surface of the base substrate 110, as illustrated in FIG. 5, the first surface of the second substrate 220 is a surface of the second substrate 220 facing the first surface of the base substrate 100. As such, the first surface of the second substrate is hermetically secured with the first surface of the base substrate, while air could merely enter through the location where the first surface of the second substrate is hermetically secured with the first surface of the base substrate, thus greatly depressing the probability of the moisture in the air entering the second groove and contacting with the luminous element, improving the performance and life of the electroluminescent device.

[0036] At least one embodiment of the present invention provides a display device comprising any one of the above electroluminescent devices.

[0037] The electroluminescent device and display device provided by at least one embodiment of the present invention could depress the probability of the moisture in the air entering the sealing element and contacting with the luminous element by decreasing the contact area of the side surface of the sealing element with the air or by the fact that the air could merely enter through the location where the second substrate is hermetically secured with the base substrate, thus improve the performance and life of the electroluminescent device.

[0038] The foregoing embodiments are merely exemplary embodiments of the invention, and not intended to define the scope of the invention, and the scope of the invention is determined by the appended claims.

[0039] The present application claims the priority of the Chinese patent application No. 201420429775.6 filed on Jul. 31, 2014, the entirety of which is incorporated herein by reference as a part of the present application.

1. An electroluminescent device, comprising:

- a base substrate, a first surface of which is provided with a luminous element;
- a first substrate having a first groove arranged to be opposed to the first surface of the base substrate;
- a sealing element hermetically secured with a wall of the first groove, protruding from a notch of the first groove, and having a sealing groove provided to be opposed to the first surface of the base substrate;
- a part of the sealing element protruding from the notch of the first groove is hermetically secured with the base substrate, and the luminous element is arranged within the sealing groove.

2. The electroluminescent device according to claim 1, wherein, the sealing element covers and is hermetically secured with a bottom surface of the first groove.

3. The electroluminescent device according to claim 1, wherein, a first surface of the sealing element is hermetically secured with the first surface of the base substrate, and is a surface where the part of the sealing element protruding from the notch of the first groove is opposed to the first surface of the base substrate.

4. The electroluminescent device according to claim 3, wherein, the sealing element is formed of a sealant material.

5. The electroluminescent device according to claim 4, wherein, the sealing element is formed of epoxy resin, polyurethane, phenolic resin, unsaturated polyester or melamine resin materials.

6. The electroluminescent device according to claim 3, wherein, the sealing element is of one-piece configuration.

7. The electroluminescent device according to claim 2, wherein, the sealing element comprises a sealing bottom plate covering the bottom of the first groove and sealing side plates enclosing around the bottom plate, the sealing bottom plate and the sealing side plates enclose to form the sealing groove.

8. The electroluminescent device according to claim 3, wherein, a blocking layer is formed between the luminous element and the sealing elements.

9. The electroluminescent device according to claim 8, wherein, the blocking layer is the formed of an organic film or an inorganic film.

10. An electroluminescent device, comprising:

- a base substrate, the first surface of which is provided with a luminous element;
- a second substrate having a second groove arranged to be opposed to the first surface of the base substrate;
- the second substrate is hermetically secured with the base substrate, and the luminous element is provided within the second groove.

11. The electroluminescent device according to claim 10, wherein, a first surface of the second substrate is hermetically secured with a first surface of the base substrate, and is a surface of the second substrate facing the first surface of the base substrate.

12. A display device comprising an electroluminescent device, the electroluminescent device comprising:

- a base substrate, a first surface of which is provided with a luminous element;
- a first substrate having a first groove arranged to be opposed to the first surface of the base substrate;
- a sealing element hermetically secured with a wall of the first groove, protruding from a notch of the first groove, and having a sealing groove provided to be opposed to the first surface of the base substrate;
- a part of the sealing element protruding from the notch of the first groove is hermetically secured with the base substrate, and the luminous element is arranged within the sealing groove.

13. The electroluminescent device according to claim 2, wherein, a first surface of the sealing element is hermetically secured with the first surface of the base substrate, and is a surface where the part of the sealing element protruding from the notch of the first groove is opposed to the first surface of the base substrate.

14. The display device according to claim 12, wherein, the sealing element covers and is hermetically secured with a bottom surface of the first groove.

**15.** The display device according to claim **12**, wherein, a first surface of the sealing element is hermetically secured with the first surface of the base substrate, and is a surface where the part of the sealing element protruding from the notch of the first groove is opposed to the first surface of the base substrate.

**16.** The display device according to claim **15**, wherein, the sealing element is formed of a sealant material.

**17.** The display device according to claim **16**, wherein, the sealing element is formed of epoxy resin, polyurethane, phenolic resin, unsaturated polyester or melamine resin materials.

**18.** The display device according to claim **15**, wherein, the sealing element is of one-piece configuration.

**19.** The display device according to claim **14**, wherein, the sealing element comprises a sealing bottom plate covering the bottom of the first groove and sealing side plates enclosing around the bottom plate, the sealing bottom plate and the sealing side plates enclose to form the sealing groove.

**20.** The display device according to claim **15**, wherein, a blocking layer is formed between the luminous element and the sealing elements.

\* \* \* \* \*

|                |                                                 |         |            |
|----------------|-------------------------------------------------|---------|------------|
| 专利名称(译)        | 电致发光器件和显示器件                                     |         |            |
| 公开(公告)号        | <a href="#">US20160254484A1</a>                 | 公开(公告)日 | 2016-09-01 |
| 申请号            | US14/762048                                     | 申请日     | 2014-12-04 |
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| CPC分类号         | H01L51/5246                                     |         |            |
| 优先权            | 201420429775.6 2014-07-31 CN                    |         |            |
| 其他公开文献         | US9768409                                       |         |            |
| 外部链接           | <a href="#">Espacenet</a> <a href="#">USPTO</a> |         |            |

#### 摘要(译)

提供了一种电致发光器件和显示器件。该电致发光器件包括：基础衬底（<b>100</b>），其第一表面设有发光元件（<b>110</b>）；第一基板（<b>210</b>），具有第一凹槽，所述第一凹槽布置成与所述基础基板的第一表面相对（<b>100</b>）；密封元件（<b>300</b>）与第一凹槽的壁密封地固定，从第一凹槽的凹口突出，并且具有设置成与基础基板的第一表面相对的密封凹槽（<b>100</b>）；从第一凹槽的凹口突出的密封元件（<b>300</b>）的一部分与基础基板（<b>100</b>）和发光元件（<b>110</b>）气密地固定。<b>110</b>布置在密封槽内。电致发光器件和显示器件降低了空气中的水分进入密封元件并与发光元件接触的可能性，从而改善了电致发光器件的性能和寿命。

