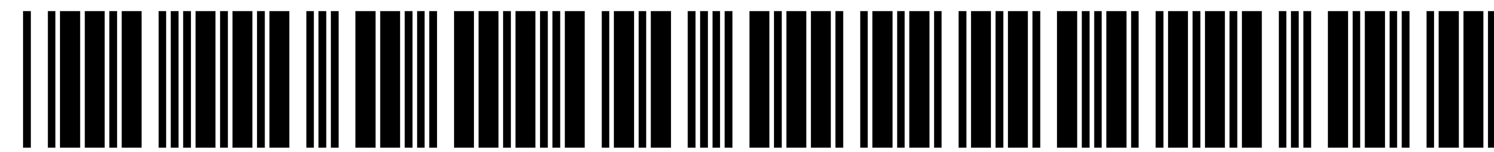

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(19) **United States**
(12) **Reissued Patent**
Jung et al.
(10) **Patent Number: US RE48,858 E**
(45) **Date of Reissued Patent: Dec. 21, 2021**

(54) **LIGHT EMITTING DEVICE PACKAGE AND LIGHT UNIT**

(71) Applicant: **SUZHOU LEKIN SEMICONDUCTOR CO., LTD.**, Taicang (CN)

(72) Inventors: **Su Jung Jung**, Seoul (KR); **Yon Tae Moon**, Seoul (KR); **Young Jun Cho**, Seoul (KR); **Son Kyo Hwang**, Seoul (KR); **Byung Mok Kim**, Seoul (KR); **Seo Yeon Kwon**, Seoul (KR)

(73) Assignee: **SUZHOU LEKIN SEMICONDUCTOR CO., LTD.**, Taicang (CN)

(21) Appl. No.: **16/394,870**

(22) Filed: **Apr. 25, 2019**

Related U.S. Patent Documents

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(64) Patent No.: **9,634,215**
Issued: **Apr. 25, 2017**
Appl. No.: **14/885,661**
Filed: **Oct. 16, 2015**

U.S. Applications:
(63) Continuation of application No. 14/253,606, filed on Apr. 15, 2014, now Pat. No. 9,196,814, which is a
(Continued)

(30) **Foreign Application Priority Data**

Aug. 22, 2011 (KR) 10-2011-0083721
Aug. 24, 2011 (KR) 10-2011-0084718
(Continued)

(51) **Int. Cl.**
H01L 33/64 (2010.01)
C09K 11/67 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H01L 33/641*** (2013.01); ***C09K 11/67*** (2013.01); ***H01L 33/64*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H01L 33/641; H01L 33/64; H01L 2224/32013; H01L 25/0753;
(Continued)

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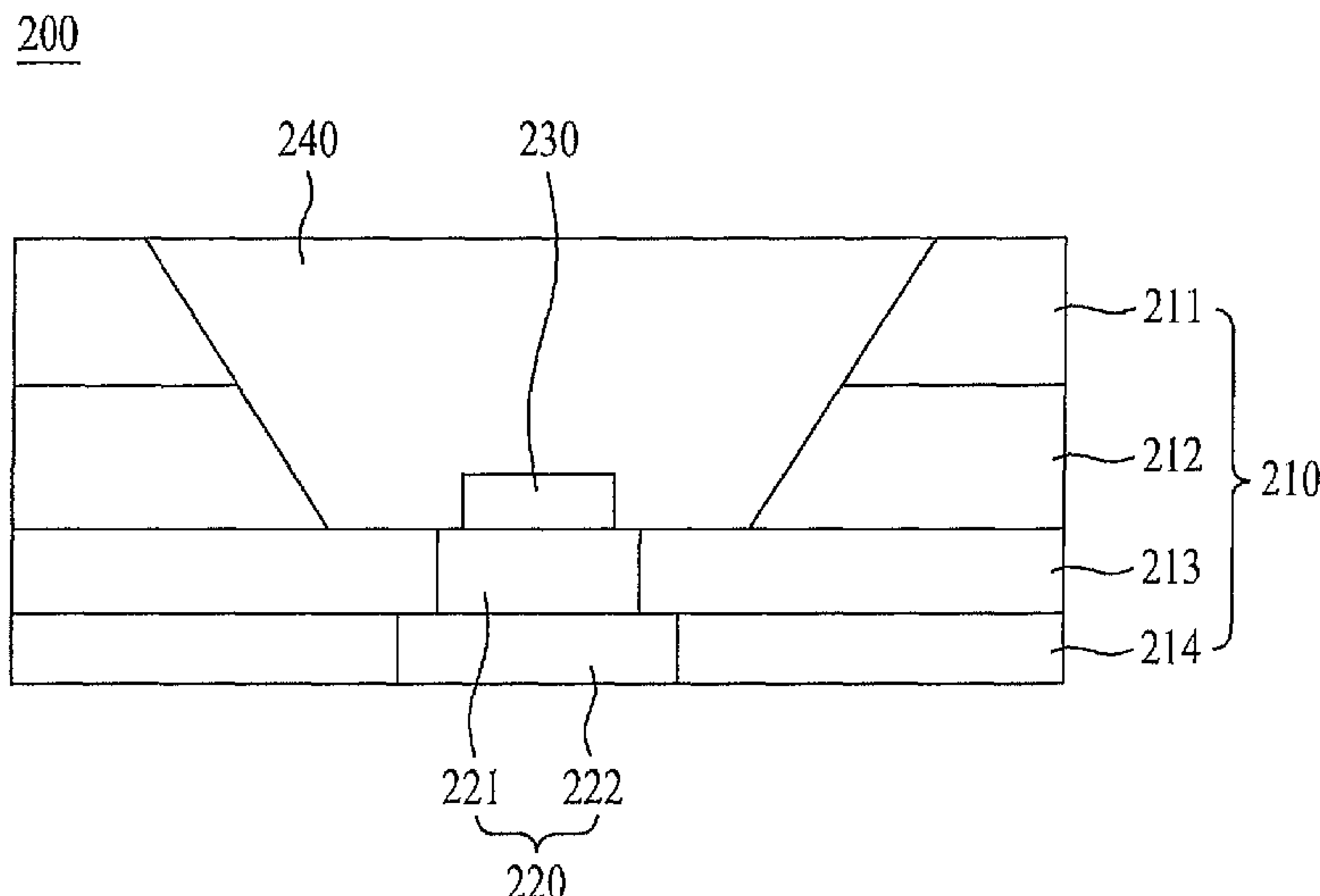
Primary Examiner — Ling X Xu
(74) *Attorney, Agent, or Firm* — Birch, Stewart, Kolasch & Birch, LLP

(57) **ABSTRACT**

Embodiments provide a light emitting device package including a package body having a through-hole; a radiator disposed in the through-hole and including an alloy layer having Cu; and a light emitting device disposed on the radiator, wherein the alloy layer includes at least one of W or Mo, and wherein the package body includes cavity including a sidewall and a bottom surface, and wherein the through-hole is formed in the bottom surface.

18 Claims, 34 Drawing Sheets



Related U.S. Application Data

continuation of application No. 13/591,626, filed on Aug. 22, 2012, now Pat. No. 8,704,433.

(30) **Foreign Application Priority Data**

Dec. 9, 2011 (KR) 10-2011-0131466
Dec. 22, 2011 (KR) 10-2011-0139806
Dec. 22, 2011 (KR) 10-2011-0140236
Dec. 27, 2011 (KR) 10-2011-0143151
Dec. 27, 2011 (KR) 10-2011-0143152
Dec. 30, 2011 (KR) 10-2011-0147361

(51) **Int. Cl.**
H01S 5/024 (2006.01)
H01L 25/075 (2006.01)
H01L 33/62 (2010.01)

(52) **U.S. Cl.**
CPC ***H01S 5/02469*** (2013.01); *H01L 25/0753* (2013.01); *H01L 33/62* (2013.01); *H01L 2224/32013* (2013.01); *H01L 2224/45144* (2013.01); *H01L 2224/48091* (2013.01); *H01L 2224/73265* (2013.01); *H01L 2924/01322* (2013.01); *H01L 2924/12032* (2013.01)

(58) **Field of Classification Search**
CPC H01L 2924/01322; H01L 33/62; H01L 2224/73265; H01L 2224/45144; H01L 2224/48091; H01L 2924/00014; H01L 2924/00; H01L 2924/12032; H01S 5/02469; C09K 11/67
See application file for complete search history.

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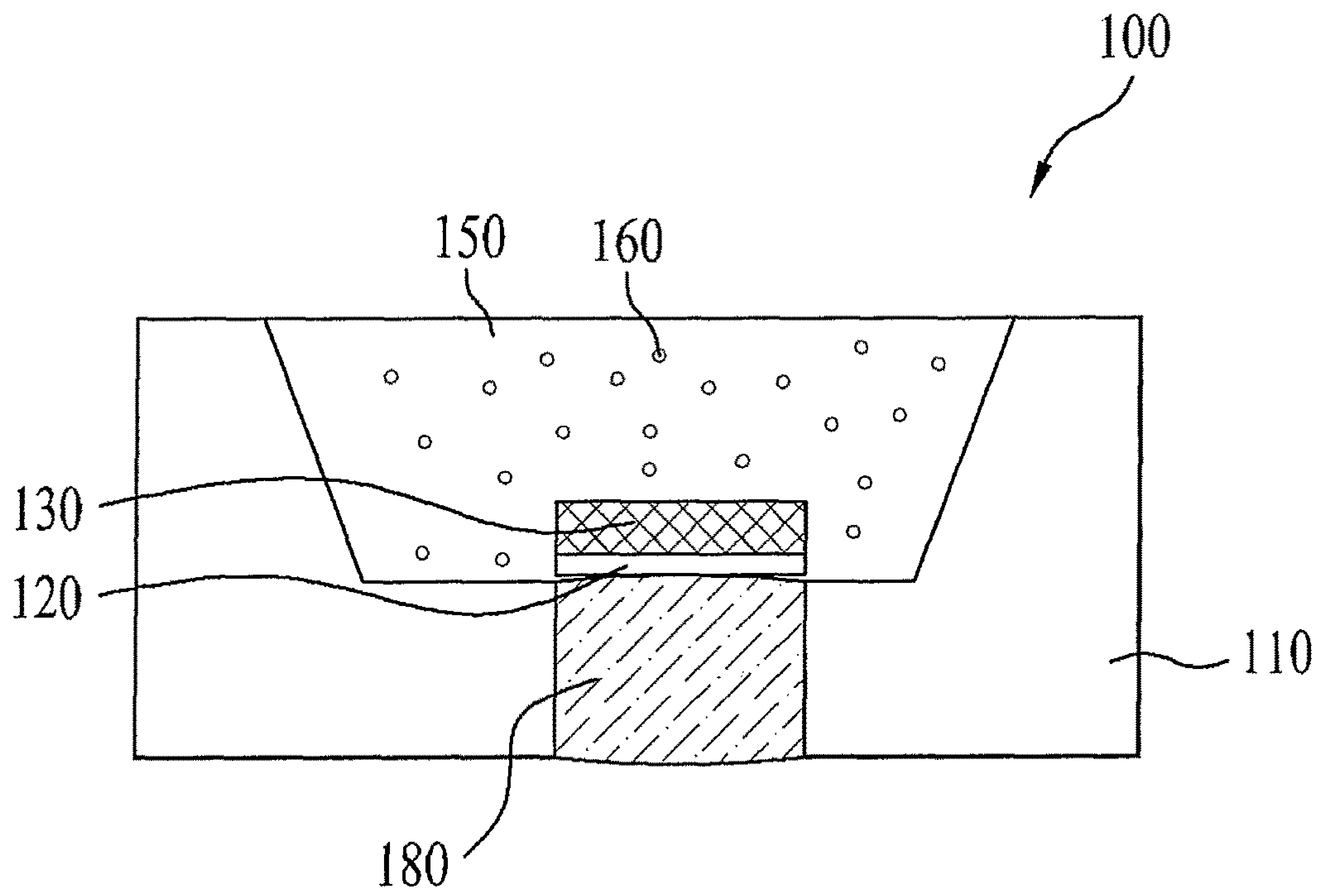
Fig. 1

(Related Art)



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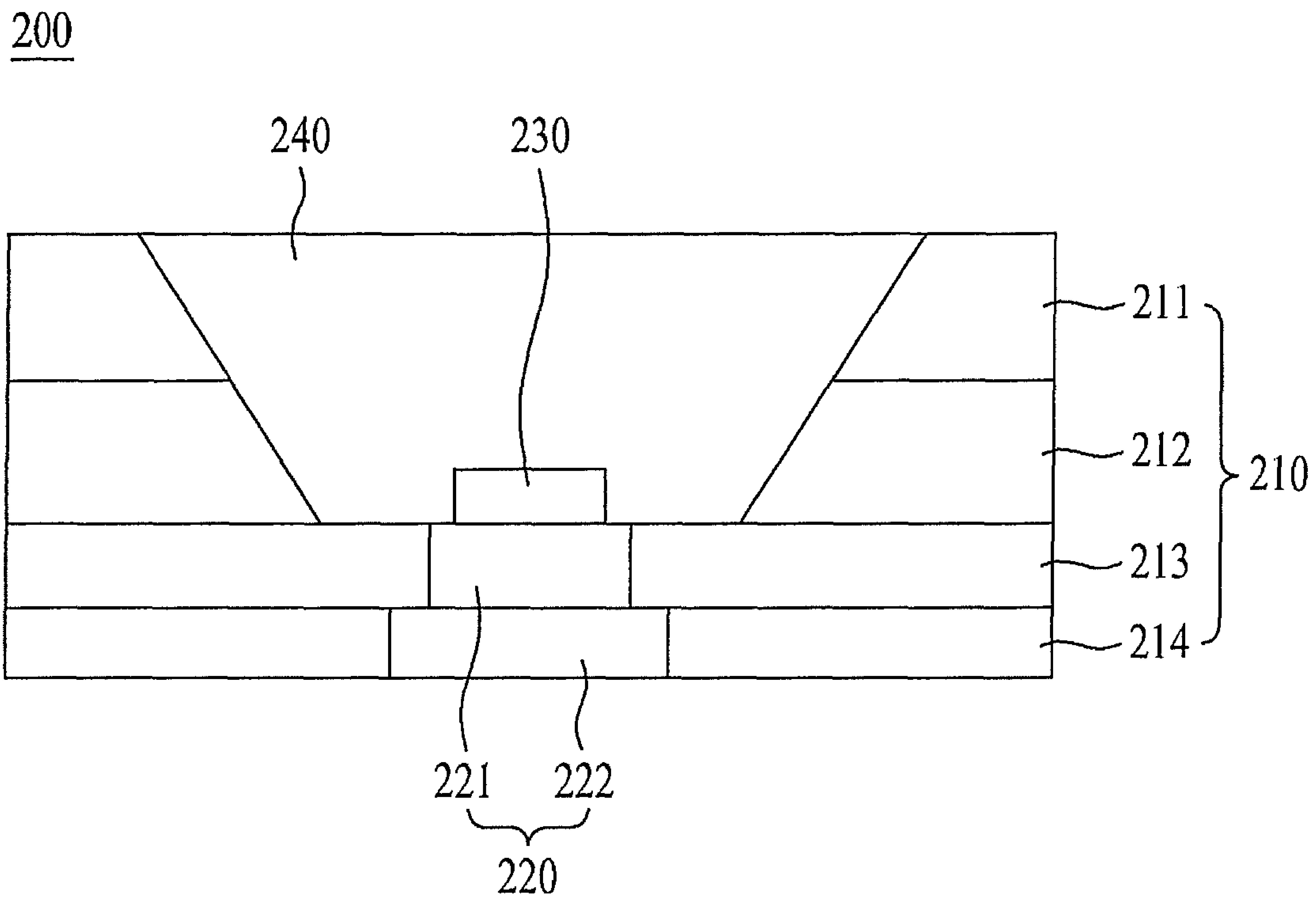

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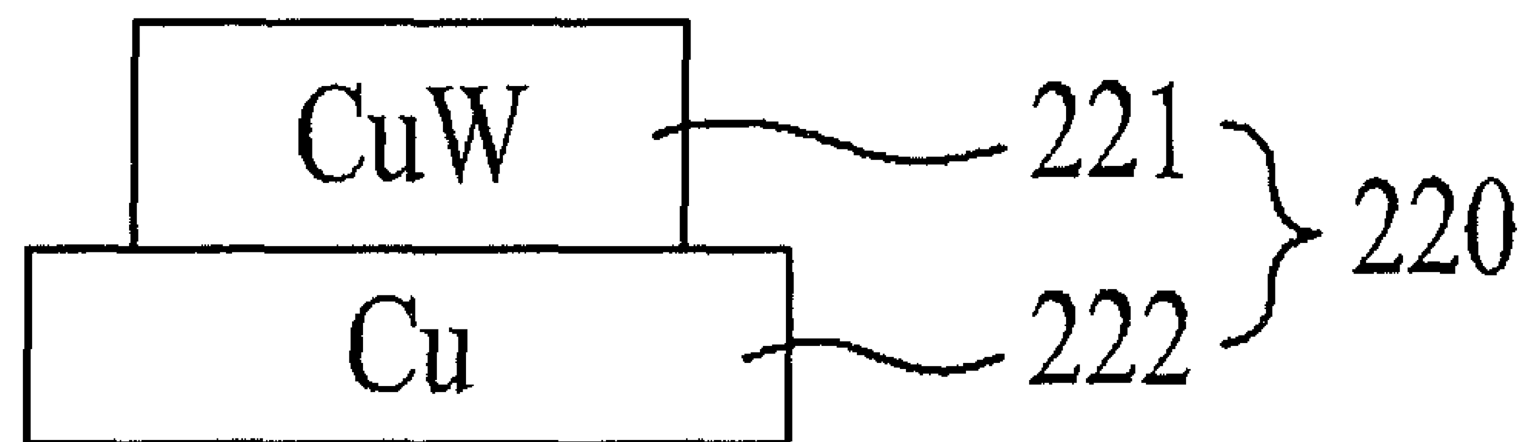

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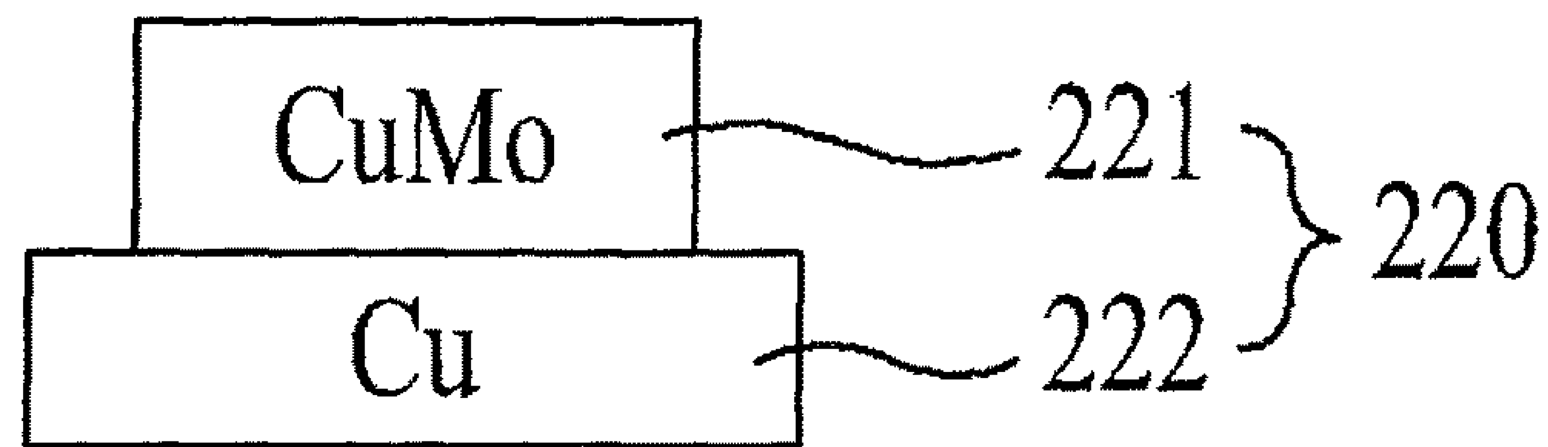

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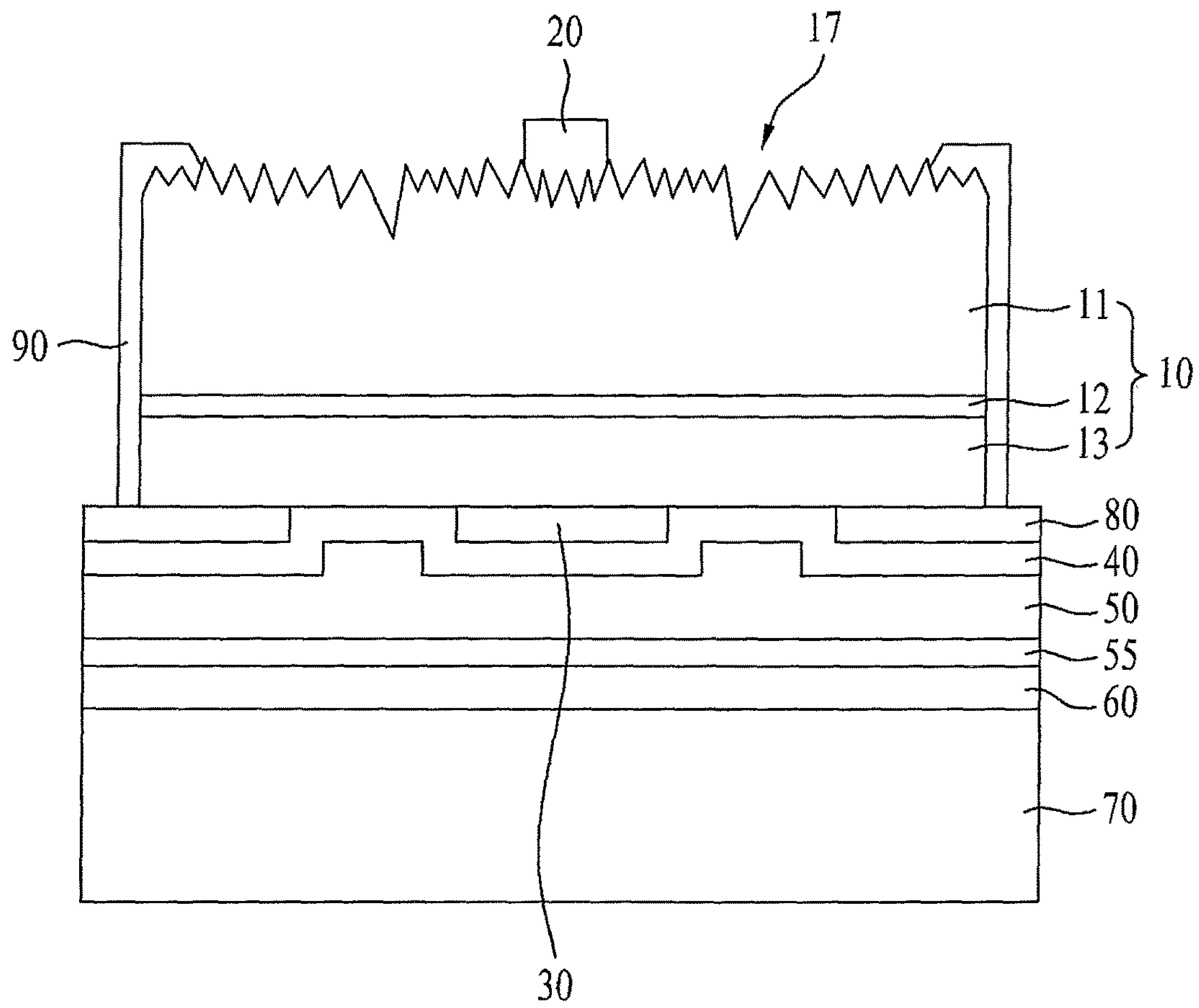

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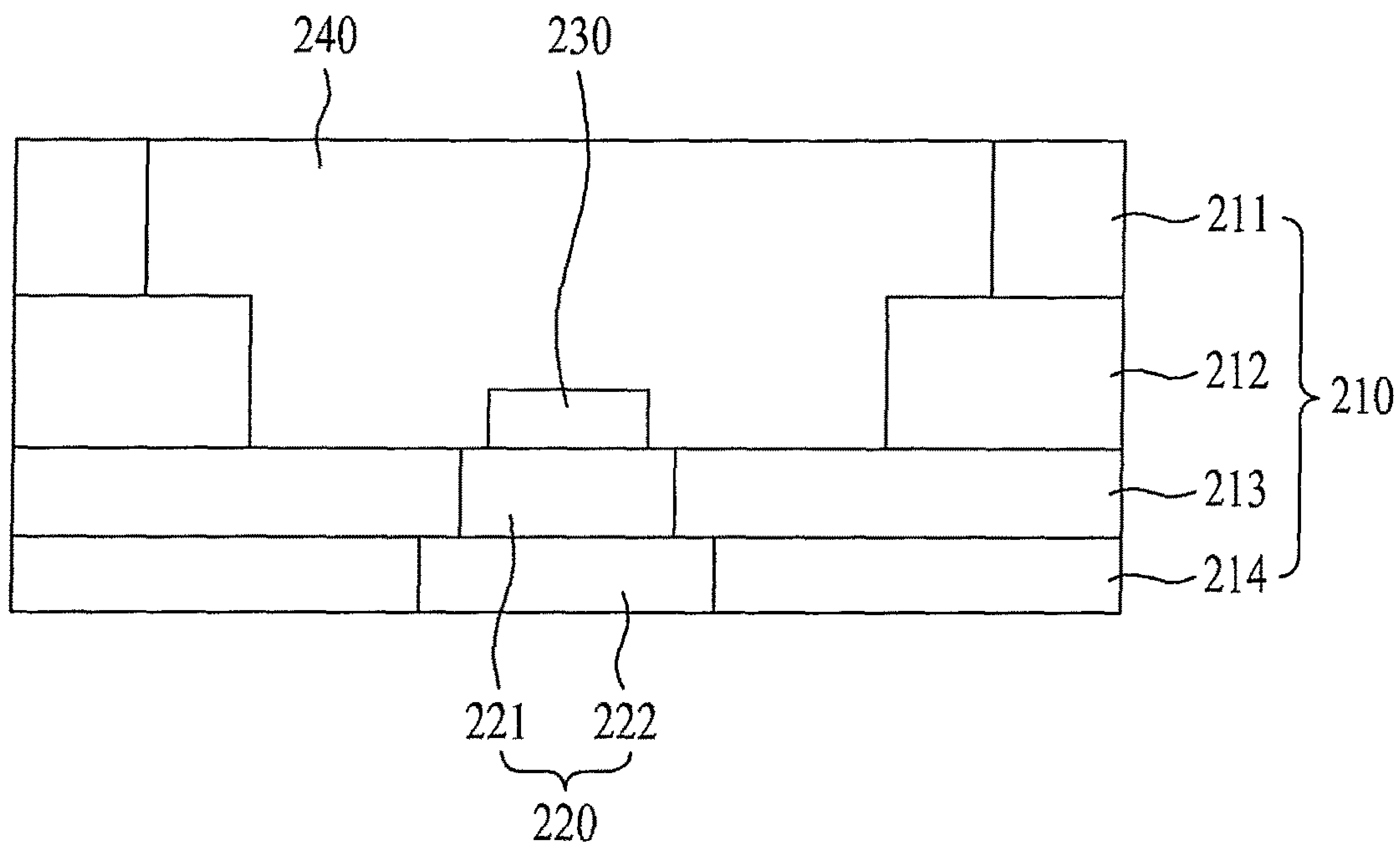

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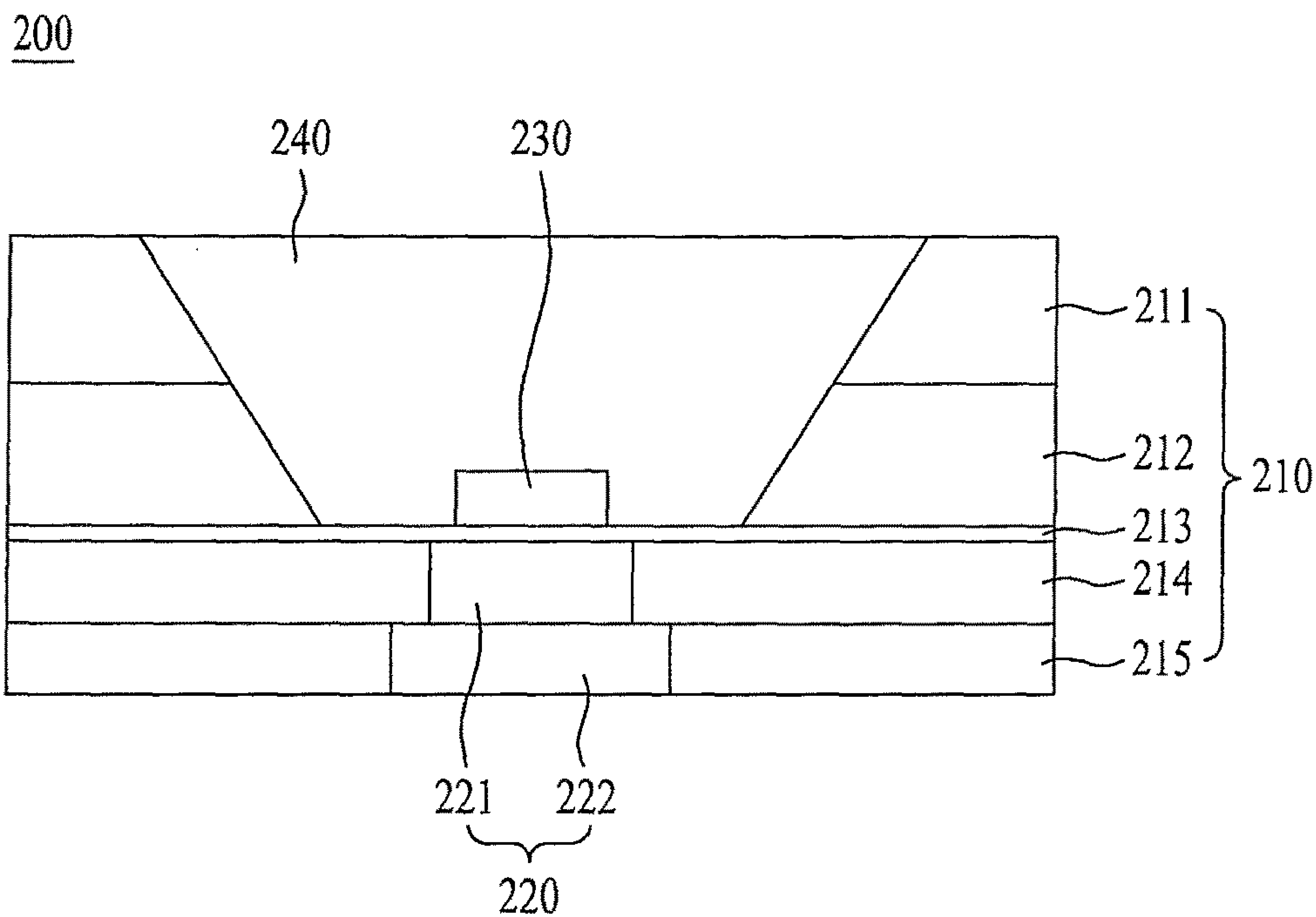

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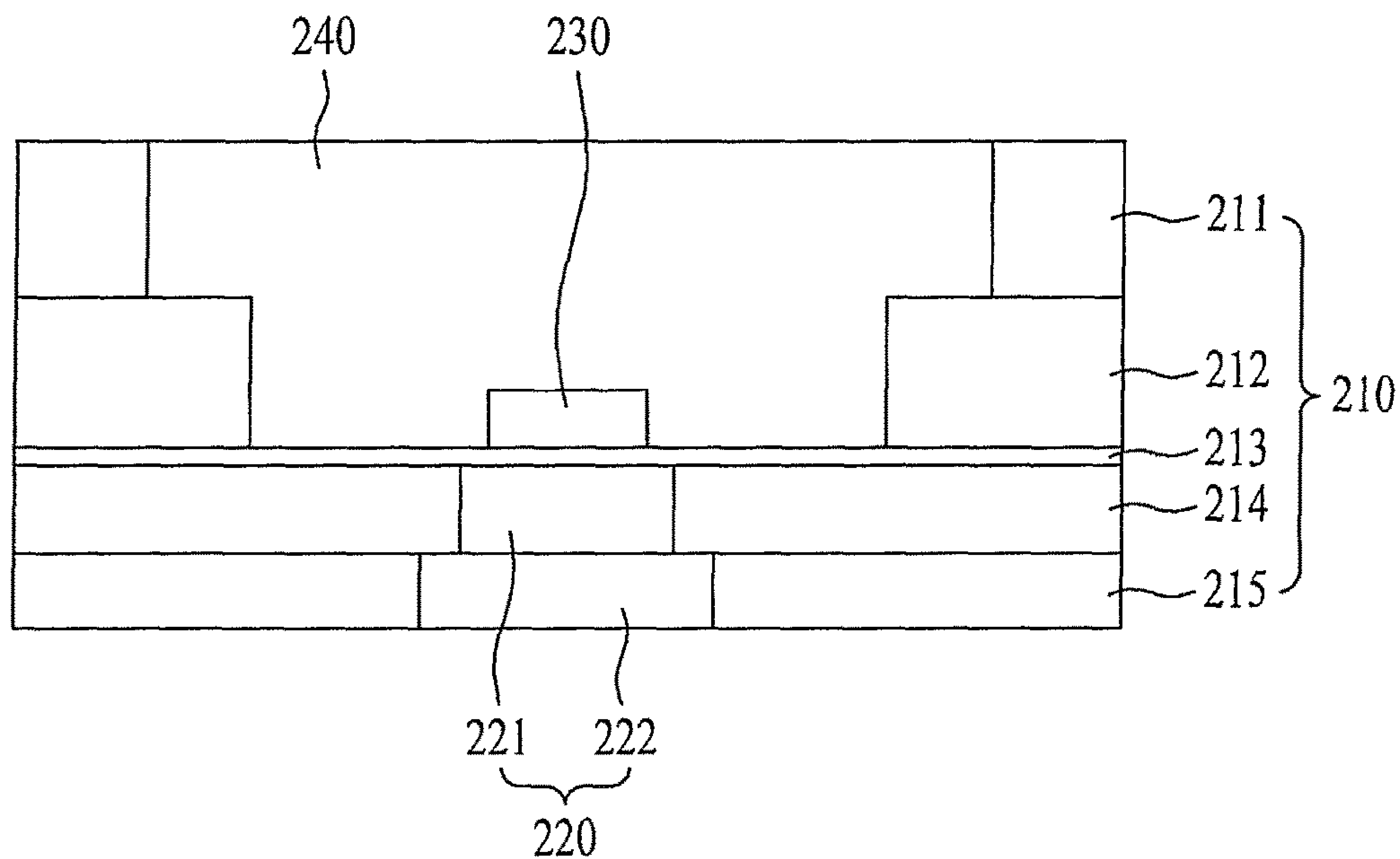

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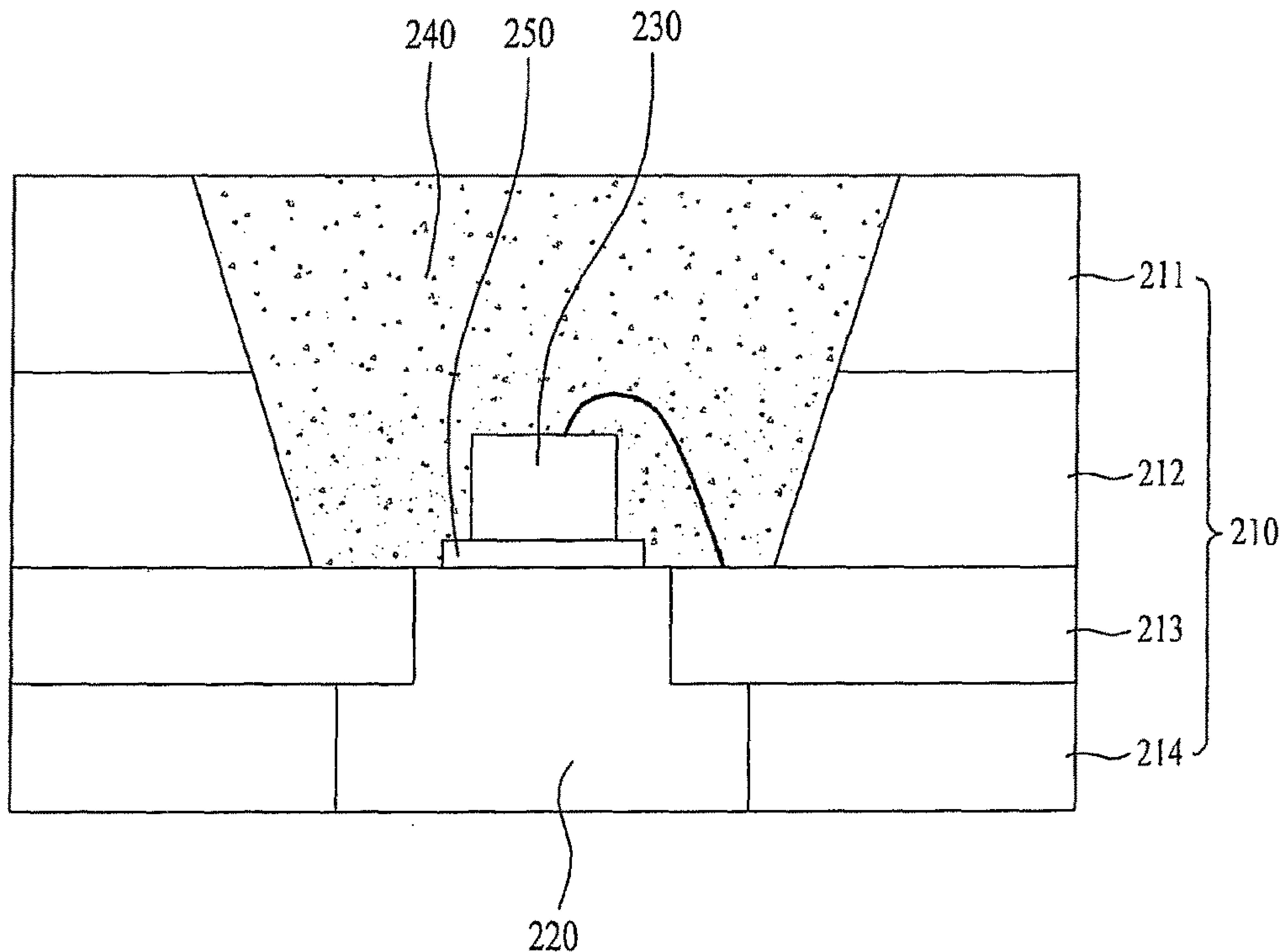

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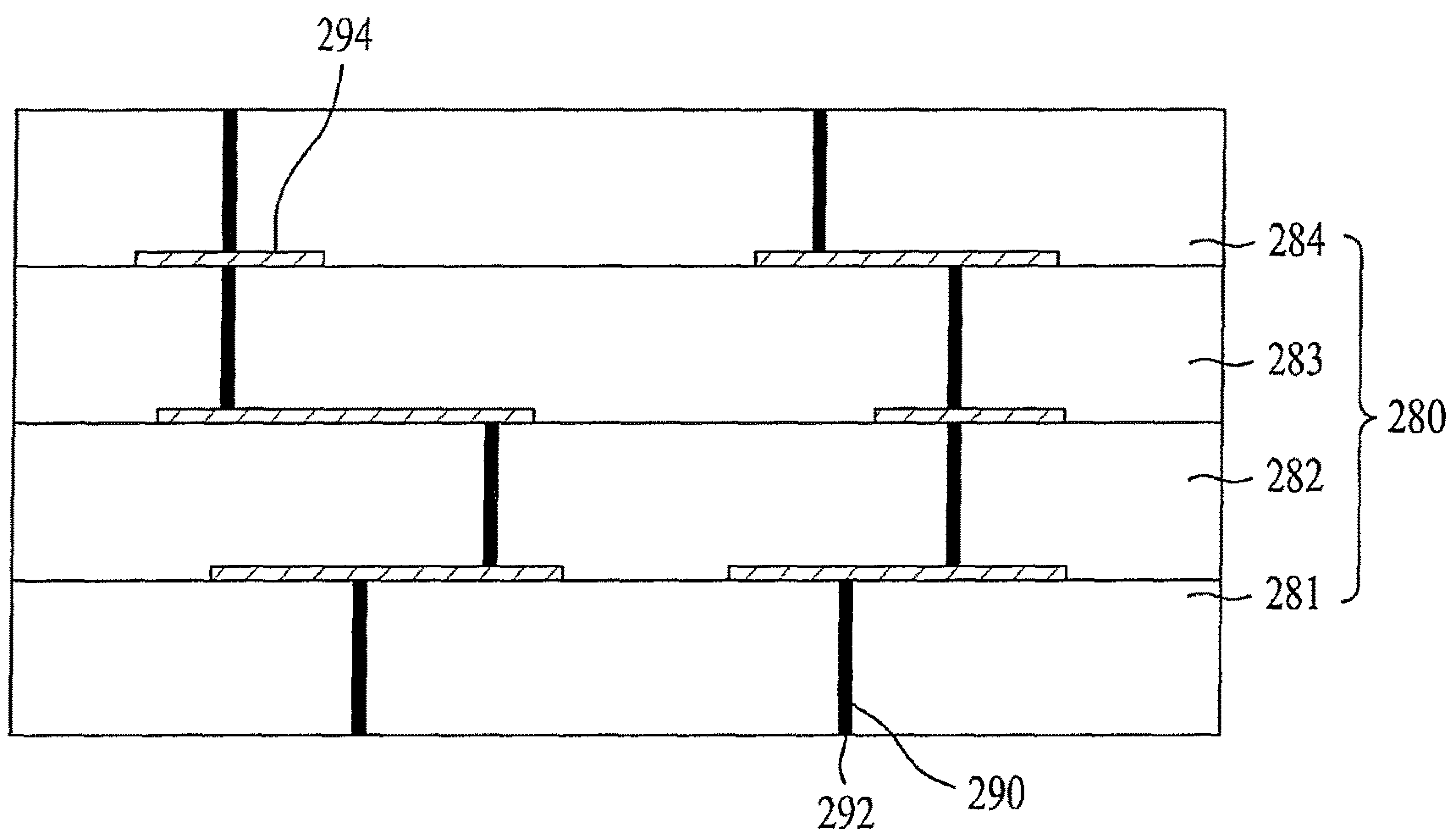

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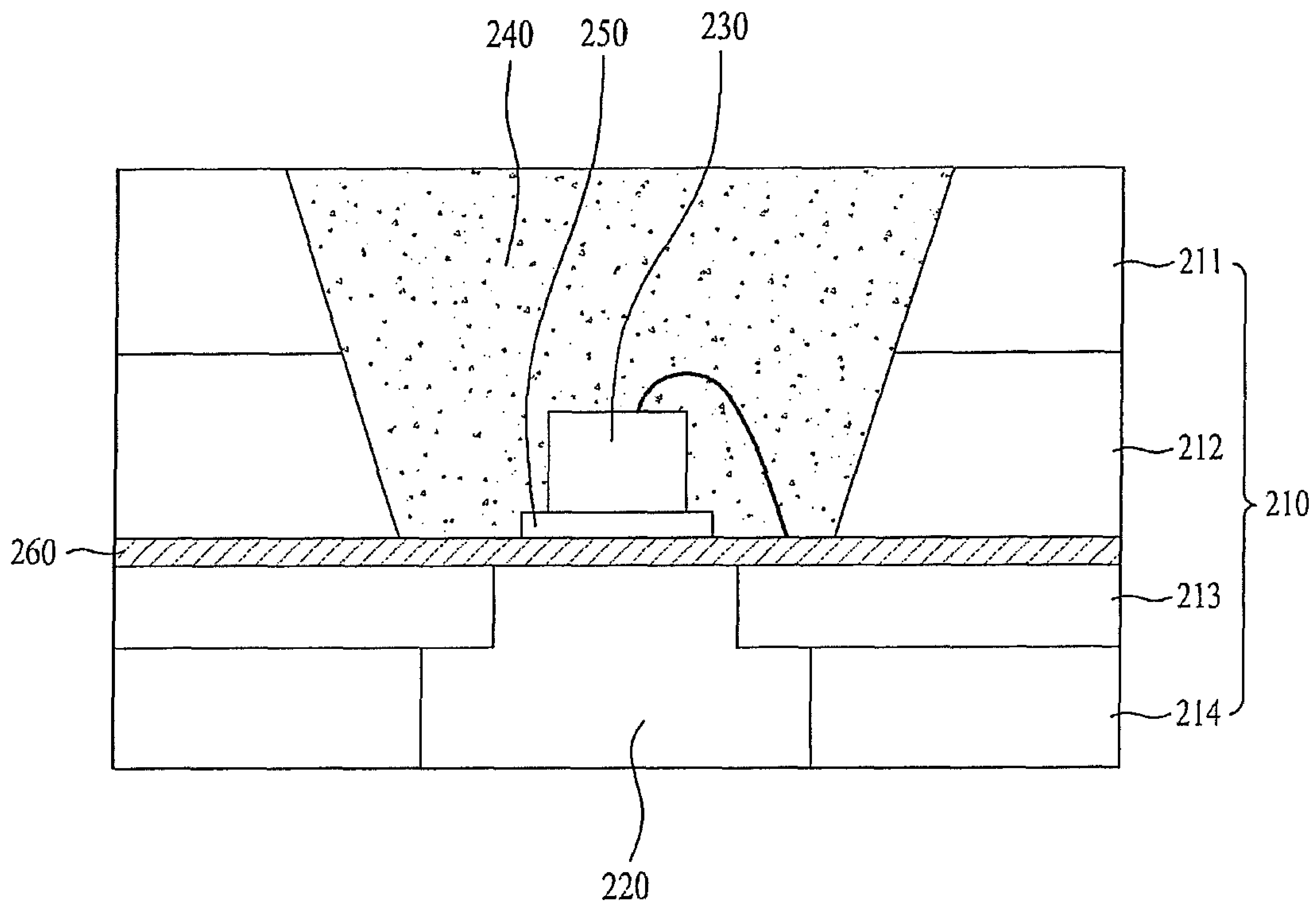

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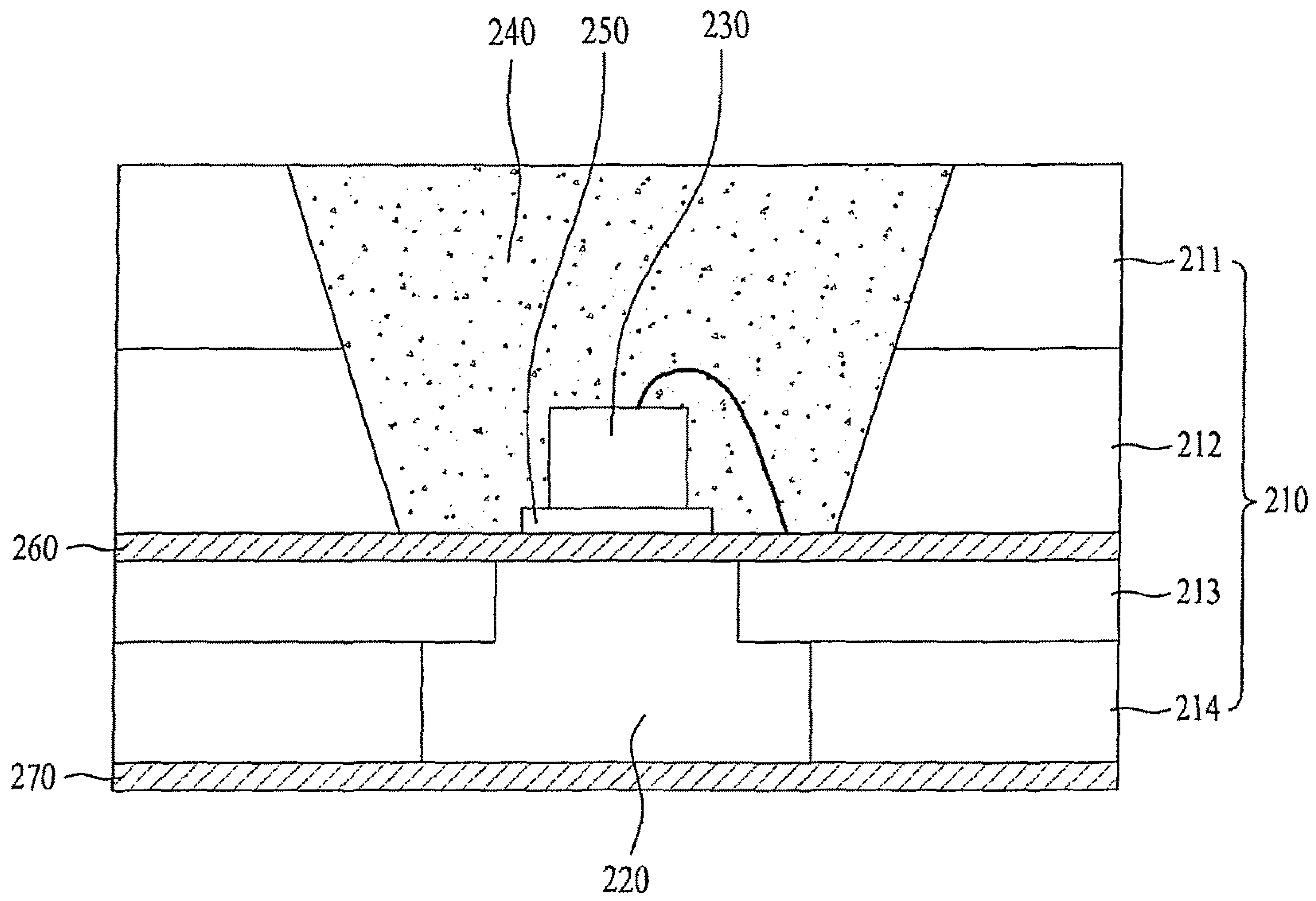

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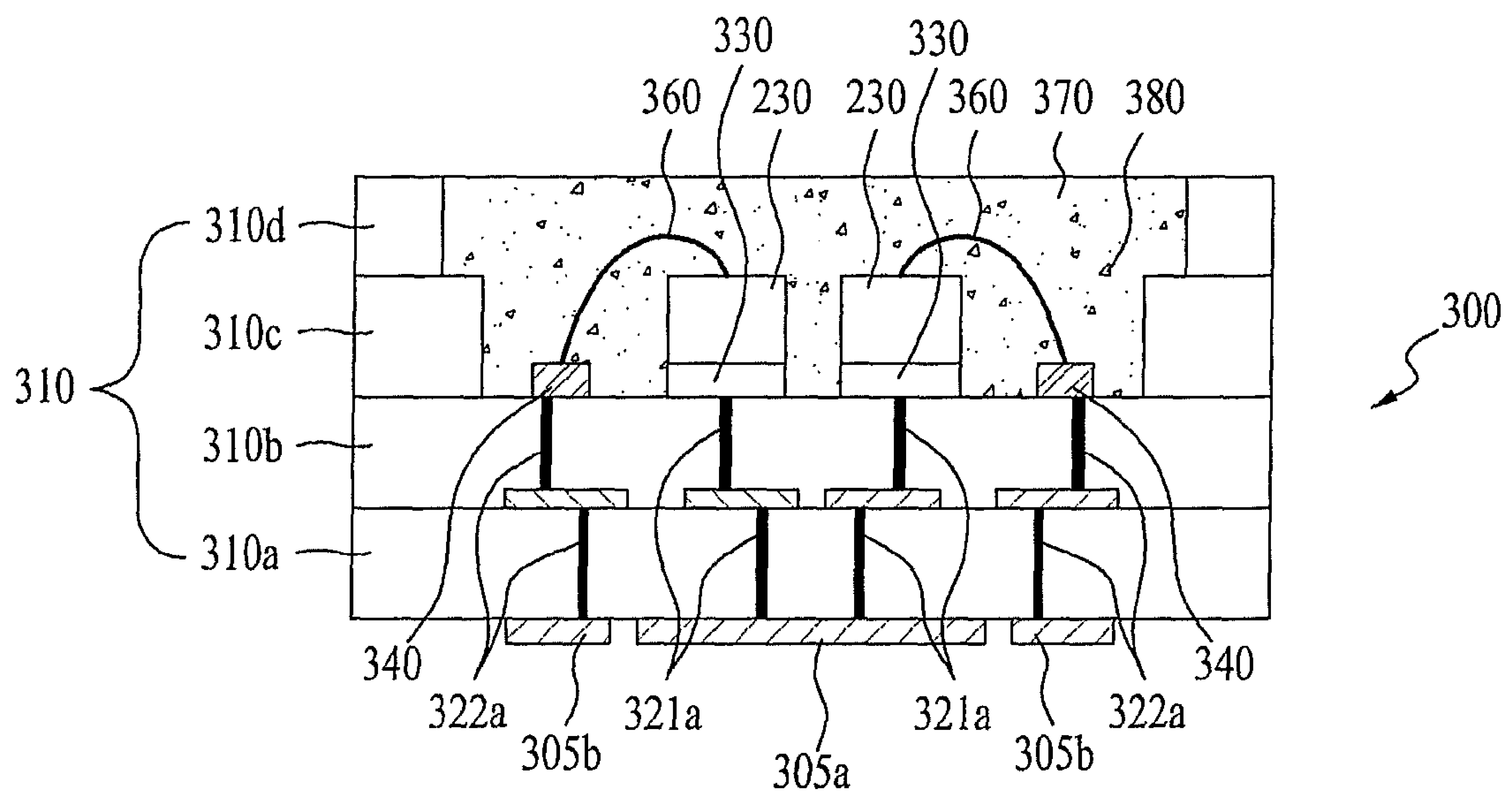

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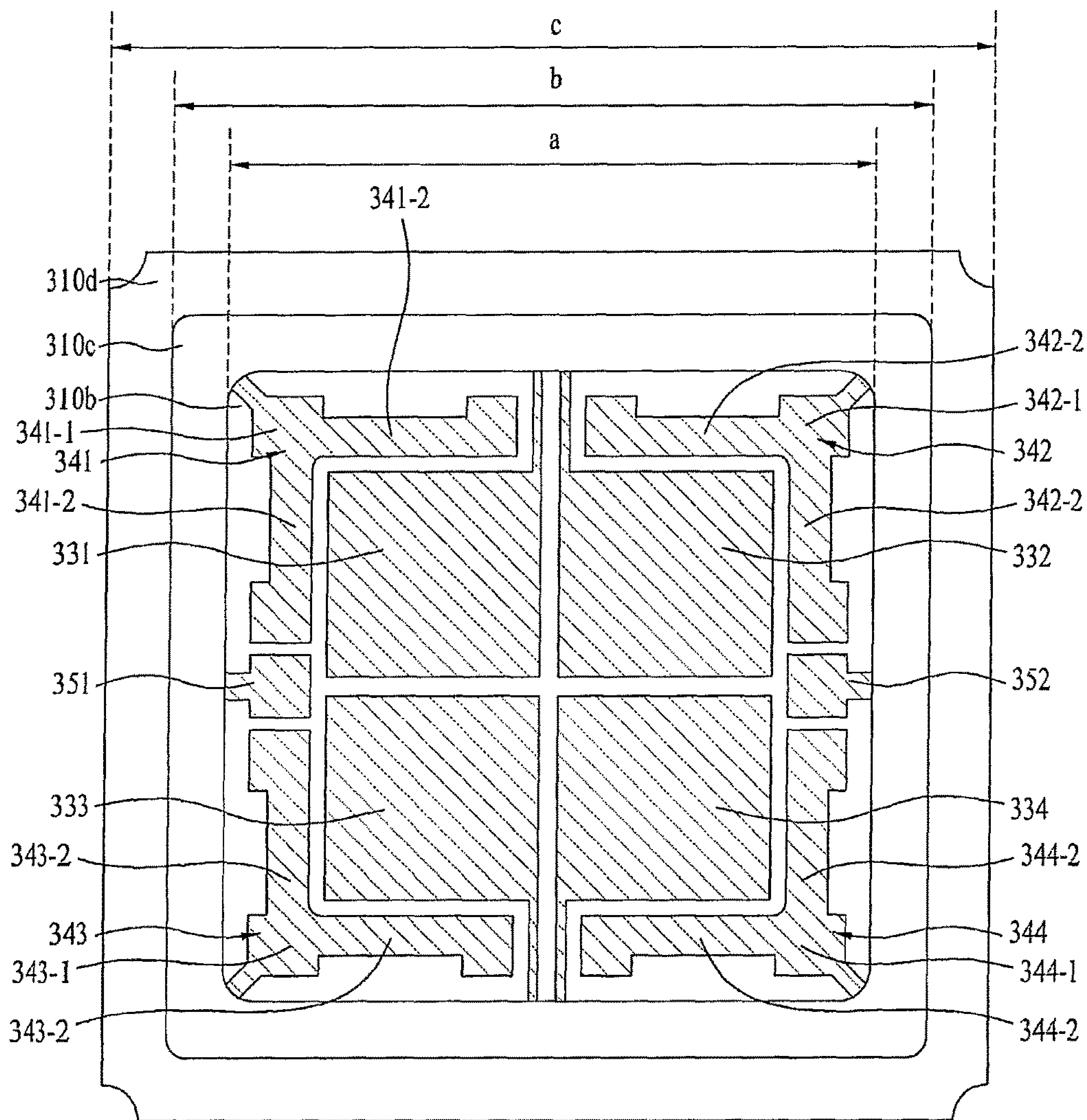

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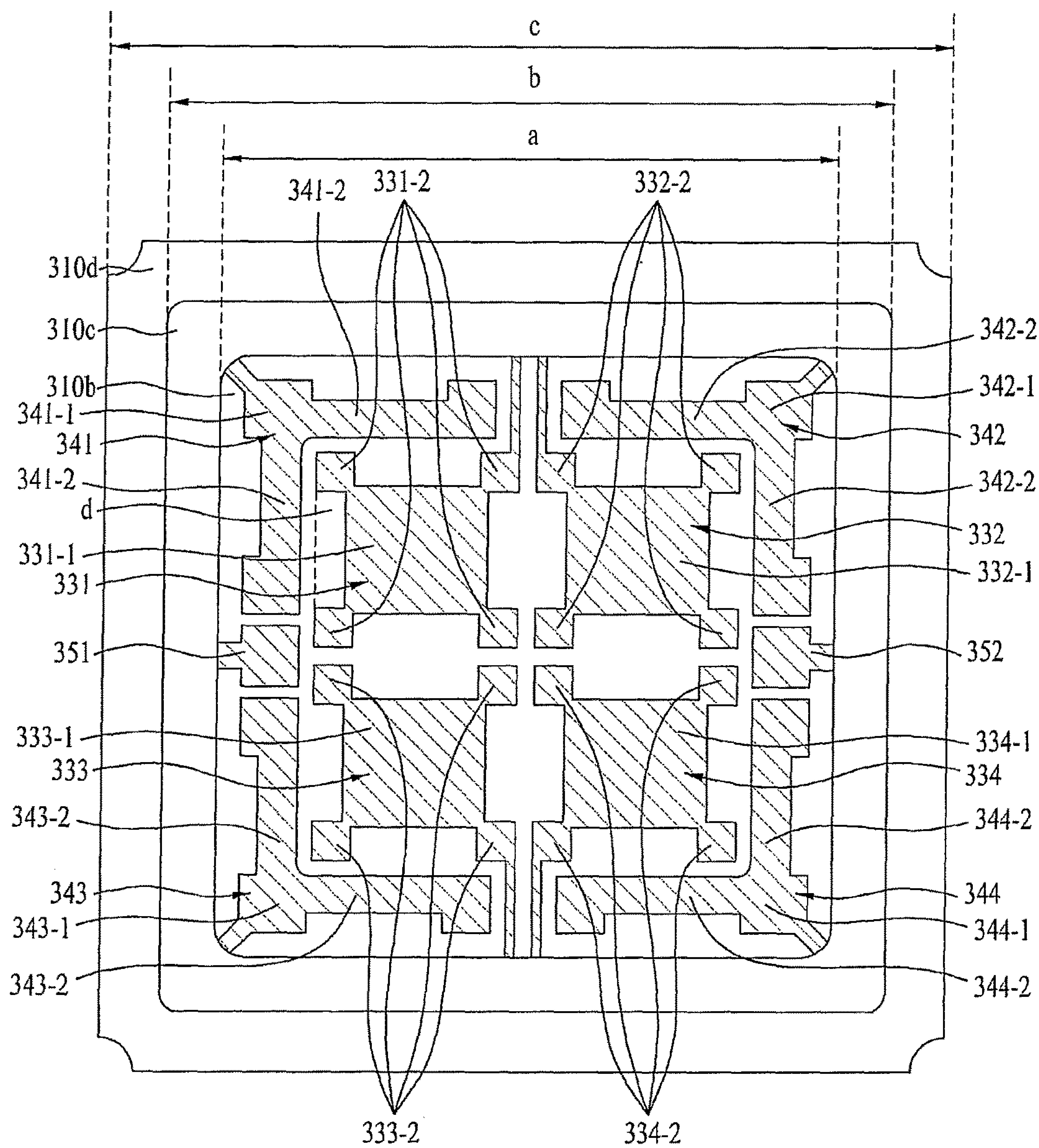

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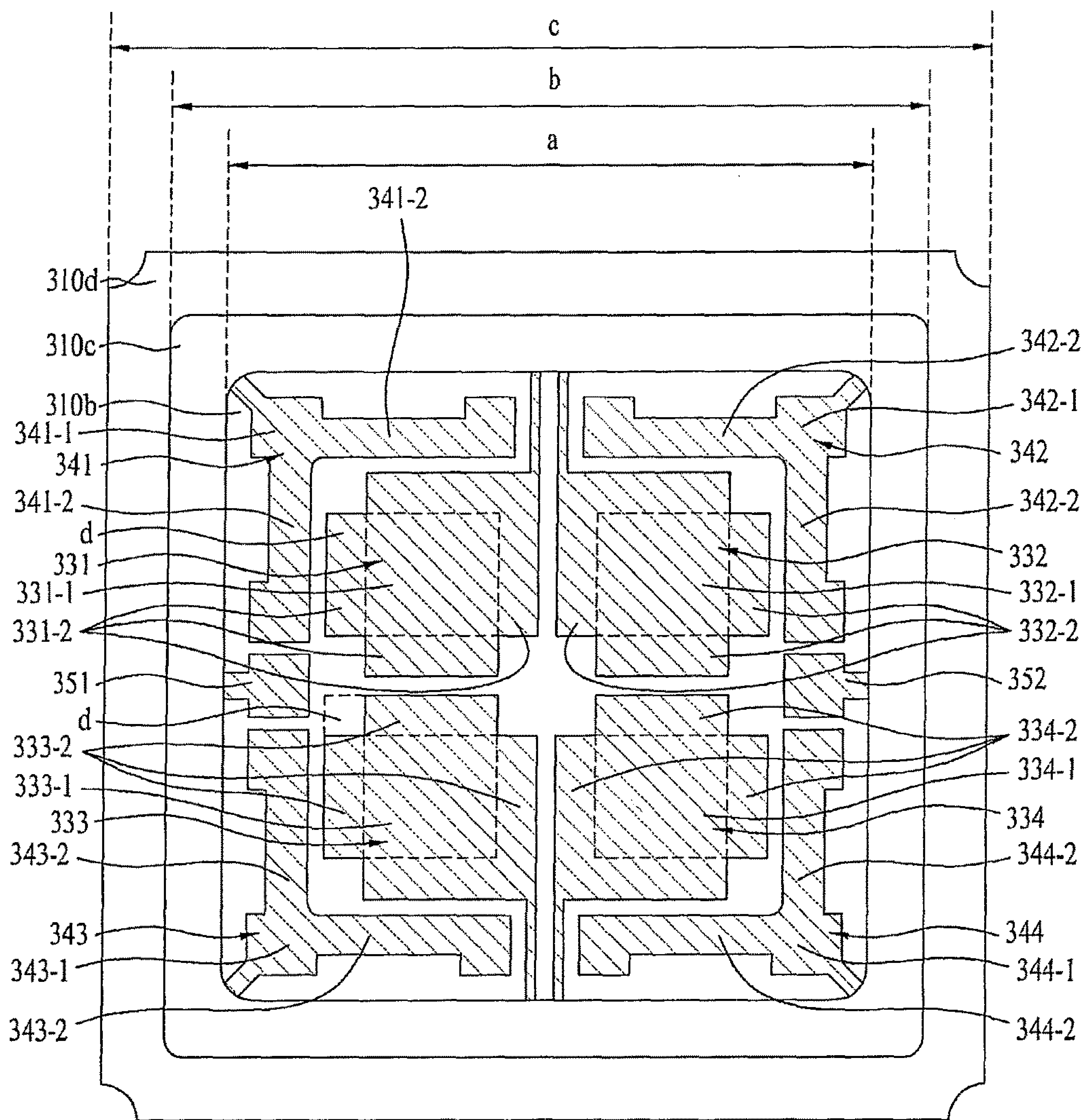

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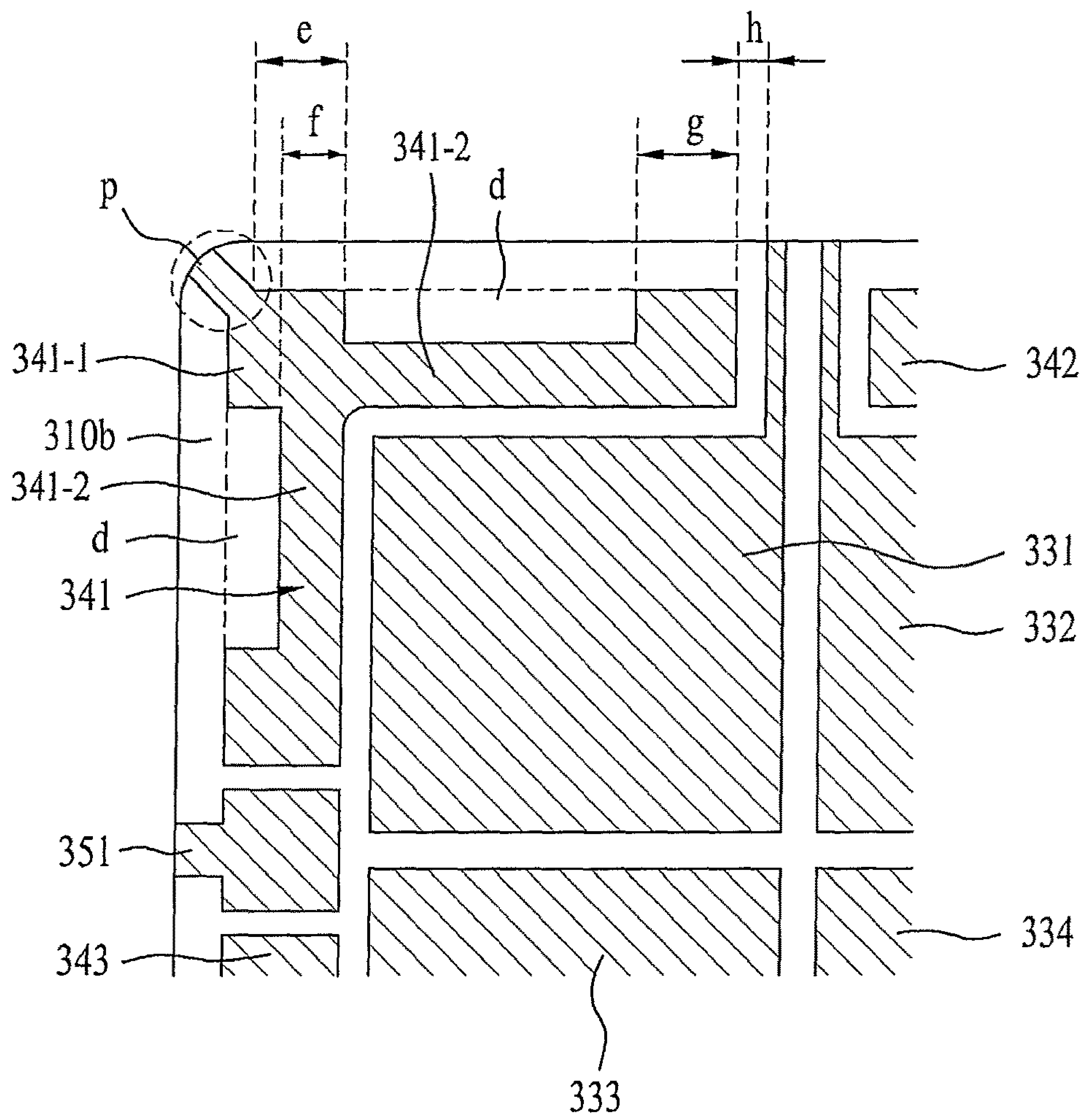

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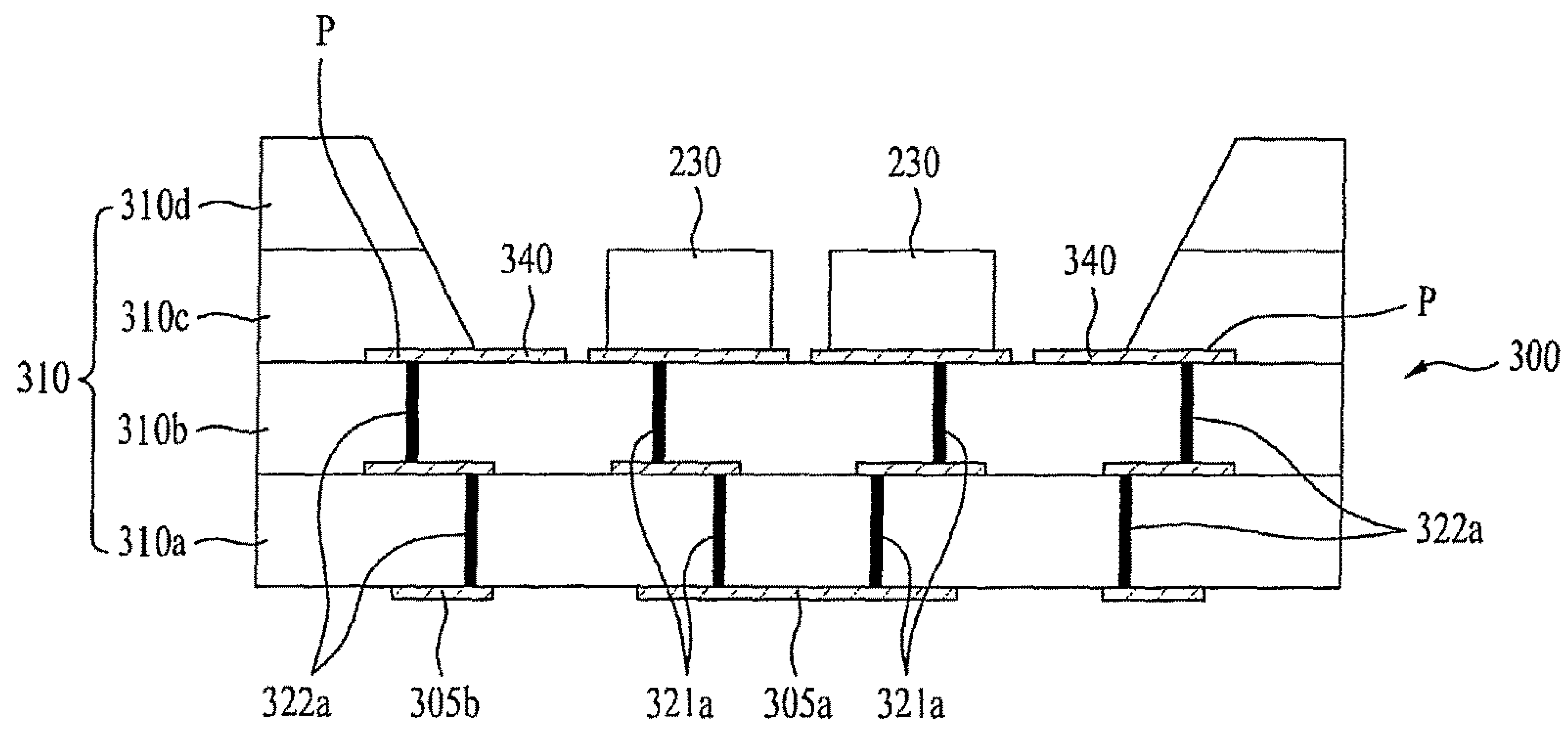

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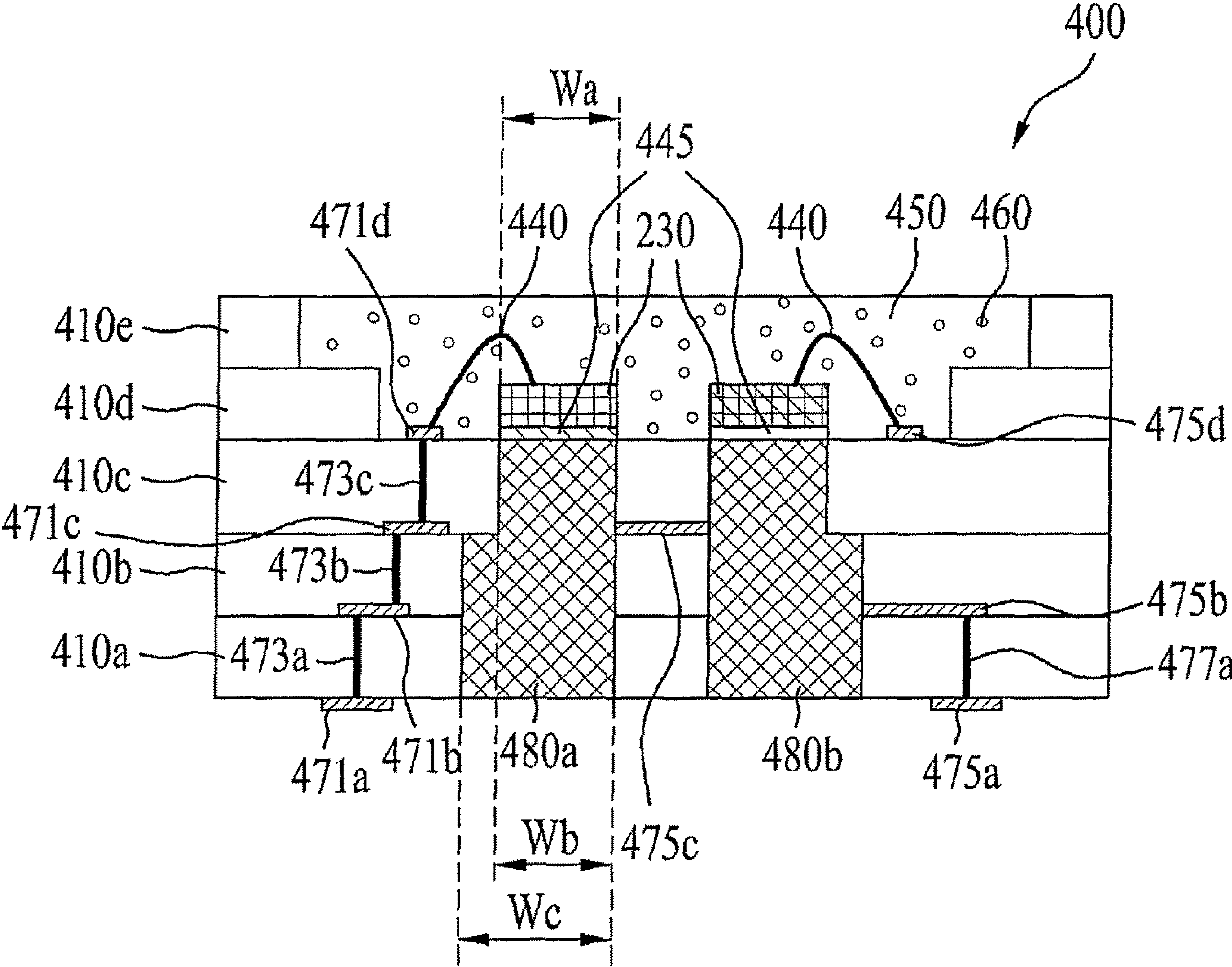

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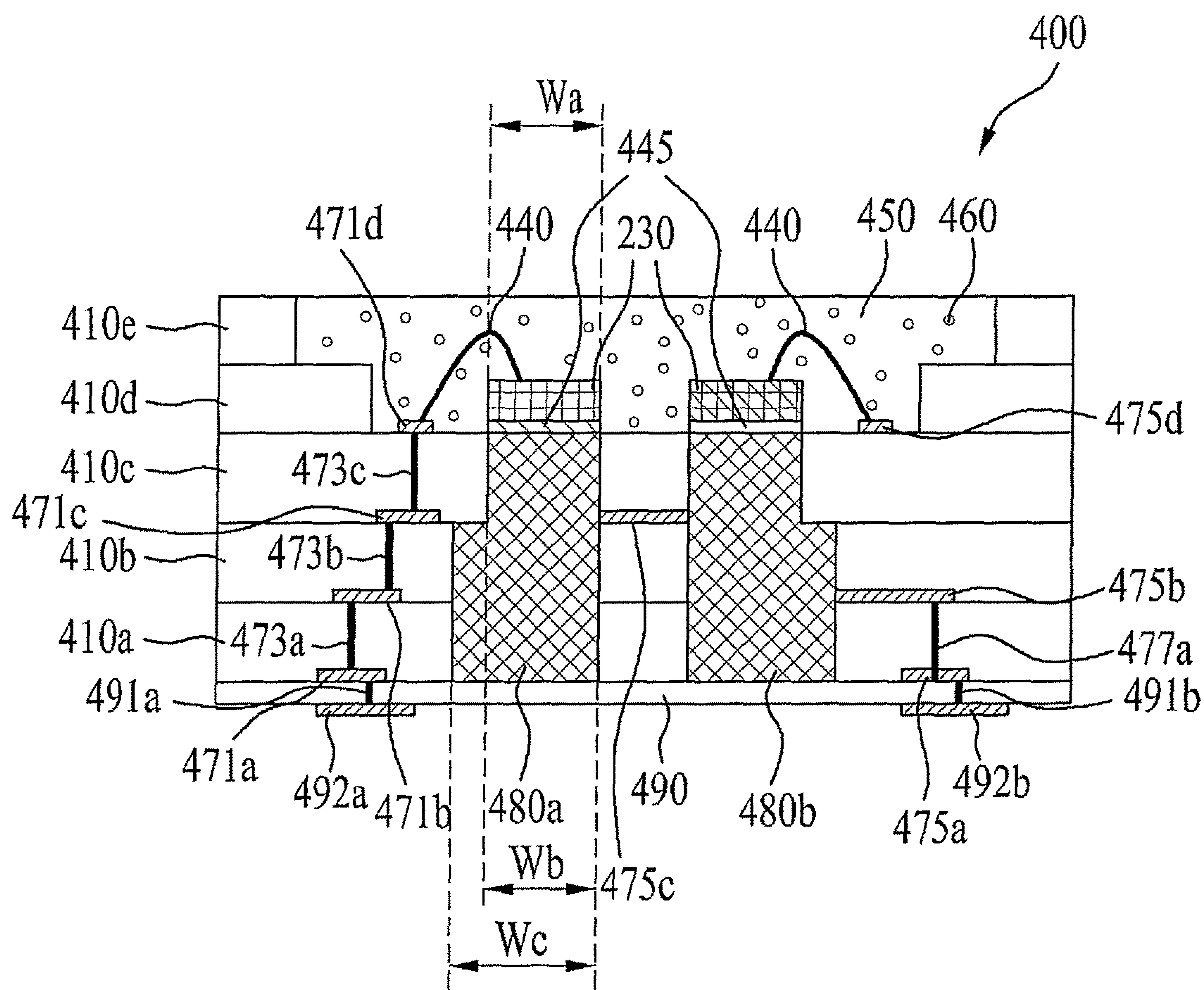

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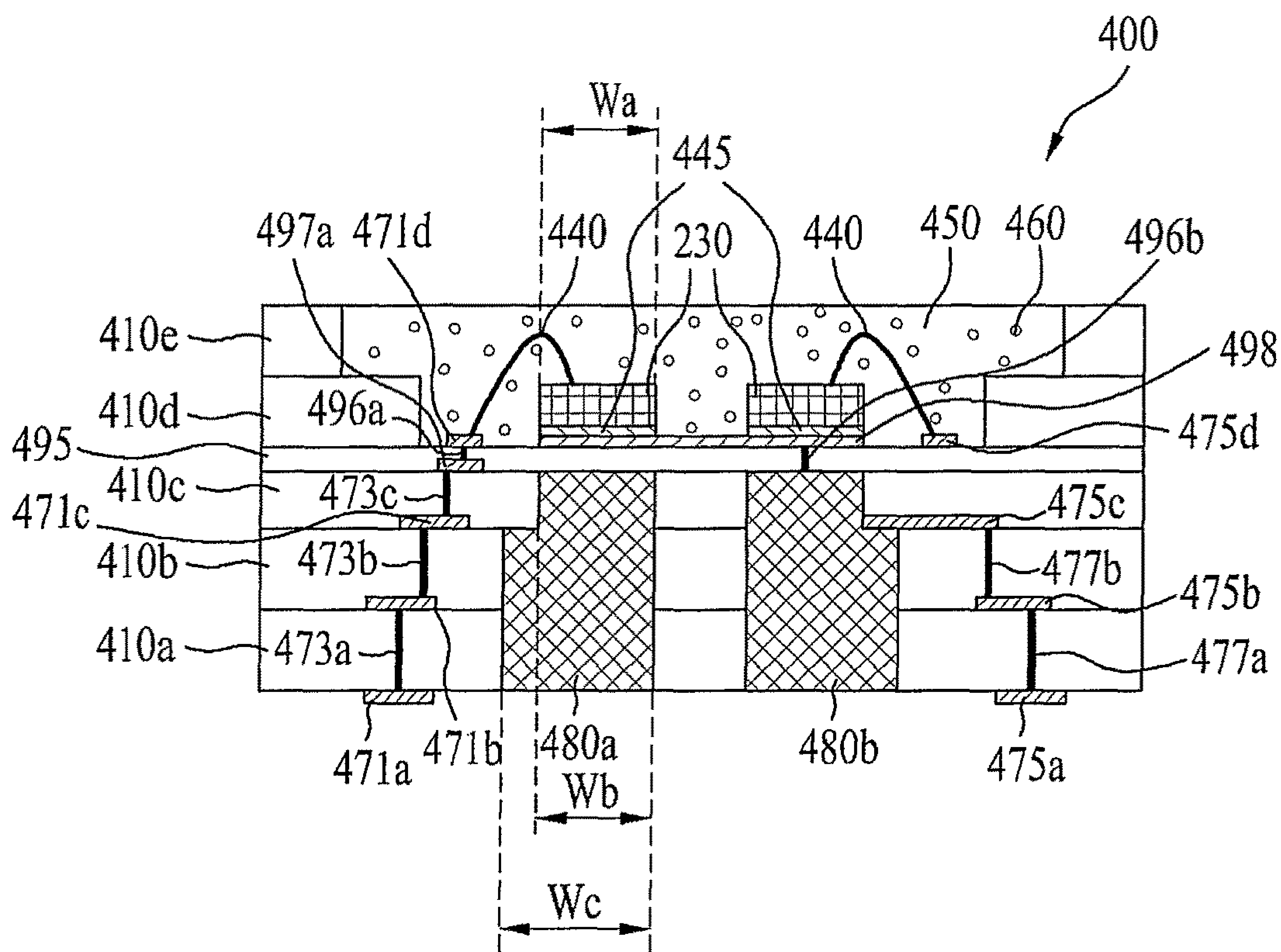

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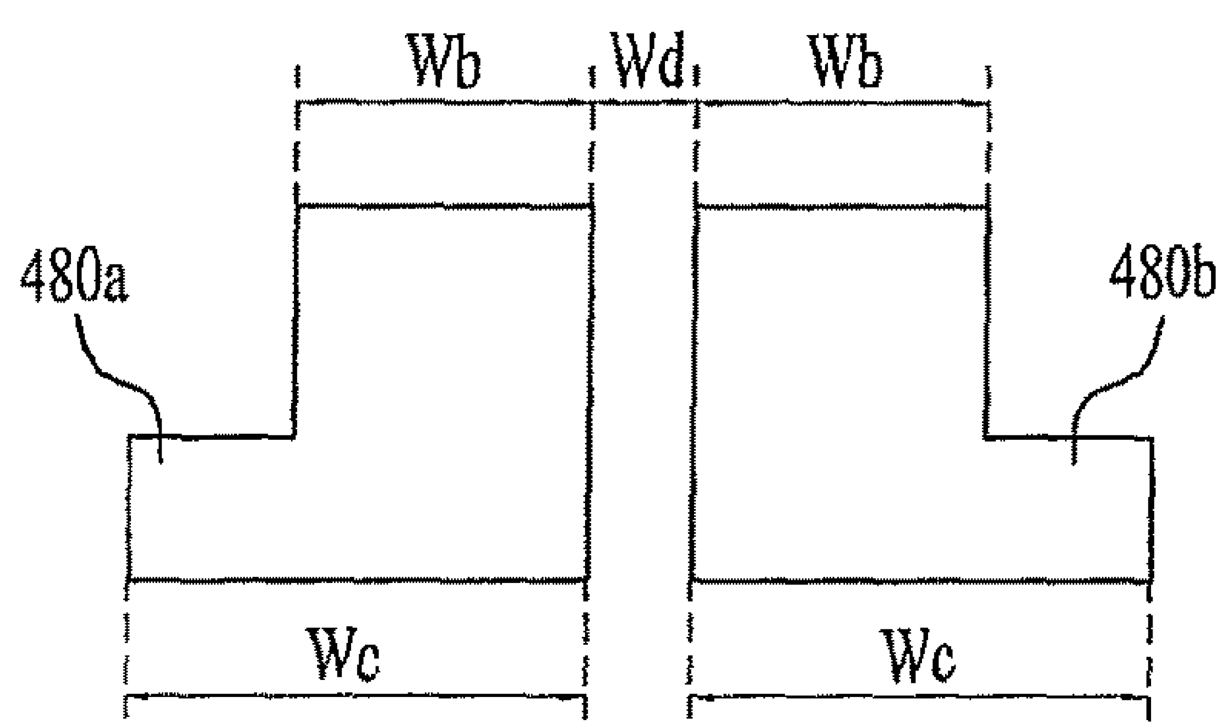

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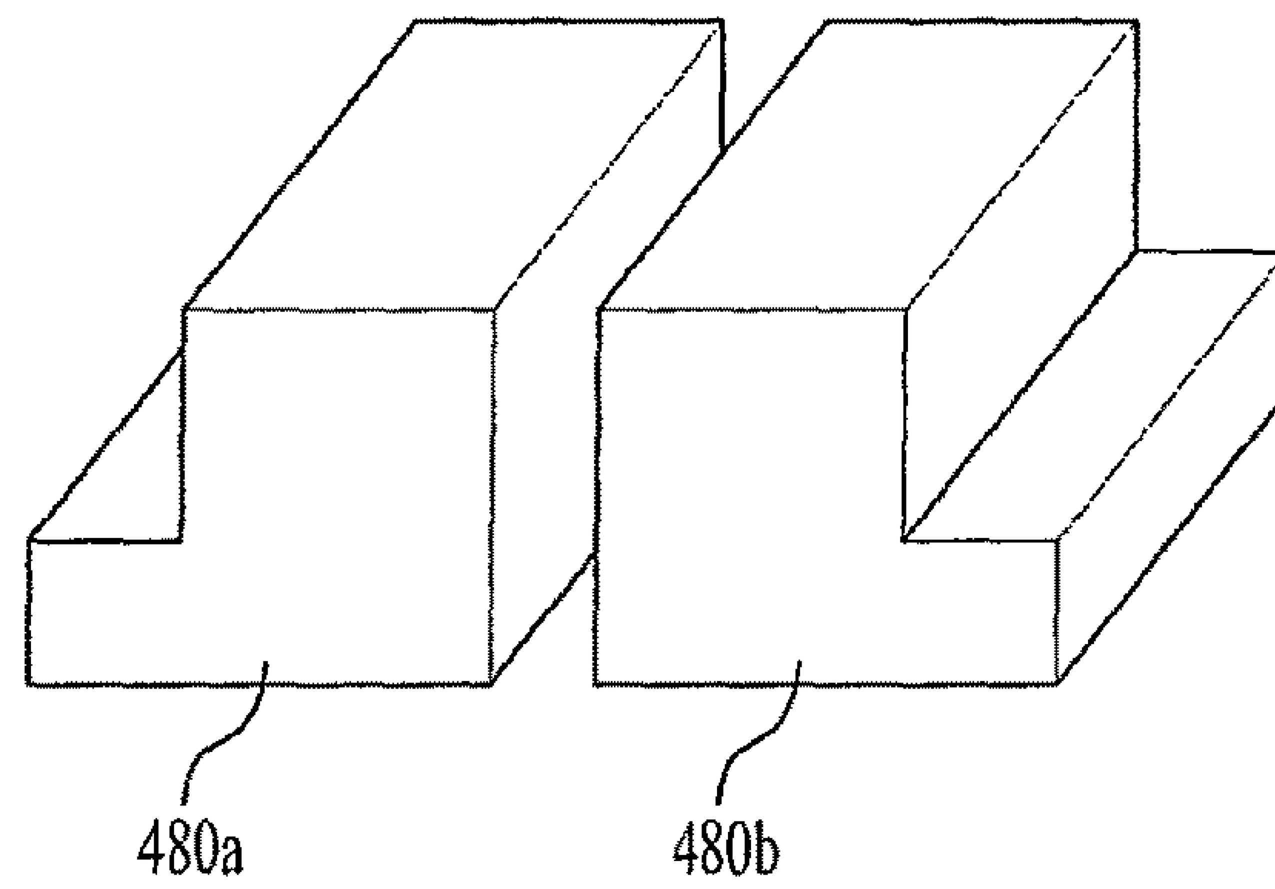

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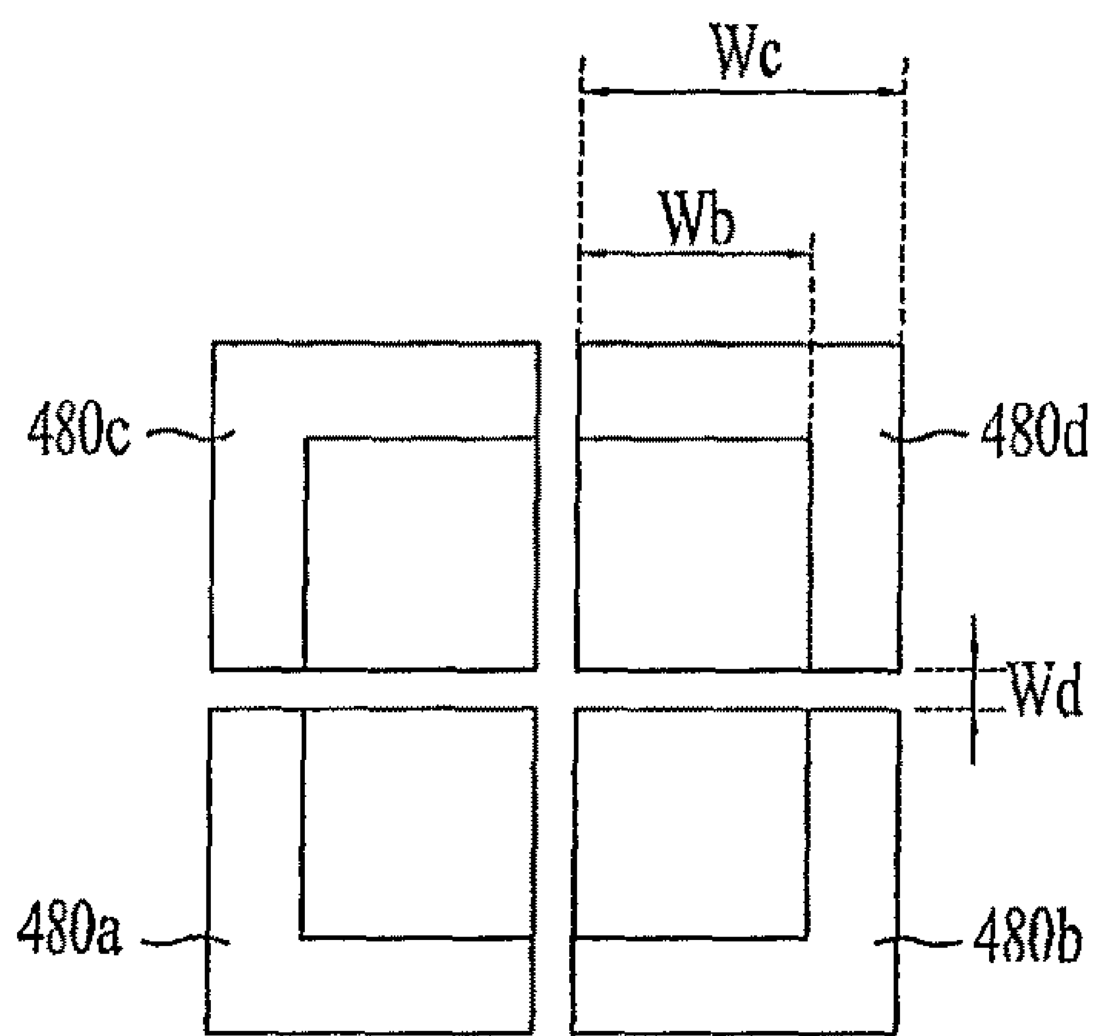

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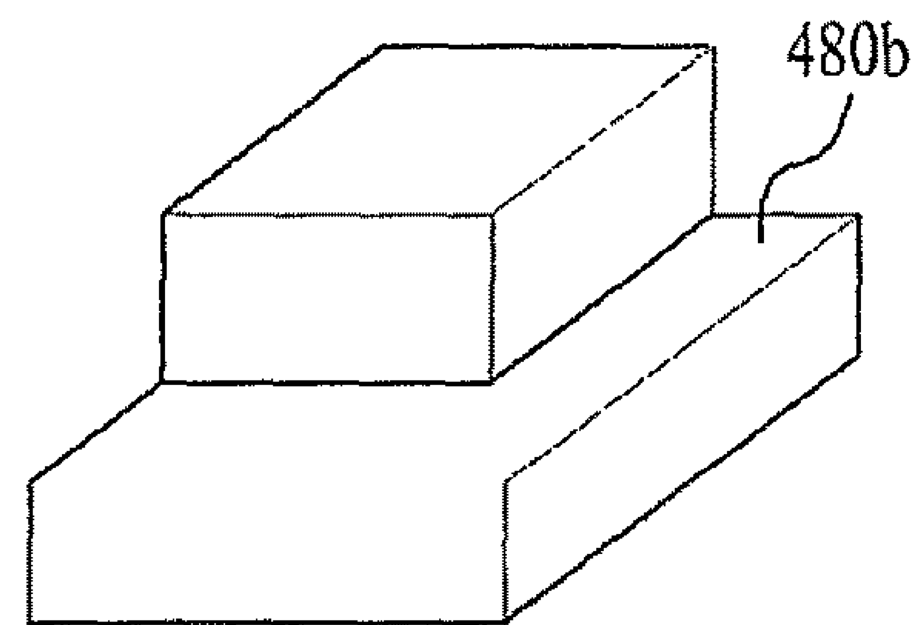

(d)

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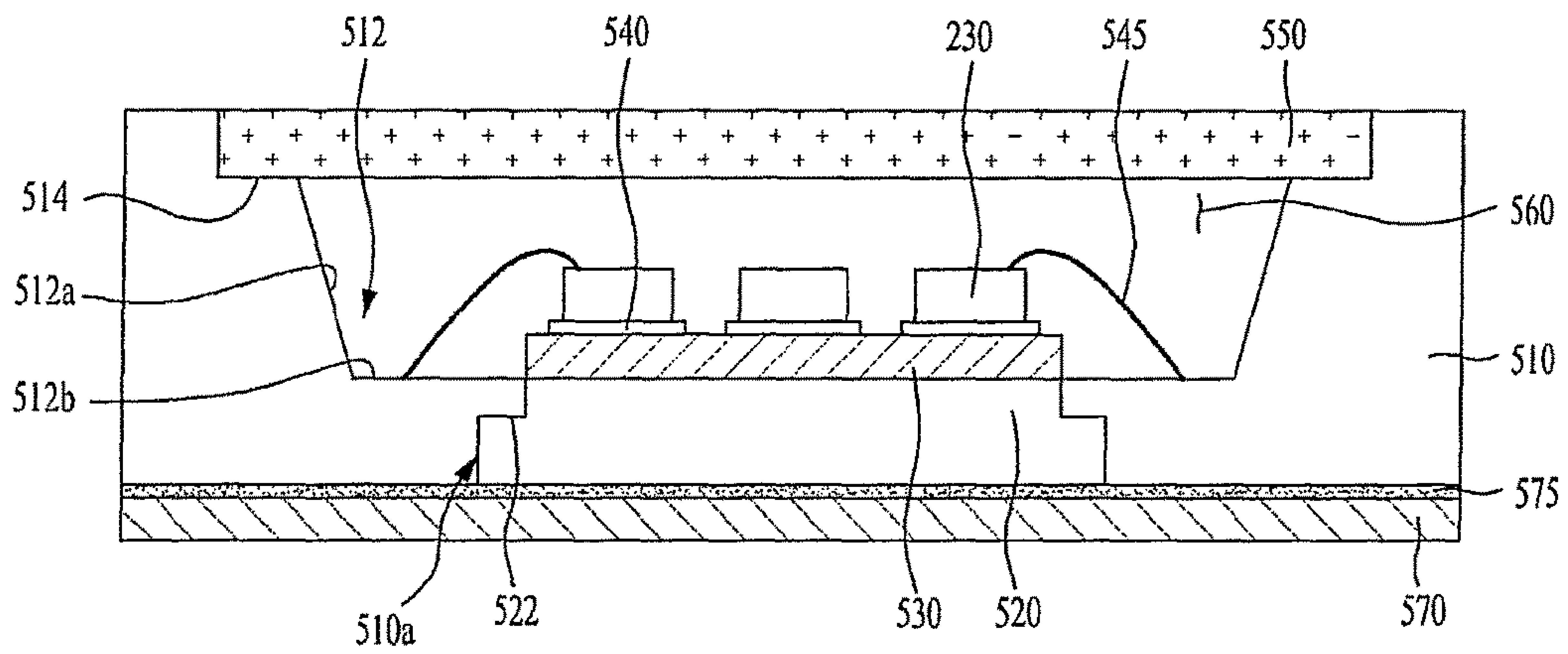

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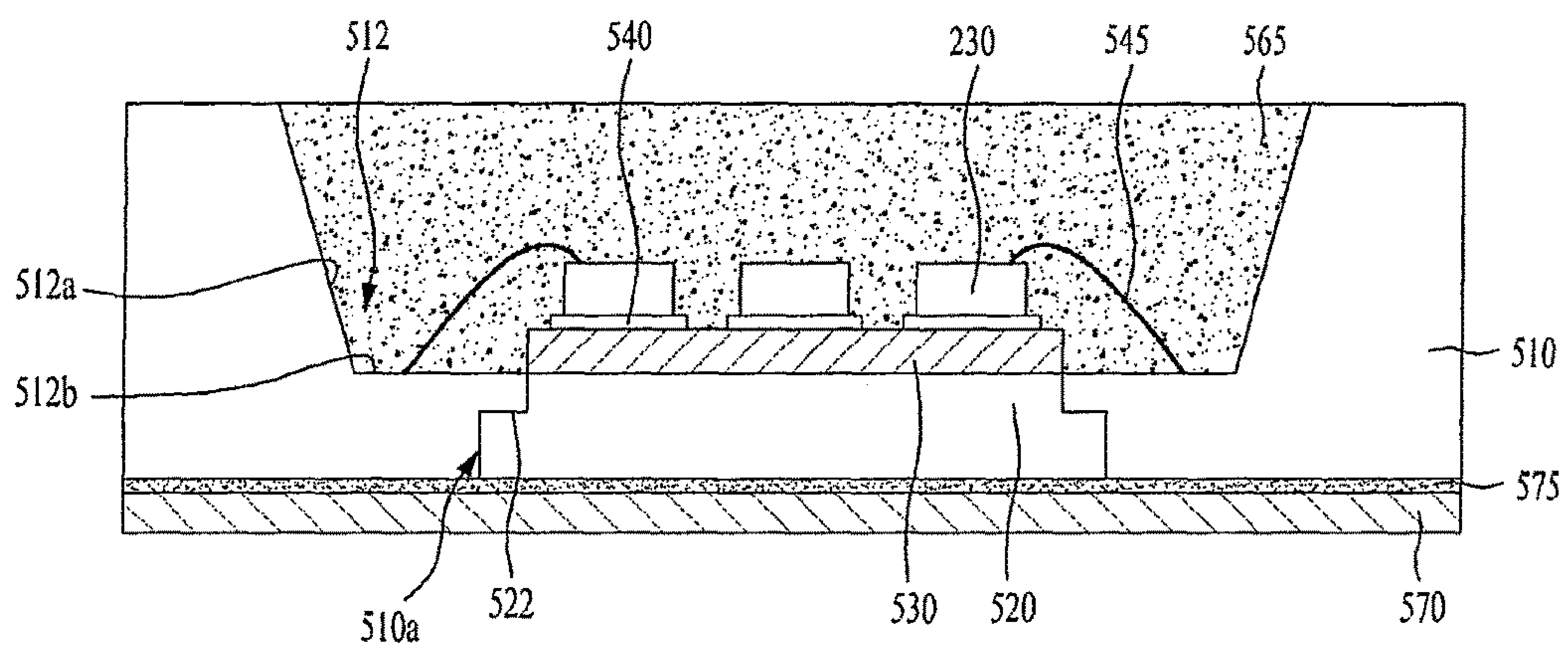

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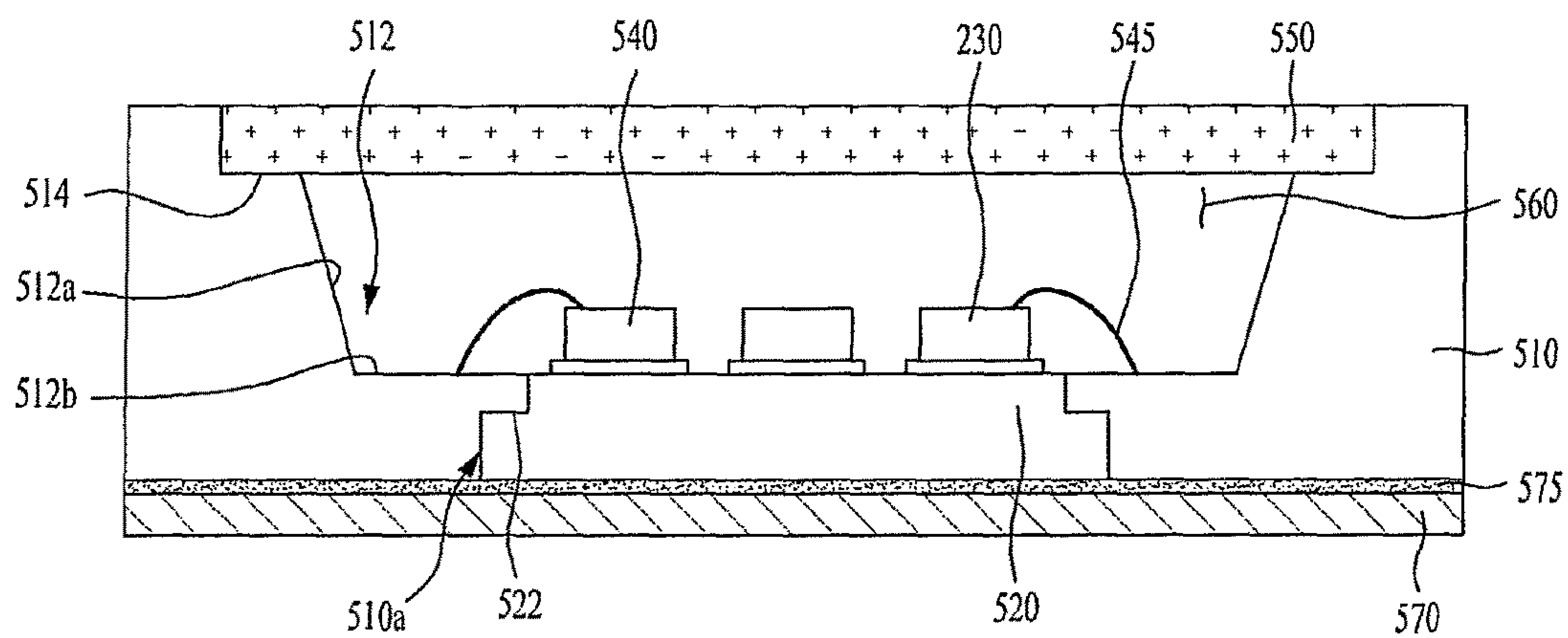

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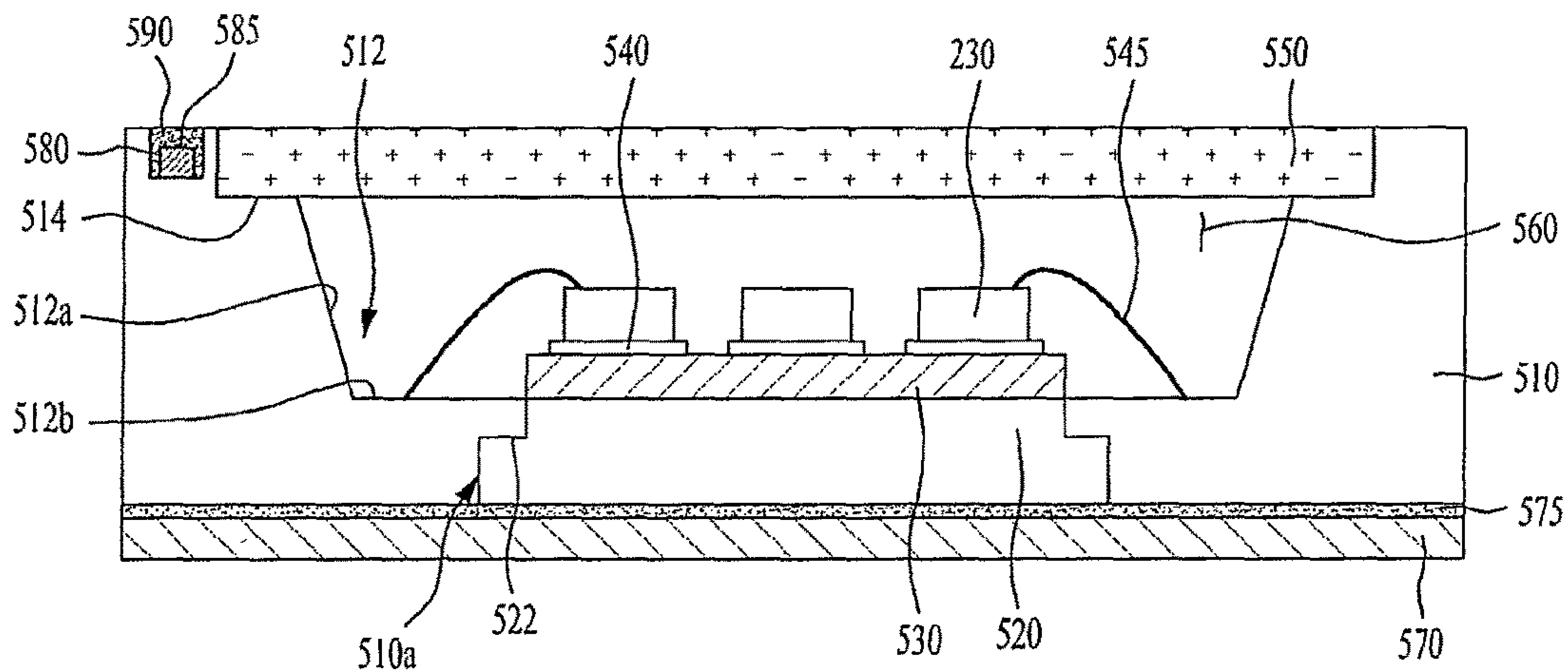

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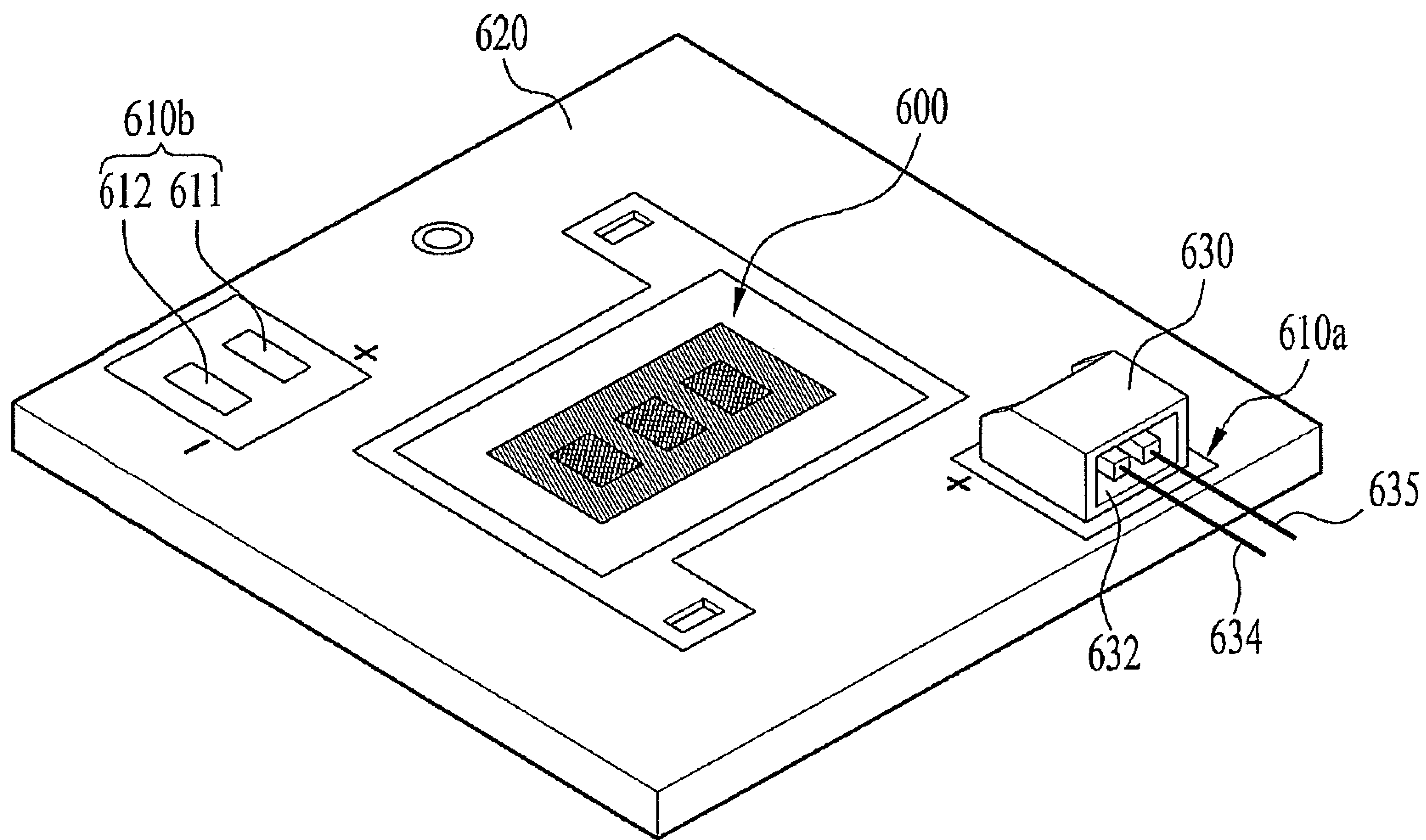

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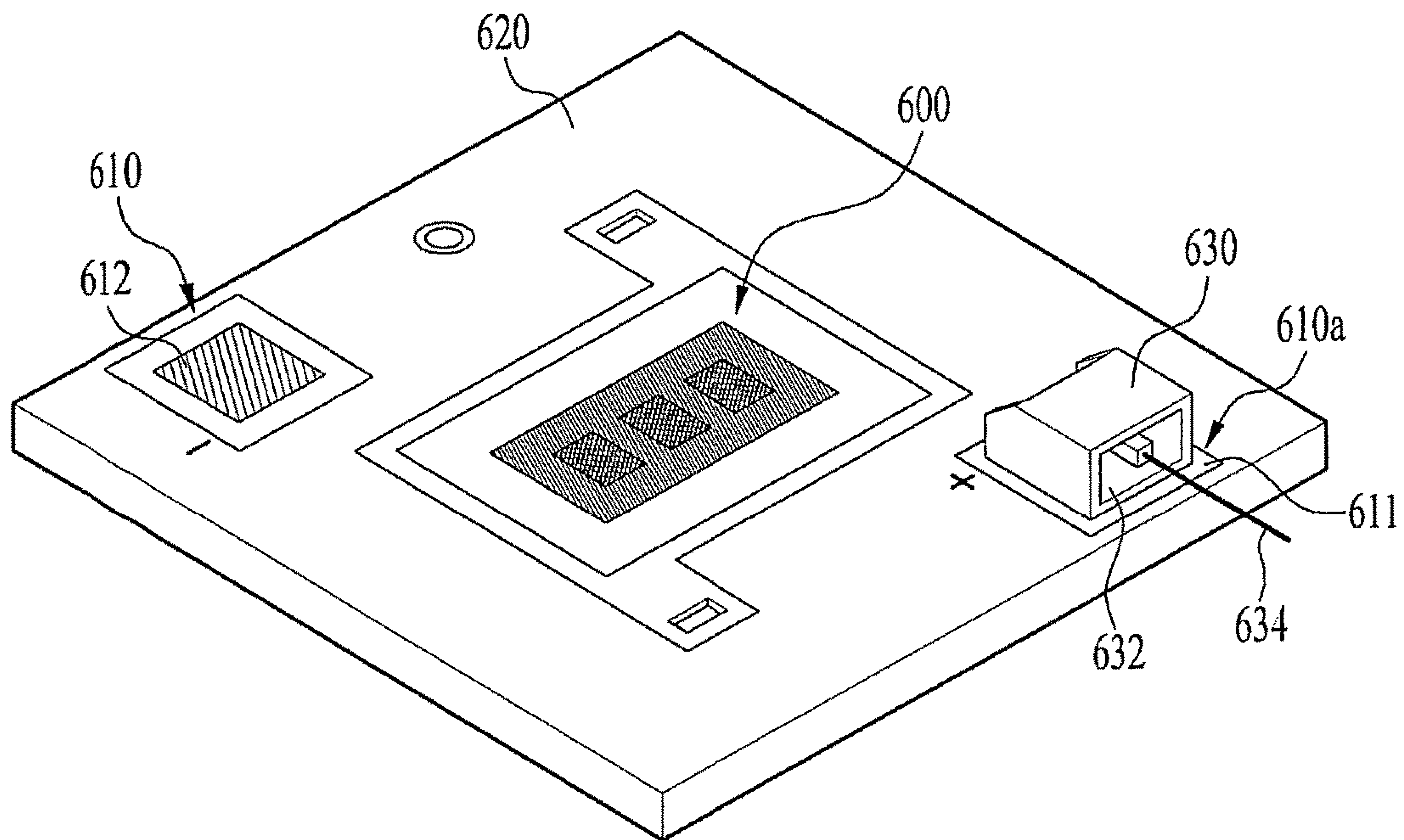

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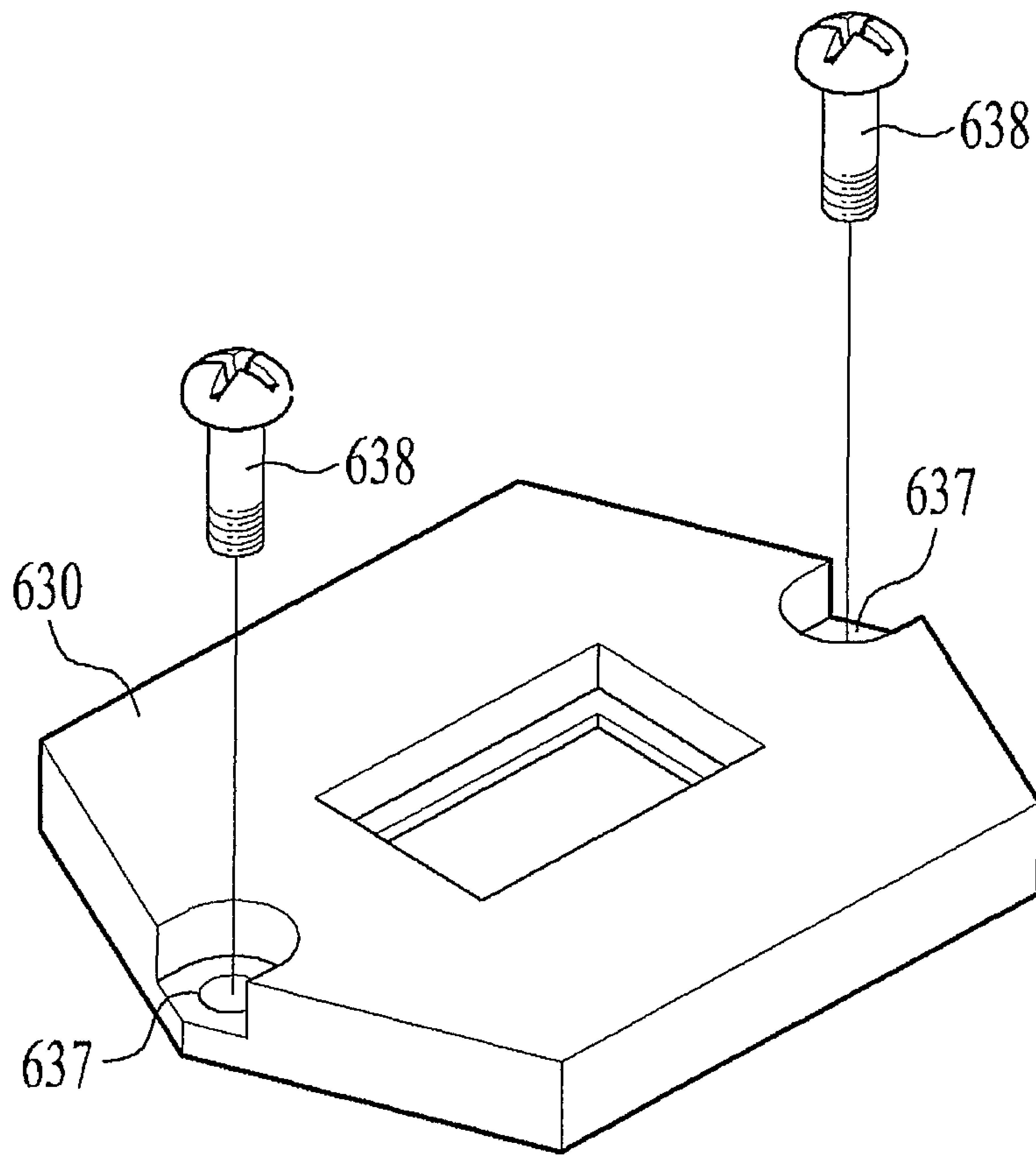

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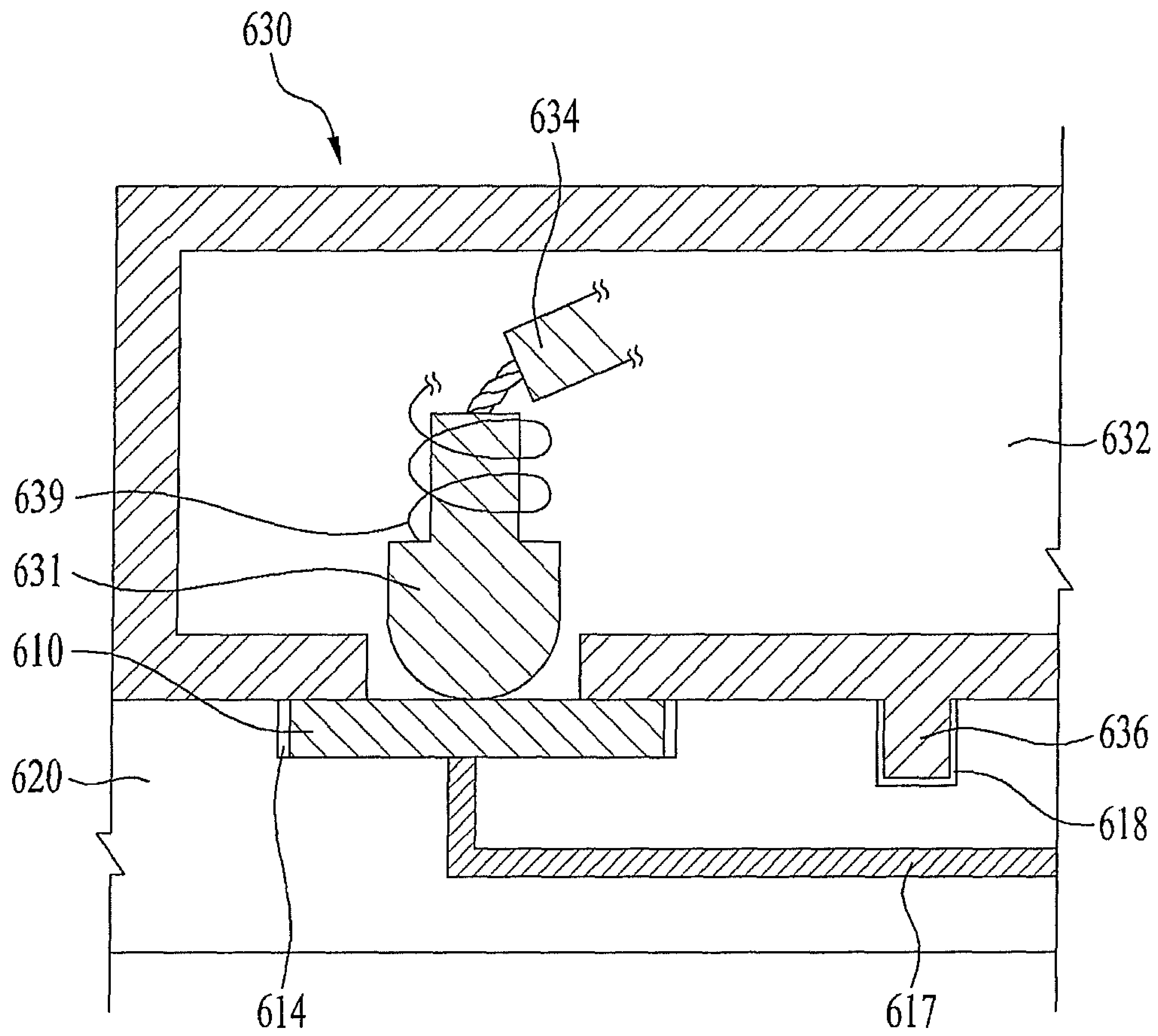

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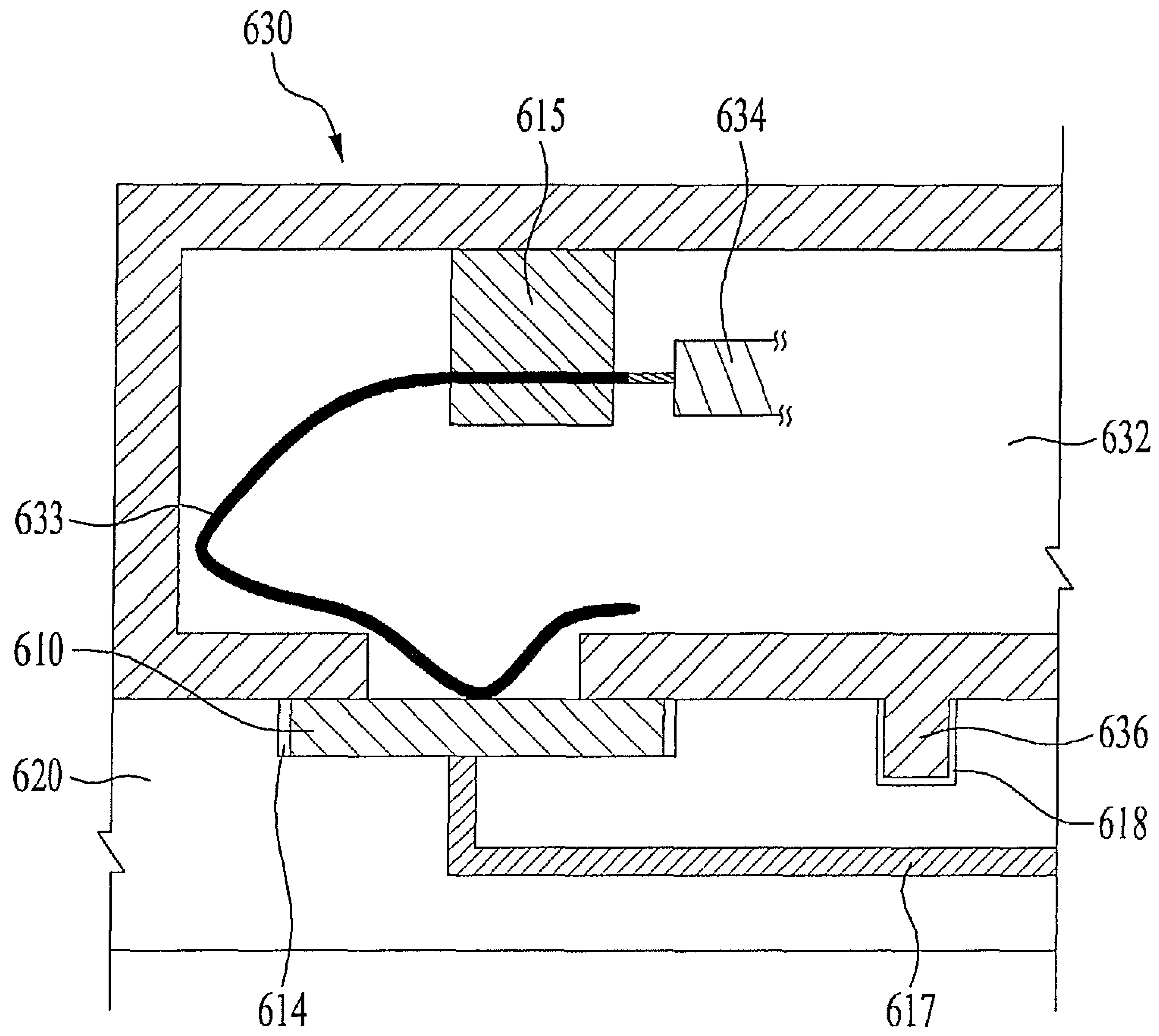

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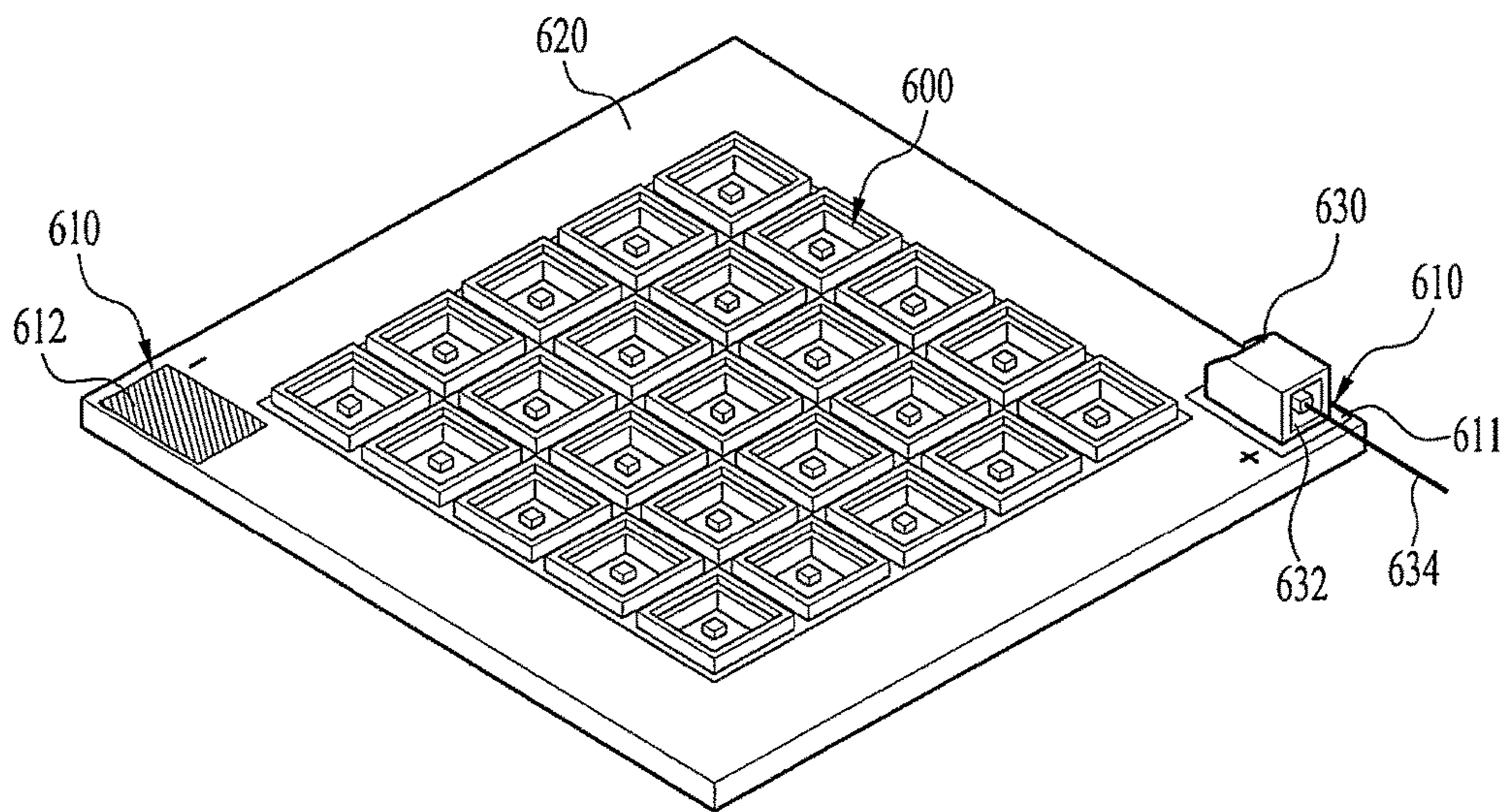

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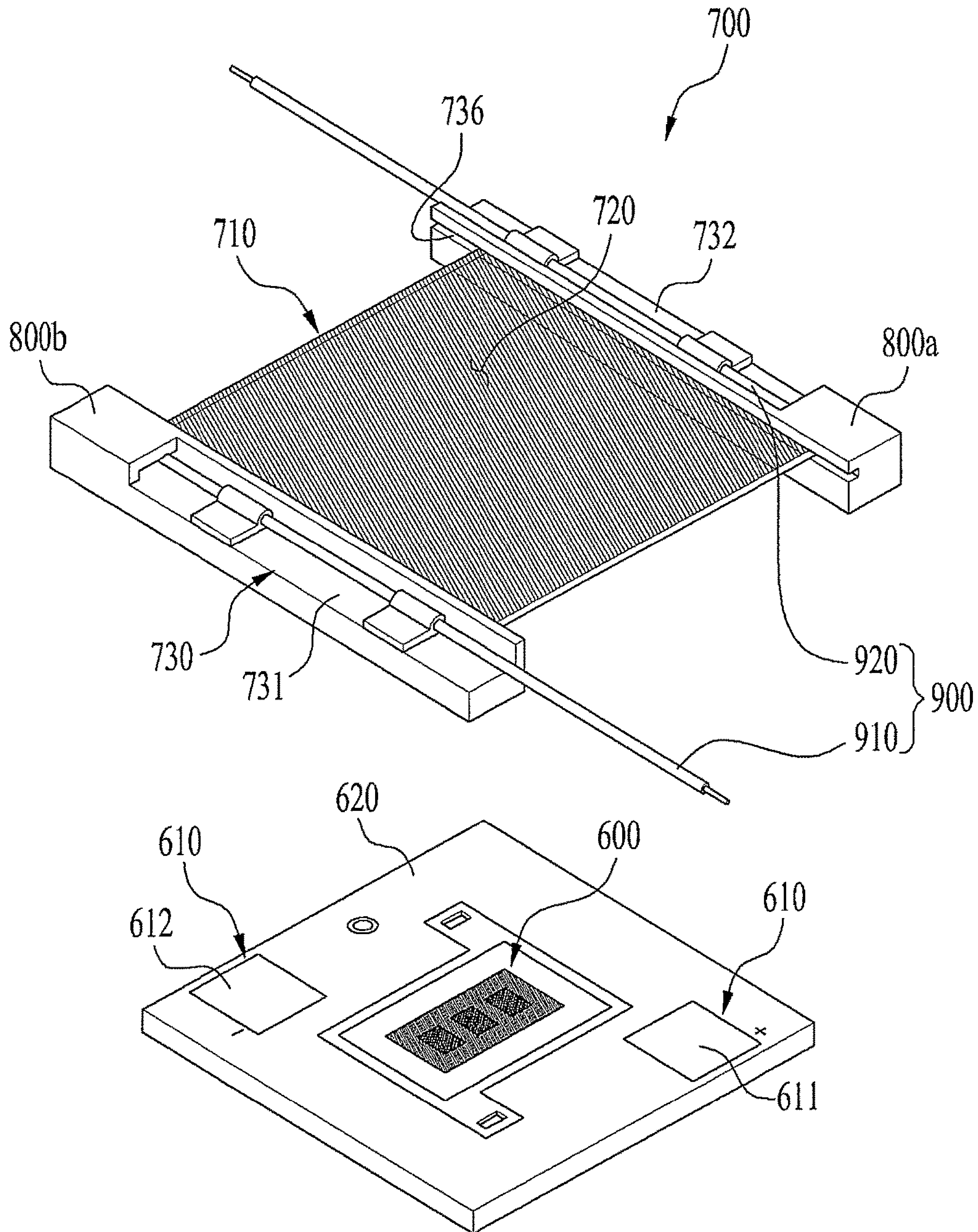

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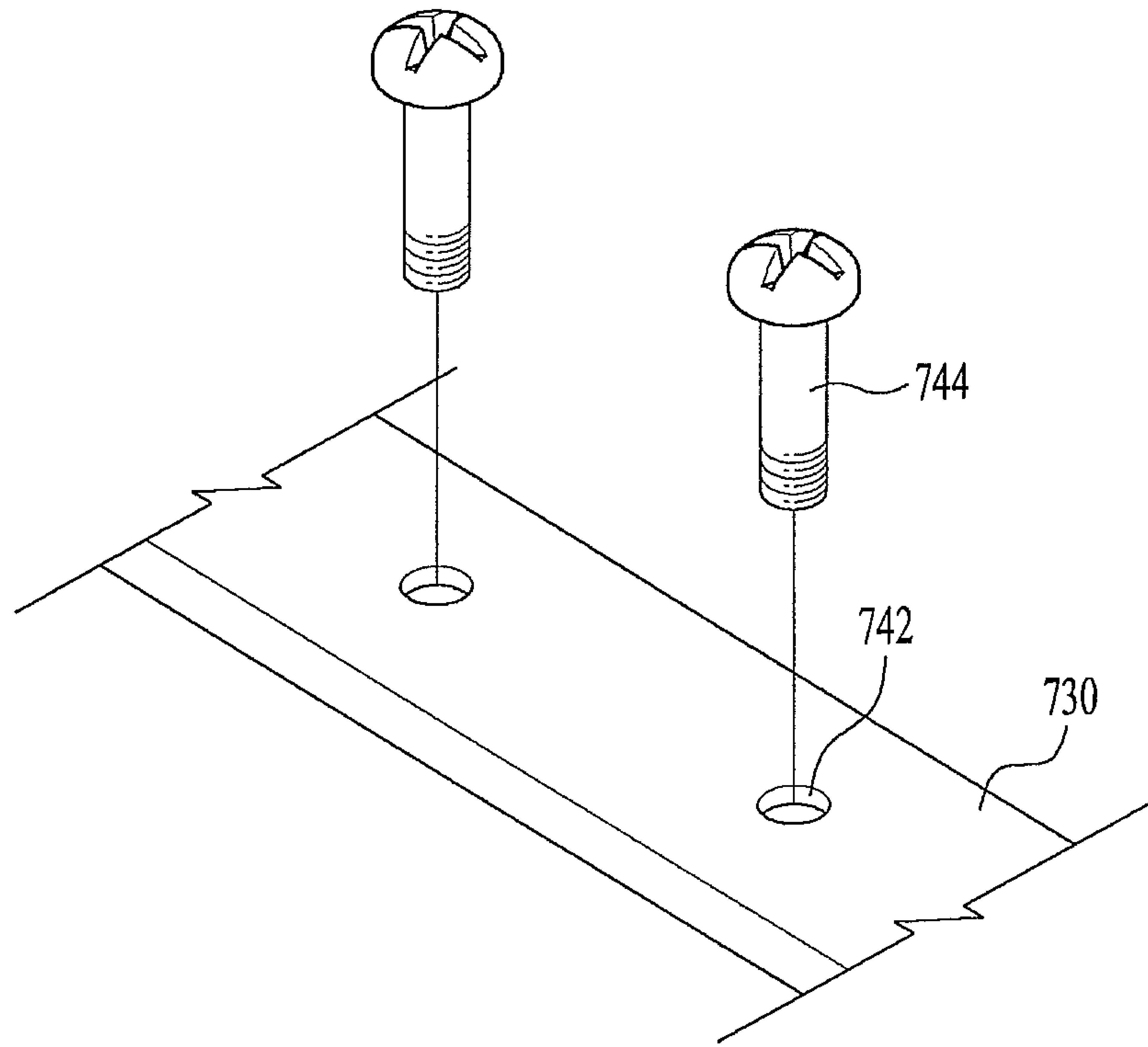

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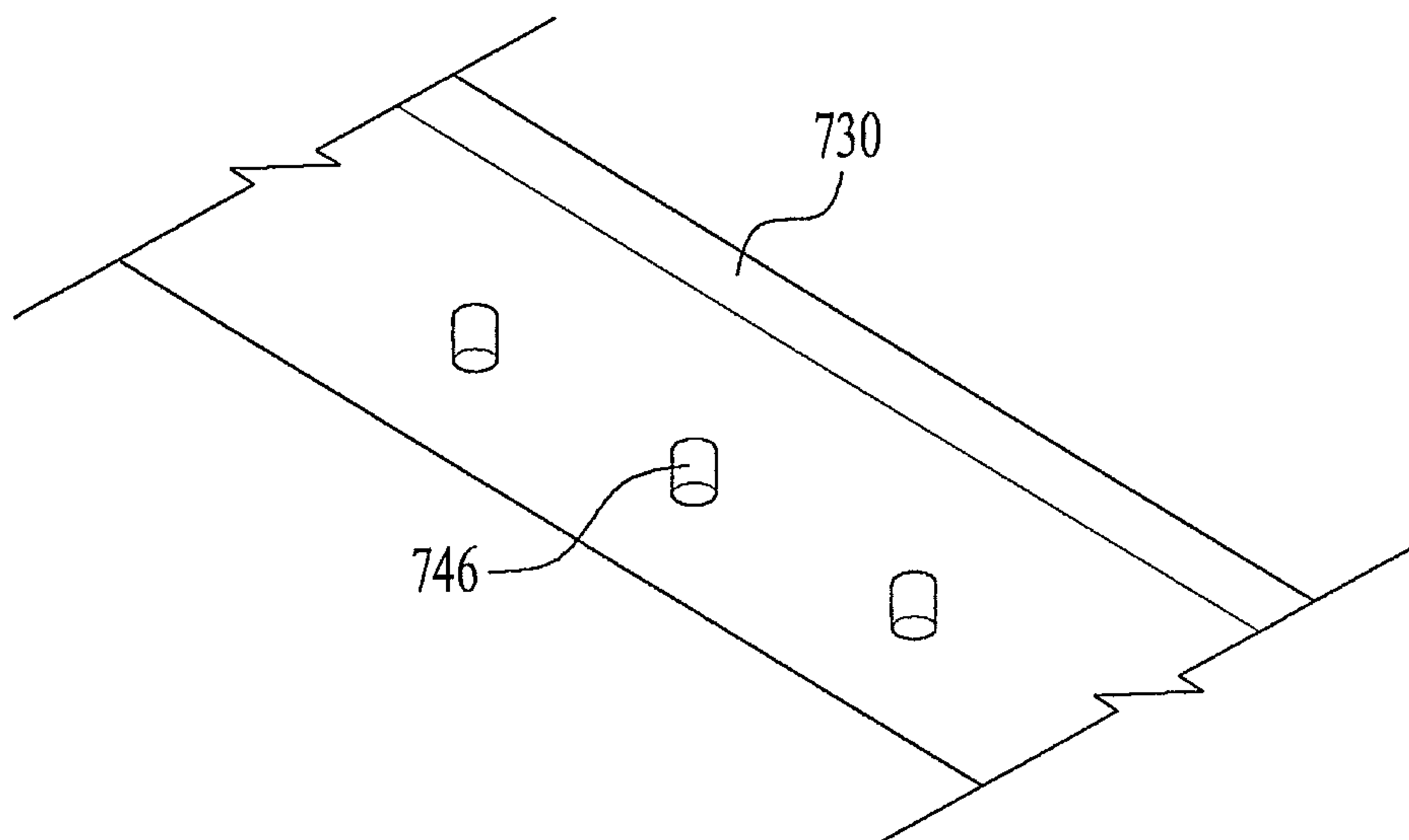

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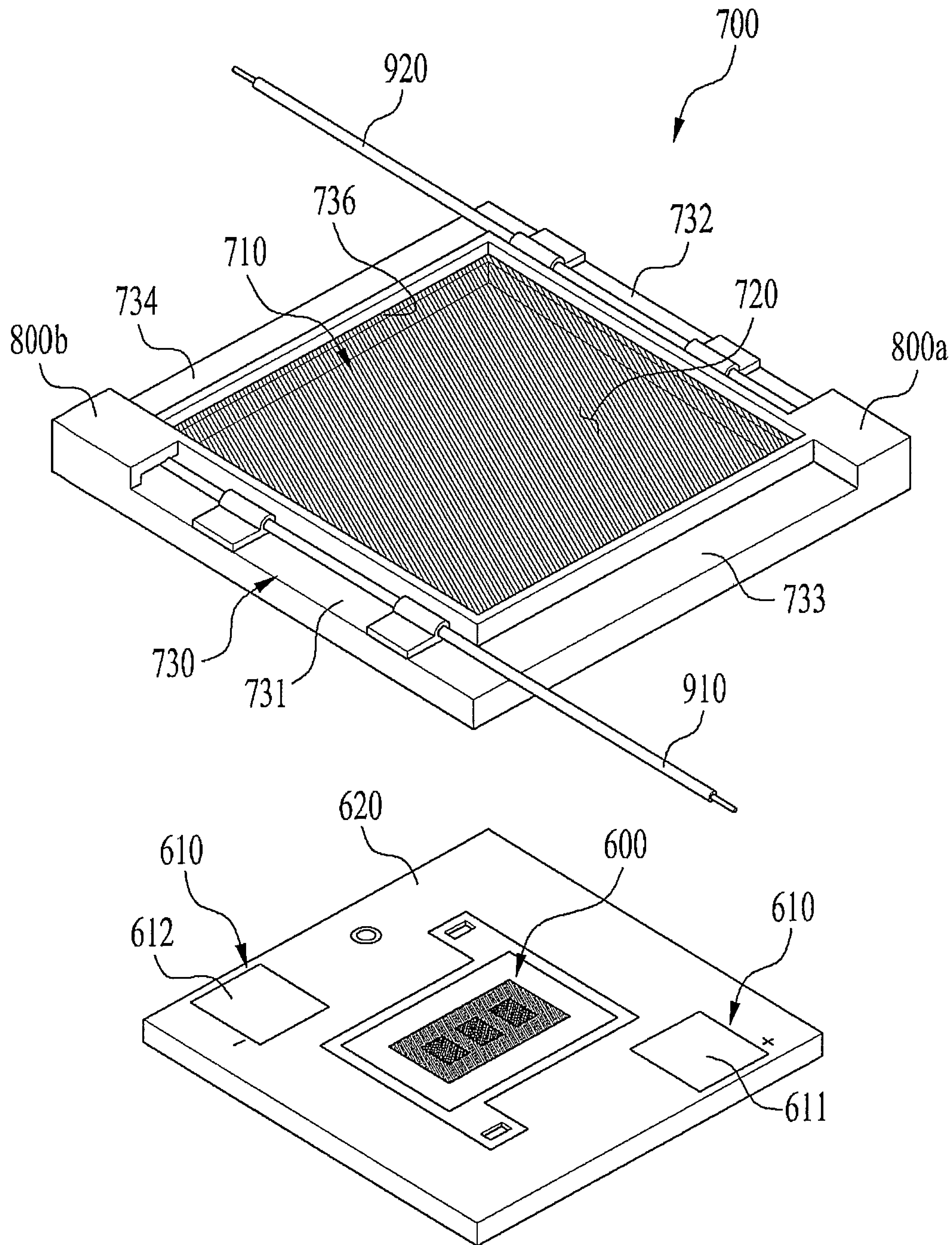


Fig. 31

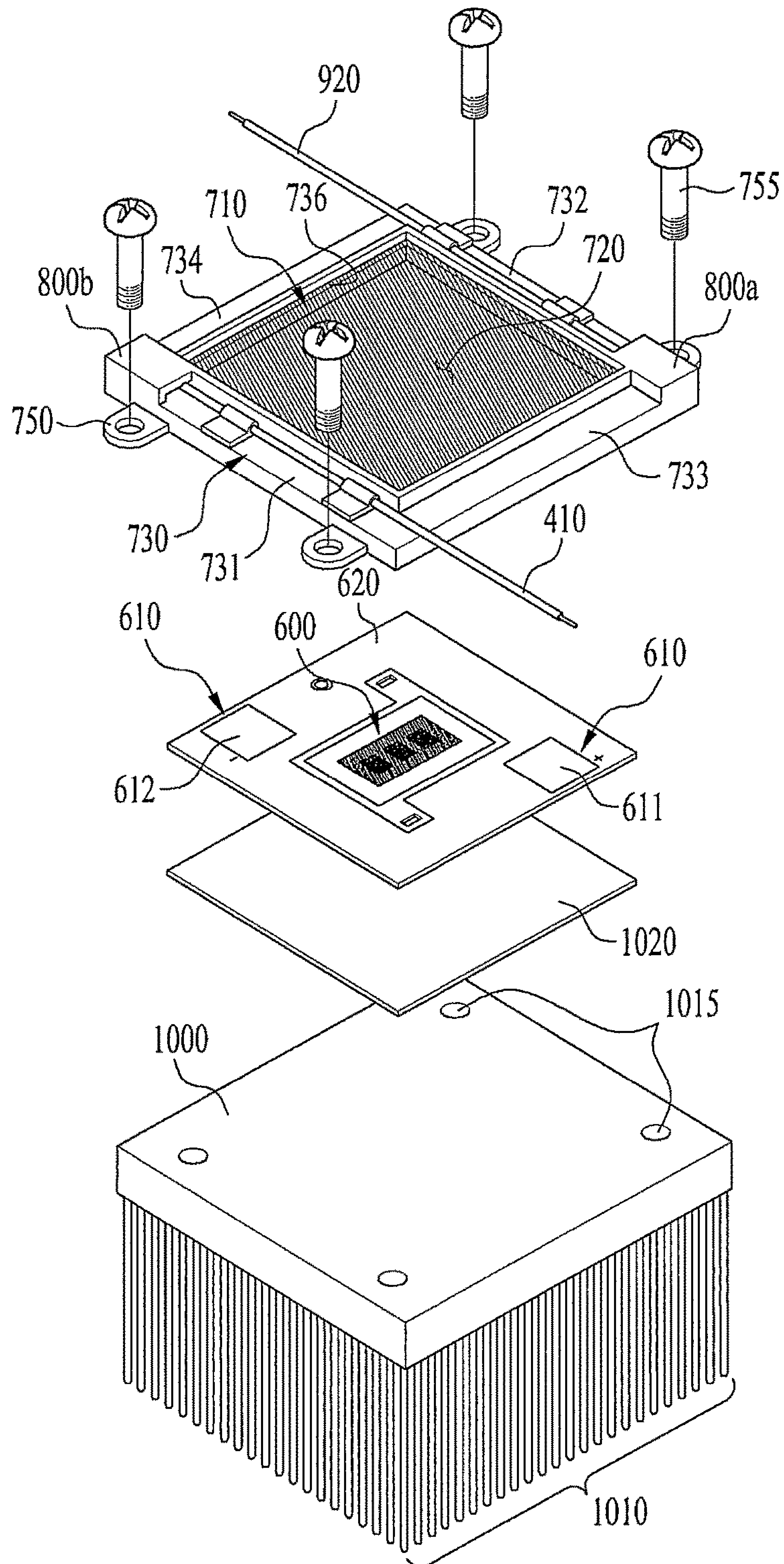


Fig. 32

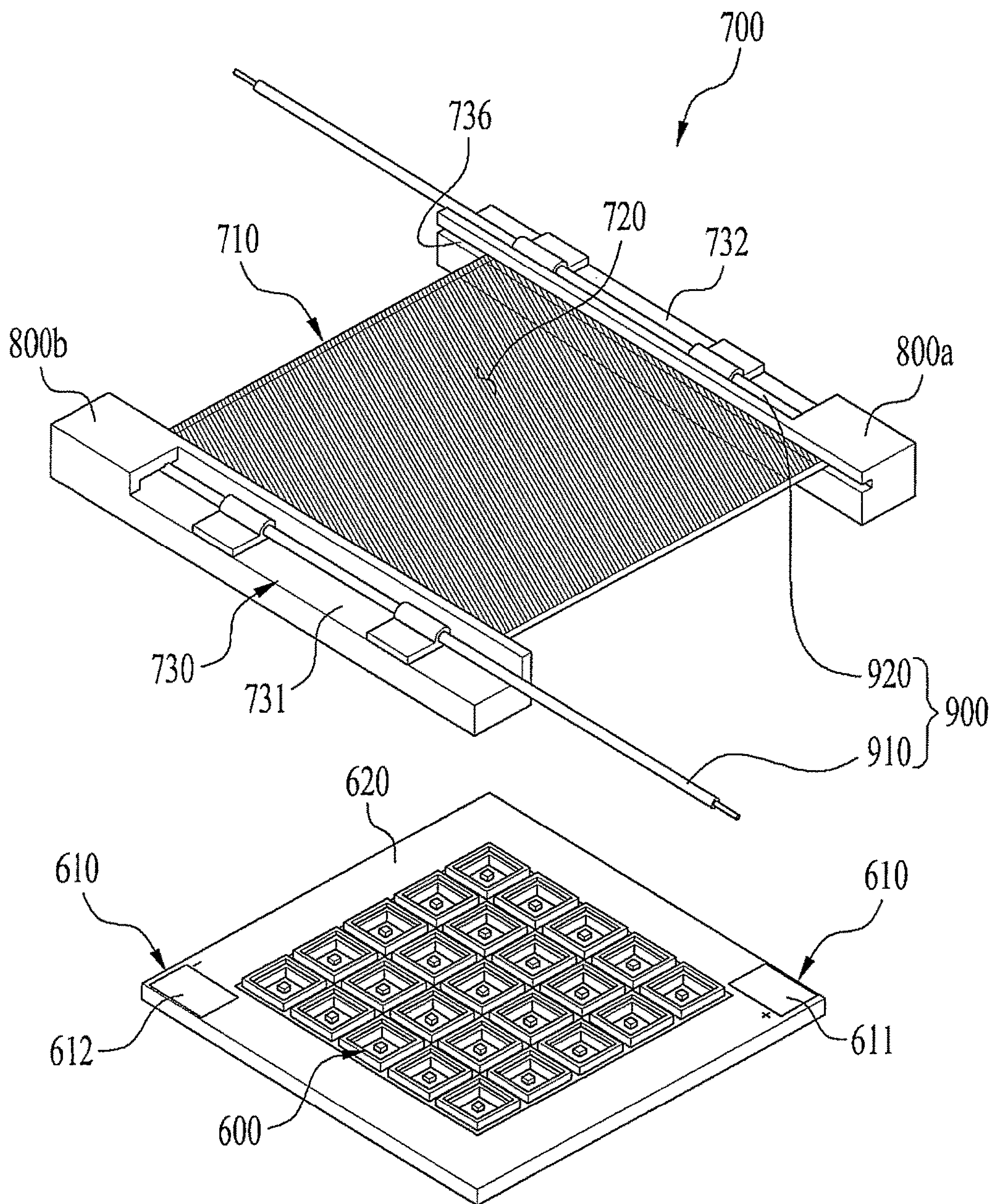


Fig. 33

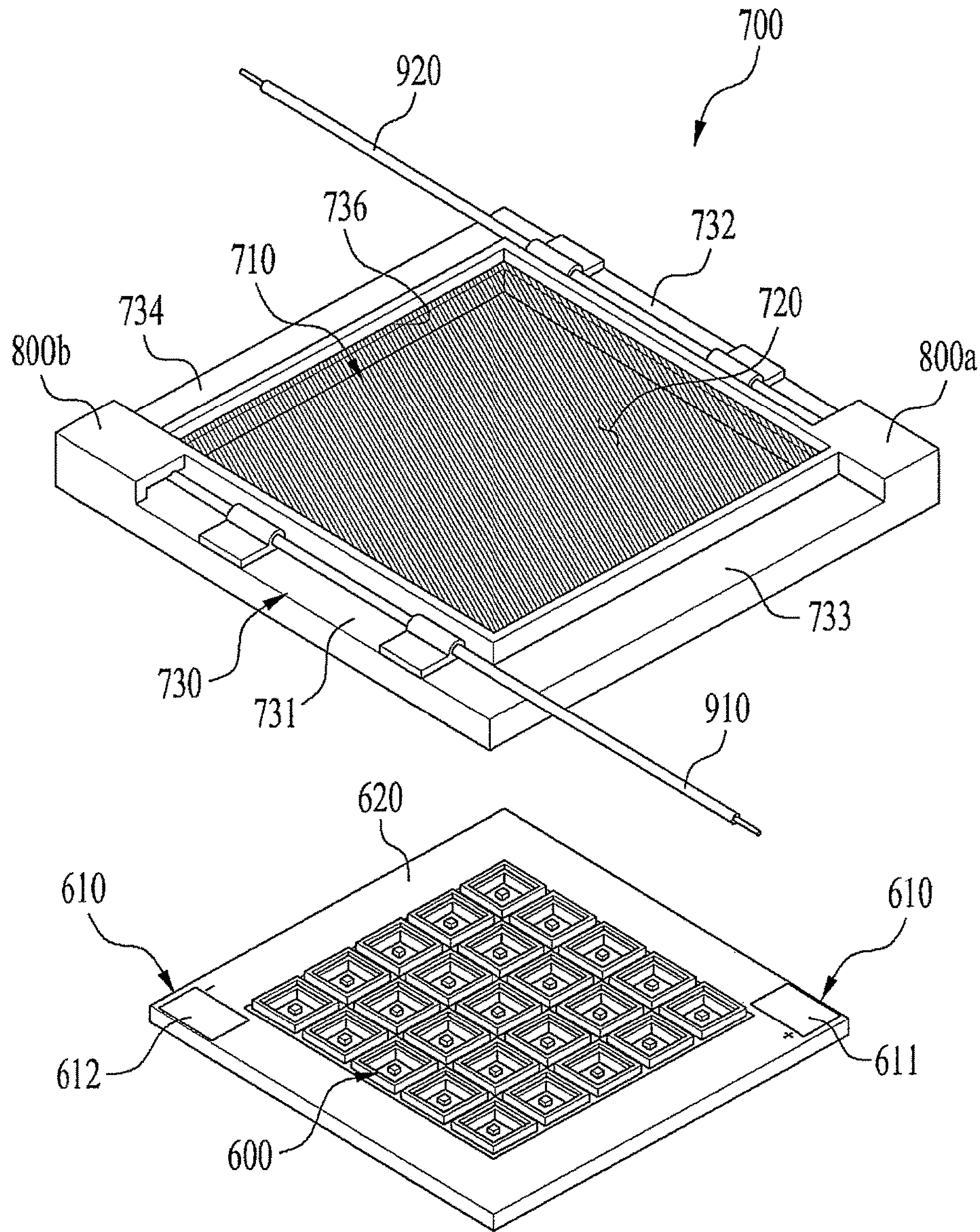


Fig. 34

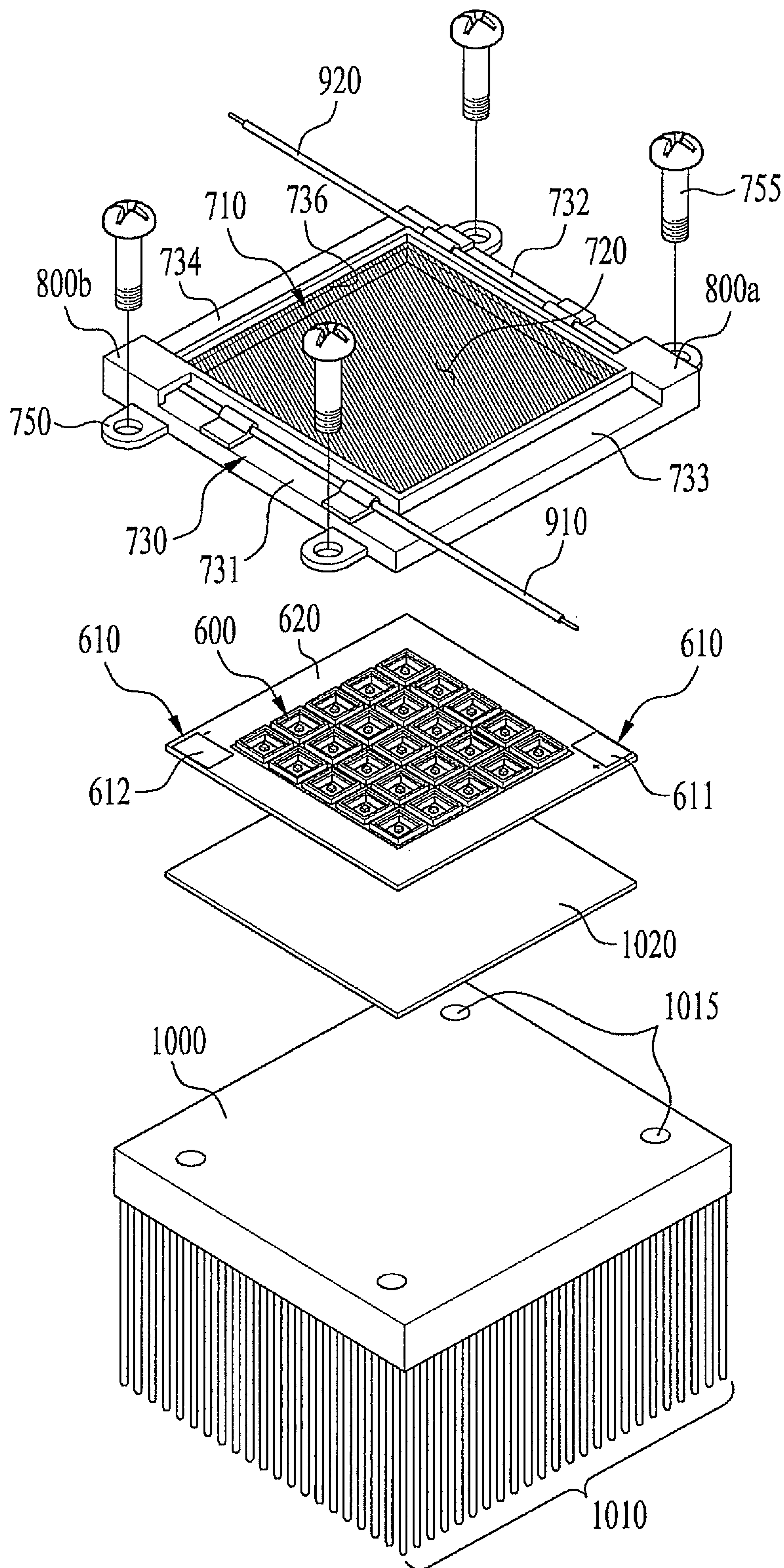
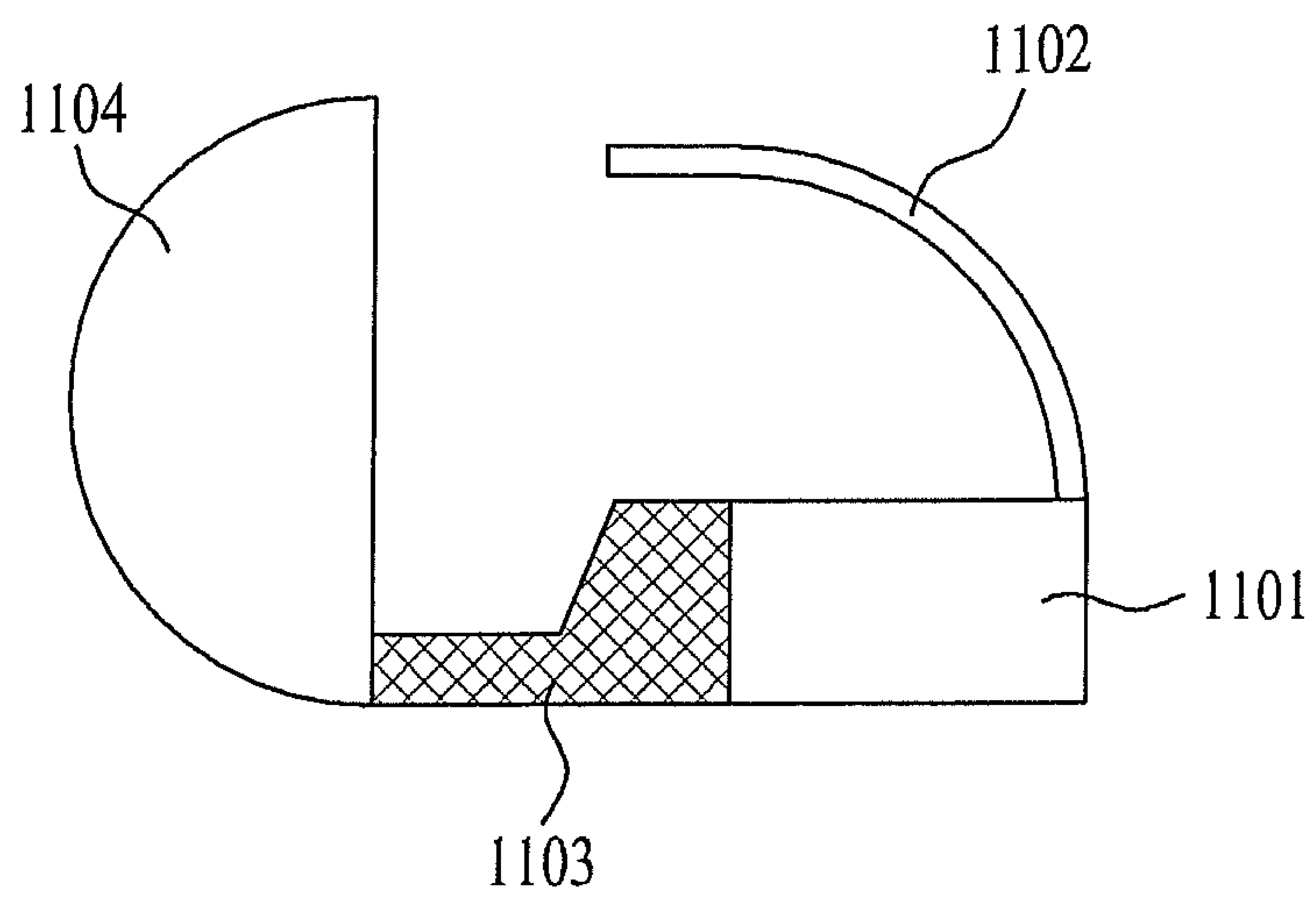


Fig. 35



LIGHT EMITTING DEVICE PACKAGE AND LIGHT UNIT

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS REFERENCE TO RELATED APPLICATION

This application *is a Reissue Application of U.S. Pat. No. 9,634,215* (*based on U.S. patent application Ser. No. 14/885,661 filed Oct. 16, 2015*), *which* is a Continuation application of U.S. patent application Ser. No. 14/253,606, filed Apr. 15, 2014, which is a Continuation application of U.S. patent application Ser. No. 13/591,626, filed Aug. 22, 2012 (now U.S. Pat. No. 8,704,433), which claims priority under 35 U.S.C. §119 to Korean Patent Application No. 10-2011-0083721, filed on Aug. 22, 2011, Korean Patent Application No. 10-2011-0084718, filed on Aug. 24, 2011, Korean Patent Application No. 10-2011-0131466, filed on Dec. 9, 2011, Korean Patent Application No. 10-2011-0139806, filed on Dec. 22, 2011, Korean Patent Application No. 10-2011-0140236, filed on Dec. 22, 2011, Korean Patent Application No. 10-2011-0143151, filed on Dec. 27, 2011, Korean Patent Application No. 10-2011-0143152, filed on Dec. 27, 2011, and Korean Patent Application No. 10-2011-0147361, filed on Dec. 30, 2011, which are hereby incorporated in their entirety by reference as if fully set forth herein.

TECHNICAL FIELD

Embodiments relate to a light emitting device package, a light source module, and a light unit.

BACKGROUND

Light emitting devices, such as laser diodes or light emitting diodes that use group III-V or group II-VI compound semiconductors, are capable of emitting light of various colors, such as for example, red, green, blue, and ultraviolet light, owing to developments of device materials and thin-film growth technologies. Moreover, these light emitting devices are capable of emitting white light with high efficiency through use of a fluorescent substance or color combination, and have advantages including low power consumption, semi-permanent lifespan, fast response time, safety and environmental friendliness as compared to conventional light sources, such as fluorescent lamps, incandescent lamps and the like.

Accordingly, application sectors of light emitting devices are expanded up to transmitting modules of optical communication means, light emitting diode backlights that can replace Cold Cathode Fluorescence Lamps (CCFLs) constituting backlights of Liquid Crystal Display (LCD) apparatuses, white light emitting diode lighting apparatuses that can replace fluorescent lamps or incandescent lamps, automobile head lights, and traffic lights.

A light emitting device package is configured such that a first electrode and a second electrode are arranged on a package body, and a light emitting device is placed on a

bottom surface of the package body and is electrically connected to the first electrode and the second electrode.

In the case of a light emitting device package in which a light emitting diode to emit ultraviolet light (UV) is mounted, if reflected ultraviolet light reaches a package body, an organic material contained in the package body is discolored or deteriorated, causing reduction in the reliability of the package. Thus, there exists a need to improve the reliability of the light emitting device package while maintaining excellent heat radiation properties.

FIG. **1** is a view illustrating a light emitting device package.

A package body **110** has a cavity, and a light emitting device **130** is placed on a bottom surface of the cavity. A radiator **180** may be disposed in a lower portion of the package body **110**. The radiator **180** and the light emitting device **130** may be fixed to each other via a conductive adhesive layer **120**.

However, the light emitting device package has problems as follows.

In FIG. **1**, the radiator **180** may be formed of a high thermal-conductivity material. As the light emitting device **130** of the light emitting device package **100** may emit heat, the radiator **180** may undergo deterioration of planarity due to a difference in coefficients of thermal expansion between different constituent materials of the package body **110** and the radiator **180**.

That is, in FIG. **1**, the radiator **180** may have a roughened surface other than a flat surface due to volumetric expansion of the radiator **180**, which causes tilting of the light emitting device **130**, and consequently tilting of a light emission angle of the light emitting device package **100**. In addition, the roughened radiator **180** provided at a lower surface of the light emitting device package **100** may cause the light emitting device package **100** to tilt when mounted onto a circuit board and the like.

SUMMARY

Embodiments provide improved reliability of a light emitting device package.

In one embodiment, a light emitting device package includes a package body having a package body having a through-hole; a radiator disposed in the through-hole and including an alloy layer having Cu; and a light emitting device disposed on the radiator, wherein the alloy layer includes at least one of W or Mo, and wherein the package body comprises cavity including a sidewall and a bottom surface, and wherein the through-hole is formed in the bottom surface.

In another embodiment, a light emitting device package includes a package body having a cavity defined by a sidewall and a bottom surface and a through-hole formed in the bottom surface; a radiator disposed in the through-hole and exposed outside from a lower surface of the package body; and a light emitting device electrically connected to the radiator.

In accordance with a further embodiment, a light unit includes a light emitting device package. The light emitting device package includes, a package body having a through-hole; a radiator disposed in the through-hole and including an alloy layer having Cu; and a light emitting device disposed on the radiator and electrically connected to the radiator.

BRIEF DESCRIPTION OF THE DRAWINGS

Arrangements and embodiments may be described in detail with reference to the following drawings in which like reference numerals refer to like elements and wherein:

FIG. **1** is a view illustrating a light emitting device package;

FIG. **2** is a view illustrating a light emitting device package according to a first embodiment;

FIGS. **3** and **4** are views illustrating only a radiator included in the light emitting device package of FIG. **2**;

FIG. **5** is a view illustrating a light emitting device that may be applied to the light emitting device package according to the first embodiment;

FIG. **6** is a view illustrating a light emitting device package according to a second embodiment;

FIG. **7** is a view illustrating a light emitting device package according to a third embodiment;

FIG. **8** is a view illustrating a light emitting device package according to a fourth embodiment;

FIG. **9**A is a view illustrating a light emitting device package according to a fifth embodiment;

FIG. **9**B is a view illustrating an embodiment of a method for forming a circuit pattern in a package body;

FIG. **10** is a view illustrating a light emitting device package according to a sixth embodiment;

FIG. **11** is a view illustrating a light emitting device package according to a seventh embodiment;

FIG. **12** is a view illustrating a light emitting device package according to an eighth embodiment;

FIGS. **13**A to **13**C are views illustrating the arrangement of electrode patterns included in the light emitting device package of FIG. **12**;

FIG. **14**A is a partial detailed view of FIG. **13**A;

FIG. **14**B is a side sectional view provided by diagonally cutting the light emitting device package of FIG. **13**;

FIGS. **15** to **17** are views illustrating light emitting device packages according to a ninth embodiment;

FIG. **18** is a detailed view illustrating the radiator included in the light emitting device package according to the ninth embodiment;

FIGS. **19** and **20** are views illustrating a light source module according to a tenth embodiment;

FIG. **21** is a view illustrating a light source module according to an eleventh embodiment;

FIG. **22** is a view illustrating a light source module according to a twelfth embodiment;

FIG. **23** is a view illustrating a light source module according to a thirteenth embodiment;

FIG. **24** is a view illustrating a light source module according to a fourteenth embodiment;

FIG. **25** is a view illustrating a holder fastening configuration;

FIGS. **26**A and **26**B are sectional views illustrating an embodiment of a contact structure between a wire disposed in a holder and an electrode pad on a substrate;

FIG. **27** is a view illustrating a light source module according to a fifteenth embodiment;

FIG. **28** is a view illustrating a light source module according to a sixteenth embodiment;

FIG. **29**A is a partial perspective view of a support plate when viewed from the top;

FIG. **29**B is a partial perspective view of the support plate when viewed from the bottom;

FIG. **30** is a view illustrating a light source module according to a seventeenth embodiment;

FIG. **31** is a view illustrating a light source module according to an eighteenth embodiment;

FIG. **32** is a view illustrating a light source module according to a nineteenth embodiment;

FIG. **33** is a view illustrating a light source module according to a twentieth embodiment;

FIG. **34** is a view illustrating a light source module according to a twenty-first embodiment;

FIG. **35** is a view illustrating an embodiment of a head lamp including the light source module according to the above described embodiments.

DESCRIPTION OF SPECIFIC EMBODIMENTS

Hereinafter, embodiments will be described with reference to the annexed drawings.

It will be understood that when an element is referred to as being 'on' or "under" another element, it can be directly on/under the element, and one or more intervening elements may also be present. When an element is referred to as being 'on' or 'under', 'under the element' as well as 'on the element' can be included based on the element. Also, it will also be understood that criteria of on or under is on the basis of the drawing.

In the drawings, dimensions of layers are exaggerated, omitted or schematically illustrated for clarity and description convenience. In addition, dimensions of constituent elements do not entirely reflect actual dimensions.

FIG. **2** is a view illustrating a light emitting device package according to a first embodiment, and FIGS. **3** and **4** are views illustrating only a radiator included in the light emitting device package of FIG. **2**.

The light emitting device package **200** according to the first embodiment, as illustrated in FIG. **2**, may include a package body **210**, a radiator **220**, and a light emitting device **230**.

The package body **210** may be a stack of a plurality of layers. Although FIG. **2** illustrates the case in which the package body **210** includes a first layer **211**, a second layer **212**, a third layer **213**, and a fourth layer **214**, the package body **210** may have more or fewer layers. Also, the package body **210** may be formed into a single layer.

The package body **210** may include a plurality of insulating layers. The package body **210** may be formed of an insulating material, such as a nitride or oxide. Also, the package body **210** may include a plurality of ceramic layers. For example, the package body **210** may be formed by a Low Temperature Co-fired Ceramic (LTCC) method. Also, the package body **210** may be formed by a High Temperature Co-fired Ceramic (HTCC) method. A constituent material of the package body **210** may be SiO_2, Si_xO_y, Si_3N_4, Si_xN_y, SiO_xN_y, Al_2O_3, or AlN. For example, the package body **210** may be formed of AlN, or a metal nitride having thermal conductivity of 140 W/mK or more.

The respective layers **211**, **212**, **213** and **214** of the package body **210** may have the same thickness, or at least one of the layers may have a different thickness. The layers **211**, **212**, **213** and **214** of the package body **210** may be individual layers obtained by different fabrication processes, and may be integrated with one another after completion of firing.

An electrode pattern may be formed between the respective layers of the package body **210**, and power may be applied to the light emitting device **230** through the electrode pattern. The power may be applied to the light emitting device **230** through a via-hole structure.

An upper inner surface of the package body **210** may be an inclined surface. A reflective material may be provided in the inclined inner surface of the package body **210**. Accordingly, the package body **210** may reflect light emitted from the light emitting device **230** to extract the light to the outside.

According to an embodiment, the package body **210** may have a cavity and the light emitting device **230** may be disposed in the cavity. A sidewall of the cavity may be formed by an inclined surface.

A molded part **240** may be provided over the light emitting device **230**. The molded part **240** serves to protect the light emitting device **230** by intercepting foreign substances, moisture and the like introduced from the outside. Also, the molded part **240** may contain a fluorescent material, and may provide wavelength-converted light upon receiving light emitted from the light emitting device **230**.

A through-hole may be formed in a lower portion of the package body **210**. The radiator **220** may be disposed in the through-hole of the package body **210**. In the case in which a cavity is formed in the package body **210** according to an embodiment, the through-hole may be formed in the bottom of the cavity. The light emitting device **230** may be disposed over the radiator **220**. The light emitting device **230** may come into contact with the radiator **220**. The radiator **220** is able to efficiently transfer heat generated from the light emitting device **230** to the outside. The radiator **220** may be exposed to the outside. The radiator **220** may include an alloy layer **221** containing copper (Cu), and a Cu layer **222** disposed beneath the alloy layer **221**. The alloy layer **221** containing Cu may have a smaller horizontal cross sectional area than that of the Cu layer **222**.

According to one embodiment, the radiator **220**, as illustrated in FIG. **3**, may include the alloy layer **221** containing Cu—W, and the Cu layer **222** disposed beneath the alloy layer **221**. According to another embodiment, the radiator **220**, as illustrated in FIG. **4**, may include the alloy layer **221** containing Cu—Mo, and the Cu layer **222** disposed beneath the alloy layer **221**. The alloy layer **221** may contain at least one element of W and Mo.

In the embodiment, the radiator **220** includes the alloy layer **221** containing Cu and the Cu layer **222**. A Cu layer has low processability, but has very excellent heat transfer properties. However, the Cu layer has a high coefficient of thermal expansion, which is considerably different from that of the light emitting device **230**. Accordingly, thermal expansion and contraction stress is transmitted to the light emitting device **230** upon temperature change, which may cause damage to the light emitting device **230**. To solve this problem, in the embodiment, the radiator **220** is configured such that the Cu layer **222** serves as a lower layer and the alloy layer **221** containing Cu is stacked over the Cu layer **222**. With this configuration, the light emitting device **230** comes into contact with the alloy layer **221** other than the Cu layer **222**. In the above mentioned embodiments, the alloy layer **221** may be a Cu—W alloy layer or a Cu—Mo alloy layer. Since the Cu—W alloy layer and Cu—Mo alloy layer have coefficients of thermal expansion similar to that of the light emitting device **230**, it is possible to prevent damage to the light emitting device **230** due to temperature change. The alloy layer **221** may contain at least one material of W and Mo. The alloy layer **221** may include Cu—W, Cu—Mo, and Cu—W—Mo layers.

Additionally, in the embodiment, the radiator **220** takes the form of a stack of a plurality of layers, which may prevent upward bulging of an upper surface of the radiator **220**. In this way, the light emitting device **230** disposed over the radiator **220** may be stably disposed.

FIG. **5** is a view illustrating a light emitting device that may be applied to the light emitting device package according to the first embodiment.

The light emitting device according to the embodiment, as illustrated in FIG. **5**, may include a light emitting structure **10**, an electrode **20**, and a reflective electrode **50**.

The light emitting structure **10** may include a first conductive semiconductor layer **11**, an active layer **12**, and a second conductive semiconductor layer **13**. The first conductive semiconductor layer **11** may have a roughened upper surface **17**.

In one example, the first conductive semiconductor layer **11** may be an n-type semiconductor layer, to which a first conductive dopant, i.e. an n-type dopant is added, and the second conductive semiconductor layer **13** may be a p-type semiconductor layer, to which a second conductive dopant, i.e. a p-type dopant is added. In another example, the first conductive semiconductor layer **11** may be a p-type semiconductor layer, and the second conductive semiconductor layer **13** may be an n-type semiconductor layer.

The first conductive semiconductor layer **11** may include an n-type semiconductor layer. The first conductive semiconductor layer **11** may be formed of a semiconductor material having a composition of $In_xAl_yGa_{1-x-y}N$ ($0 \le x \le 1$, $0 \le y \le 1$, $0 \le x+y \le 1$). For example, the first conductive semiconductor layer **11** may be selected from among GaN, AlN, AlGaN, InGaN, InN, InAlGaN, AlInN, AlGaAs, GaP, GaAs, GaAsP, AlGaInP and the like, and may be doped with an n-type dopant, such as Si, Ge, S, Se, Te and the like.

The active layer **12** is adapted to emit light via an energy band gap depending on constituent materials of the active layer **12**, i.e. pairs of electrons (or holes) introduced through the first conductive semiconductor layer **11** and holes (or electrons) introduced through the second conductive semiconductor layer **12**. The active layer **12** may have any one structure of a Single Quantum Well (SQW), Multi Quantum Well (MQW), quantum dot and quantum wire structures, but the disclosure is not limited thereto.

The active layer **12** may be formed of a semiconductor material having a composition of $In_xAl_yGa_{1-x-y}N$ ($0 \le x \le 1$, $0 \le y \le 1$, $0 \le x+y \le 1$). If the active layer **12** has a MQW structure, the active layer **12** may be a stack of a plurality of well layers and a plurality of barrier layers. For example, the active layer **12** may be a periodic stack of InGaN well/GaN barrier layers.

The second conductive semiconductor layer **13** may include a p-type semiconductor layer. The second conductive semiconductor layer **13** may be formed of a semiconductor material having a composition of $In_xAl_yGa_{1-x-y}N$ $0 \le x \le 1$, $0 \le y \le 1$, $0 \le x+y \le 1$). For example, the second conductive semiconductor layer **13** may be selected from among GaN, AlN, AlGaN, InGaN, InN, InAlGaN, AlInN, AlGaAs, GaP, GaAs, GaAsP, AlGaInP and the like, and may be doped with a p-type dopant, such as Mg, Zn, Ca, Sr, Ba and the like.

Meanwhile, the first conductive semiconductor layer **11** may include a p-type semiconductor layer, and the second conductive semiconductor layer **13** may include an n-type semiconductor layer. A semiconductor layer including an n-type or p-type semiconductor layer may be further formed beneath the second conductive semiconductor layer **13**. In this way, the light emitting structure **10** may have at least any one of np, pn, npn, pnp junction structures. Also, the first conductive semiconductor layer **11** and the second conductive semiconductor layer **13** may have an even or uneven dopant doping concentration. That is, the light emitting structure **10** may have various structures, but the disclosure is not limited thereto.

A first conductive InGaN/GaN super-lattice structure or InGaN/InGaN super-lattice structure may be formed between the first conductive semiconductor layer **11** and the

active layer **12**. Also, a second conductive AlGaN layer may be formed between the second conductive semiconductor layer **13** and the active layer **12**.

The first conductive semiconductor layer **11** may have the roughened upper surface **17**. If the first conductive semiconductor layer **11** is a GaN layer, the roughened surface **17** may be an N surface in consideration of growth and etching directions.

An ohmic contact layer **40** and the reflective electrode **50** may be disposed below the light emitting structure **10**. The electrode **20** may be disposed over the light emitting structure **10**. The electrode **20** and the reflective electrode **50** may apply power to the light emitting structure **10**. The ohmic contact layer **40** may come into ohmic contact with the light emitting structure **10**. The reflective electrode **50** may function to reflect light directed from the light emitting structure **10** so as to increase the extraction quantity of light to the outside.

The ohmic contact layer **40**, for example, may be a transparent conductive oxide film layer. The ohmic contact layer **40** may be formed of at least one material selected from among Indium Tin Oxide (ITO), Indium Zinc Oxide (IZO), Aluminum Zinc Oxide (AZO), Aluminum Gallium Zinc Oxide (AGZO), Indium Zinc Tin Oxide (IZTO), Indium Aluminum Zinc Oxide (IAZO), Indium Gallium Zinc Oxide (IGZO), Indium Gallium Tin Oxide (IGTO), Antimony Tin Oxide (ATO), Gallium Zinc Oxide (GZO), IZO nitride (IZON), ZnO, IrO_x, RuO_x, and NiO.

The reflective electrode **50** may be formed of a high reflectivity metal material. For example, the reflective electrode **50** may be formed of a metal including at least one of Ag, Ni, Al, Rh, Pd, Ir, Ru, Mg, Zn, Pt, Cu, Au, and Hf and alloys thereof. Also, the reflective electrode **50** may be formed into multiple layers using light-transmissive conductive materials, such as Indium Tin Oxide (ITO), Indium Zinc Oxide (IZO), Indium Zinc Tin Oxide (IZTO), Indium Aluminum Zinc Oxide (IAZO), Indium Gallium Zinc Oxide (IGZO), Indium Gallium Tin Oxide (IGTO), Aluminum Zinc Oxide (AZO), Antimony Tin Oxide (ATO), and the like. For example, in the embodiment, the reflective electrode **50** may be formed of at least any one of Ag, Al, Ag—Pd—Cu alloy, and Ag—Cu alloy.

A Current Blocking Layer (CBL) **30** may be provided between the light emitting structure **10** and the ohmic contact layer **40**. The current blocking layer **30** may be formed at a region that at least partially vertically overlaps with the electrode **20**. This alleviates concentration of current on the shortest distance between the electrode **20** and the reflective electrode **50**, resulting in improved light emission efficiency of the light emitting device according to the embodiment.

The current blocking layer **30** may have electric insulation properties, or may be formed of a material that defines a schottky contact with the light emitting structure **10**. The current blocking layer **30** may be formed of an oxide, nitride, or metal. For example, the current blocking layer **30** may be formed of at least one of SiO_2, SiO_x, SiO_xN_y, Si_3N_4, Al_2O_3, TiO_x, Ti, Al, and Cr.

The current blocking layer **30** may be disposed at a first region immediately beneath the light emitting structure **10**, and the ohmic contact layer **40** may be disposed at a second region beneath the light emitting structure **10** and immediately beneath the current blocking layer **30**. The ohmic contact layer **40** may be disposed between the light emitting structure **10** and the reflective electrode **50**. Also, the ohmic contact layer **40** may be disposed between the current blocking layer **30** and the reflective electrode **50**.

An isolation layer **80** may further be disposed between the light emitting structure **10** and the ohmic contact layer **40**. The isolation layer **80** may be disposed at a lower periphery of the light emitting structure **10** and over the ohmic contact layer **40**. For example, the isolation layer **80** may be formed of an electrically insulating material, or a lower electric conductivity material than that of the light emitting structure **10**. The isolation layer **80** may be formed of an oxide or nitride. The isolation layer **80** may be formed of at least one selected from the group consisting of SiO_2, Si_xO_y, Si_3N_4, Si_xN_y, SiO_xN_y, Al_2O_3, TiO_2, ITO, AZO, ZnO and the like. The isolation layer **80** may be formed of the same material as or a different material than that of the current blocking layer **30**. The isolation layer **80** may be referred to as a channel layer.

A diffusion barrier layer **55**, a bonding layer **60**, and a support member **70** may be disposed beneath the reflective electrode **50**.

The diffusion barrier layer **55** may function to prevent a material contained in the bonding layer **60** from being diffused toward the reflective electrode **50** during formation of the bonding layer **60**. That is, the diffusion barrier layer **55** may prevent a material, such as for example, tin (Sn), contained in the bonding layer **60** from having an effect on the reflective electrode **50** and the like. The diffusion barrier layer **55** may be formed of at least one of Cu, Ni, Ti—W, W, and Pt.

The bonding layer **60** may be formed of a barrier metal or bonding metal. For example, the bonding layer **60** may be formed of at least one of Ti, Au, Sn, Ni, Cr, Ga, In, Bi, Cu, Ag and Ta. The support member **70** serves to support the light emitting device according to the embodiment, and may be electrically connected to an external electrode so as to apply power to the light emitting structure **10**. For example, the support member **70** may be formed of at least any one of Ti, Cr, Ni, Al, Pt, Au, W, Cu, Mo, Cu—W or dopant (e.g., Si, Ge, GaN, GaAs, ZnO, SiC, SiGe and the like) implanted semiconductor wafers. Also, the support member **70** may be formed of an insulating material.

A protective layer **90** may be further provided over the light emitting structure **10**. The protective layer **90** may be formed of an oxide or nitride. For example, the protective layer **90** may be formed of a material having light transmission and insulation properties, such as SiO_2, SiO_x, SiO_xN_y, Si_3N_4, and Al_2O_3. The protective layer **90** may be provided at a lateral surface of the light emitting structure **10**. Also, the protective layer **90** may be provided at an upper surface of the light emitting structure **10** as well as the lateral surface of the light emitting structure **10**.

The above description is based on a vertical type light emitting device in which the electrode **20** is disposed above the light emitting structure **10** and the reflective electrode **50** is disposed below the light emitting structure **10**. However, the light emitting device according to the present embodiment may be altered in various ways in relation to positions and shapes of a first electrode electrically connected to the first conductive semiconductor layer **11** and a second electrode electrically connected to the second conductive semiconductor layer **13** of the light emitting structure **10**. Also, the light emitting device according to the present embodiment may be applied to a horizontal type light emitting device in which the first electrode and the second electrode are exposed in the same direction.

FIG. **6** is a view illustrating a light emitting device package according to a second embodiment. Contents overlapped with the above described embodiment will not be described again.

The light emitting device package **200** according to the second embodiment, as illustrated in FIG. **6**, may include a package body **210**, the radiator **220**, and the light emitting device **230**.

The package body **210** may be a stack of a plurality of layers. Although FIG. **6** illustrates the case in which the package body **210** includes a first layer **211**, a second layer **212**, a third layer **213**, and a fourth layer **214**, the package body **210** may have more or fewer layers. Also, the package body **210** may be formed into a single layer.

The package body **210** may include a plurality of insulating layers. The package body **210** may be formed of an insulating material, such as a nitride or oxide. Also, the package body **210** may include a plurality of ceramic layers. For example, the package body **210** may be formed by a LTCC method. Also, the package body **210** may be formed by a HTCC method. A constituent material of the package body **210** may be SiO_2, Si_xO_y, Si_3N_4, Si_xN_y, SiO_xN_y, Al_2O_3, or AlN. For example, the package body **210** may be formed of AlN, or a metal nitride having thermal conductivity of 140 W/mK or more.

The respective layers **211**, **212**, **213** and **214** of the package body **210** may have the same thickness, or at least one of the layers may have a different thickness. The layers **211**, **212**, **213** and **214** of the package body **210** may be individual layers obtained by different fabrication processes, and may be integrated with one another after completion of firing.

An electrode pattern may be formed between the respective layers of the package body **210**, and power may be applied to the light emitting device **230** through the electrode pattern. The power may be applied to the light emitting device **230** through a via-hole structure.

An upper inner surface of the package body **210** may be a stepped surface. A reflective material may be provided in the stepped inner surface of the package body **210**. Accordingly, the package body **210** may reflect light emitted from the light emitting device **230** to extract the light to the outside.

A through-hole may be formed in a lower portion of the package body **210**. The radiator **220** may be disposed in the through-hole of the package body **210**. The light emitting device **230** may be disposed over the radiator **220**. The light emitting device **230** may come into contact with the radiator **220**. The radiator **220** is able to efficiently transfer heat generated from the light emitting device **230** to the outside. The radiator **220** may be exposed to the outside.

The radiator **220** may include the alloy layer **221** containing copper (Cu), and the Cu layer **222** disposed beneath the alloy layer **221**. The alloy layer **221** containing Cu may have a smaller horizontal cross sectional area than that of the Cu layer **222**.

According to one embodiment, the radiator **220** may include the alloy layer **221** containing Cu and the Cu layer **222**. A Cu layer has low processability, but has very excellent heat transfer properties. However, the Cu layer has a high coefficient of thermal expansion, which is considerably different from that of the light emitting device **230**. Accordingly, thermal expansion and contraction stress is transmitted to the light emitting device **230** upon temperature change, which may cause damage to the light emitting device **230**. To solve this problem, in the embodiment, the radiator **220** is configured such that the Cu layer **222** serves as a lower layer and the alloy layer **221** containing Cu is stacked over the Cu layer **222**. With this configuration, the light emitting device **230** comes into contact with the alloy layer **221** other than the Cu layer **222**. In the above mentioned embodiments, the alloy layer **221** may be a Cu—W alloy layer or a Cu—Mo alloy layer. Since the Cu—W alloy layer and Cu—Mo alloy layer have coefficients of thermal expansion similar to that of the light emitting device **230**, it is possible to prevent damage to the light emitting device **230** due to temperature change. The alloy layer **221** may contain at least one material of W and Mo. The alloy layer **221** may include Cu—W, Cu—Mo, and Cu—W—Mo layers.

Additionally, in the embodiment, the radiator **220** takes the form of a stack of a plurality of layers, which may prevent upward bulging of an upper surface of the radiator **220**. In this way, the light emitting device **230** disposed over the radiator **220** may be stably disposed.

FIG. **7** illustrates a light emitting device package according to a third embodiment. Contents overlapped with the above described embodiments will not be described again.

The light emitting device package **200** according to the third embodiment, as illustrated in FIG. **7**, may include the package body **210**, the radiator **220**, and the light emitting device **230**.

The package body **210** may be a stack of a plurality of layers. Although FIG. **7** illustrates the case in which the package body **210** includes the first layer **211**, the second layer **212**, the third layer **213**, the fourth layer **214**, and a fifth layer **215**, the package body **210** may have more or fewer layers. Also, the package body **210** may be formed into a single layer.

The package body **210** may include a plurality of insulating layers. The package body **210** may be formed of an insulating material, such as a nitride or oxide. Also, the package body **210** may include a plurality of ceramic layers. The package body **210** may include a green sheet. For example, the package body **210** may be formed by a LTCC method. Also, the package body **210** may be formed by a HTCC method. A constituent material of the package body **210** may be SiO2, SixOy, Si3N4, SixNy, SiOxNy, Al2O3, or AlN. For example, the package body **210** may be formed of AlN, or a metal nitride having thermal conductivity of 140 W/mK or more.

An upper inner surface of the package body **210** may be an inclined surface. A reflective material may be provided in the inclined inner surface of the package body **210**. Accordingly, the package body **210** may reflect light emitted from the light emitting device **230** to extract the light to the outside. The first layer **211** and the second layer **212** constituting the package body **210** may be referred to as extension layers. The extension layers may be stacked so as to be disposed around the light emitting device **230**. The package body **210** may include a cavity that is defined by the extension layers and has bottom and inner lateral surfaces. The inner lateral surface of the cavity may be an inclined surface. The third layer **213** may be referred to as a support layer. The third layer **213** may support the light emitting device **230**, and also may support the radiator **220** during formation of the radiator **220**. Specifically, the third layer **213** may serve as an anti-bulging layer to prevent the radiator **220** from being thermally expanded and bulging toward the light emitting device **230**.

A recess may be indented in a lower portion of the package body **210**. The recess may be disposed above a support structure that supports the package body **210**. For example, the support structure may include the fifth layer **215** that comes into contact with the radiator **220**. The radiator **220** may be disposed in the recess of the package body **210**. The light emitting device **230** may be disposed above the radiator **220**. The third layer **213** may be disposed

between the light emitting device **230** and the radiator **220**. The third layer **213** may have a small thickness to ensure efficient transfer of heat generated from the light emitting device **230** to the radiator **220**. For example, the thickness of the third layer **213** may be in a range of 40 μm to 60 μm.

The radiator **220** is adapted to efficiently transfer heat generated from the light emitting device **230** to the outside. The radiator **220** may be exposed to the outside. The radiator **220** may include the alloy layer **221** containing Cu, and the Cu layer **222** disposed beneath the alloy layer **221**. The alloy layer **221** containing Cu may have a smaller horizontal cross sectional area than that of the Cu layer **222**.

In the embodiment, as a result of disposing the third layer **213** over the radiator **220**, it is possible to prevent upward bulging of the upper surface of the radiator **220**. The third layer **213**, for example, may be formed of a green sheet, and may have a flat upper surface. Accordingly, the light emitting device **230** may be disposed over the third layer **213** via, e.g., eutectic bonding.

For example, the radiator **220** may be formed by filling the recess of the package body **210** with sintered pieces, pellets, a rod, fine powder, paste or the like, and thereafter performing firing. In this way, the light emitting device **230** may be stably disposed over the radiator **220**. A separate thin film, for example, a green sheet having a thickness in a range of 40 μm to 60 μm may be disposed beneath the radiator **220**.

FIG. **8** is a view illustrating a light emitting device package according to a second embodiment. Contents overlapped with the above described embodiment will not be described again.

The light emitting device package **200** according to the fourth embodiment, as illustrated in FIG. **8**, may include the package body **210**, the radiator **220**, and the light emitting device **230**.

The upper inner surface of the package body **210** may be stepped. A reflective material may be provided in the stepped inner surface of the package body **210**. Accordingly, the package body **210** may reflect light emitted from the light emitting device **230** to extract the light to the outside. The first layer **211** and the second layer **212** constituting the package body **210** may be referred to as extension layers. The extension layers may be stacked so as to be disposed around the light emitting device **230**. The package body **210** may include a cavity that is defined by the extension layers and has bottom and inner lateral surfaces. The inner lateral surface of the cavity may be stepped. The third layer **213** may be referred to as a support layer. The third layer **213** may support the light emitting device **230**, and also may support the radiator **220** during formation of the radiator **220**.

FIG. **9**A is a view illustrating a light emitting device package according to a fifth embodiment, and FIG. **9**B is a view illustrating a method for forming a circuit pattern in the package body. Contents overlapped with the above described embodiment will not be described again.

The light emitting device package **200** according to the fifth embodiment, as illustrated in FIG. **9**A, may include the package body **210**, the radiator **220**, and the light emitting device **230**.

The package body **210** has a through-hole, and the radiator **220** is inserted into the through-hole. An inner surface of the through-hole and an outer surface of the radiator **220**, which come into contact with each other, are respectively provided with patterns to increase a contact area, which may increase heat radiation effects.

Although FIG. **9**A illustrates the patterns as having a stepped shape, the shape of the patterns is not particularly limited.

A circuit pattern is formed in the package body **210** using electrode patterns and penetrating electrodes.

Referring to FIG. **9**B, first, a plurality of green sheets **280** is fabricated using a mixture of ceramic and binder. Then, in consideration of the entire package body **210**, via-holes **290** are formed at accurate positions through each of the plurality of green sheets **281** to **284**, and electrode patterns **294** connected to the via-holes **290** are formed. In this case, the electrode patterns **294** may be formed prior to forming the via-holes **290**. Then, an electrode material is filled into the via-holes **290** to form penetrating electrodes **292**. The electrode material may be applied only to inner walls of the via-holes **290**, or may be filled in the entire via-holes **290**.

As an electrode pattern disposed below the package body **210** acts as an electrode pad connected to the electrodes of the substrate, supply of power to the light emitting device **230** may be accomplished.

The light emitting device **230** may be electrically connected to the radiator **220** via a conductive adhesive layer **250**. That is, the radiator **220** may be formed of a material having thermal conductivity and electric conductivity, and may be electrically connected to the electrode pattern of the package body **210**. As the light emitting device **230** is bonded to the radiator **220** via the conductive adhesive layer **250**, direct conduction between the light emitting device **230** and the radiator **210** may be realized without separate wire bonding. The conductive adhesive layer **250**, for example, may be formed of Ag paste or Au—Sn metals.

FIG. **10** is a view illustrating a light emitting device package according to a sixth embodiment. Contents overlapped with the above described embodiment will not be described again.

The light emitting device package **200** according to the sixth embodiment, as illustrated in FIG. **10**, may include the package body **210**, the radiator **220**, and the light emitting device **230**.

The package body **210** includes an anti-bulging layer **260** disposed between the light emitting device **230** and the radiator **220**.

The package body **210** and the radiator **220** are formed of different materials and have a difference in coefficients of thermal expansion. Therefore, after the radiator **220** in the form of a radiating block is inserted into the package body **210**, the radiator **220** and the package body **210** may be subjected to co-firing. Also, as the radiator **220** is expanded by heat generated from the light emitting device **230** during use of the light emitting device package, the upper surface of the radiator **220**, on which the light emitting device **230** is mounted, may convexly bulge.

Once the upper surface of the radiator **220** has convexly bulged, a contact failure between the radiator **220** and the light emitting device **230** occurs, causing deterioration in reliability. Accordingly, providing the anti-bulging layer **260** between the light emitting device **230** and the radiator **220** may prevent the upper surface of the radiator **220** from bulging toward the light emitting device **230**.

The anti-bulging layer **260** may be separately prepared, and then be disposed on the package body **210**, or may be integrally formed with the package body **210** to constitute a part of the package body **210**.

The anti-bulging layer **260** may be provided with an electrode pattern to electrically connect the light emitting device **230** and the anti-bulging layer **260** to each other.

The anti-bulging layer **260** may be formed beneath the radiator **220** other than being formed between the light emitting device **230** and the radiator **220**.

FIG. **11** is a view illustrating a light emitting device package according to a seventh embodiment. Contents overlapped with the above described embodiment will not be described again.

The light emitting device package **200** according to the seventh embodiment, as illustrated in FIG. **11**, may include the package body **210**, the radiator **220**, and the light emitting device **230**.

The package body **210** includes the anti-bulging layer **260** disposed between the light emitting device **230** and the radiator **220**, and an anti-bulging layer **270** disposed beneath the radiator **220**.

In consideration of the fact that a lower surface as well as the upper surface of the radiator **220** may convexly bulge, the anti-bulging layers **260** and **270** may be respectively formed at both the upper and lower surfaces of the radiator **220**.

The anti-bulging layers **260** and **270** may be separately prepared, and then be disposed on the package body **210**, or may be integrally formed with the package body **210** to constitute a part of the package body **210**.

FIG. **12** is a view illustrating a light emitting device package according to an eighth embodiment. Contents overlapped with the above described embodiment will not be described again.

In the light emitting device package **300** according to the eighth embodiment, a package body **310** includes a plurality of ceramic layers **310**a, **310**b, **310**c and **310**d. The package body **310** may be formed using an HTCC or LTCC method.

If the package body **310** is a multilayered ceramic substrate, the respective layers may have the same thickness or have a difference in thickness. The package body **310** may be formed of an insulating material, such as a nitride or oxide. For example, the package body **310** may be formed of SiO2, SixOy, Si3N4, SixNy, SiOxNy, Al2O3, or AlN.

The plurality of ceramic layers **310**a, **310**b, **310**c and **310**d may have different widths. Some layers **310**a and **310**b may define the bottom of the light emitting device package **300** or a cavity, and the other layers **310**c and **310**d may define a sidewall of the cavity.

The light emitting device **230** is disposed on the bottom of the cavity that is defined by the plurality of ceramic layers **310**a, **310**b, **310**c and **310**d as described above. In the present embodiment, at least one light emitting device is provided, and for example, four light emitting devices **230** may be provided.

The light emitting device **230** includes a Light Emitting Diode (LED) using a plurality of compound semiconductor layers, for example, group III-V compound semiconductor layers. The light emitting device may be a colored light emitting device that emits red, green or blue light, or a UV light emitting device that emits ultraviolet light (UV).

Since the package body **310** is a ceramic substrate formed of inorganic LTCC or HTCCs, even if the light emitting device **230** including a deep-UV LED having a wavelength of about 260 nm to about 280 nm or a near-UV LED having a wavelength of about 365 nm to about 405 nm is used, there is no risk of the package body **310** being discolored or deteriorated by ultraviolet light (a wavelength of about 260 nm to about 405 nm) emitted from the light emitting device **230**, and it is possible to maintain reliability of a light emitting module.

FIGS. **13**A to **13**C are views illustrating the arrangement of electrode patterns included in the light emitting device package of FIG. **12**. Also, FIG. **14**A is a partial detailed view of FIG. **13**A, and FIG. **14**B is a side sectional view provided by diagonally cutting the light emitting device package of FIG. **13**.

Since the four light emitting devices **230** are arranged in the light emitting device package **300** of FIG. **12**, as illustrated in FIG. **13**A, four first electrode patterns **331**, **332**, **333** and **334** and four second electrode patterns **341**, **342**, **343** and **344** may be arranged respectively. The above described four first electrode patterns **331**, **332**, **333** and **334** may have the same polarity, and thus may be connected to a single lead frame. The four second electrode patterns **341**, **342**, **343** and **344** may have the same polarity that is different from that of the first electrode patterns **331**, **332**, **333** and **334**, and thus may be connected to another single lead frame.

In the plan view of FIG. **13**A, the ceramic layers **310**c and **310**d, which define the sidewall of the above described cavity, are illustrated at the periphery, and the ceramic layer **310**b, which defines the bottom of the cavity, is exposed at the center. As illustrated in the plan view of FIG. **13**A, the ceramic layer **310**d, which is illustrated as an uppermost layer in FIG. **12**, has the greatest width c, the ceramic layer **310**c, which is illustrated as a second layer from top in FIG. **12**, has a smaller width b than the greatest width c, and the ceramic layer **310**b, which defines the bottom of the cavity, has the smallest width a.

The first electrode patterns **331**, **332**, **333** and **334** and the second electrode patterns **341**, **342**, **343** and **344** as described above may be symmetrically arranged about the center of the ceramic layer **310**b that defines the bottom of the cavity. Hereinafter, an electrode pattern structure will partially be described in detail with reference to FIG. **14**.

The first electrode patterns **331**, **332**, **333** and **334** are positioned at a central region of the bottom of the cavity, and the second electrode patterns **341**, **342**, **343** and **344** are positioned at an edge region of the bottom of the cavity. The above described positions of the first electrode patterns **331**, **332**, **333** and **334** and the second electrode patterns **341**, **342**, **343** and **344** may be interchanged.

The second electrode pattern **341** is shaped such that a width f of each side is smaller than a width e of a corner. The ceramic layer **310**b is exposed from a region d corresponding to each side of the second electrode pattern **341** having the smaller width f as described above. That is, the second electrode pattern **341** may have different maximum and minimum widths. This arrangement ensures that light emitted from the light emitting device is reflected from an increased area of the ceramic layer **310**b, which may improve light emission efficiency of the light emitting device package.

Explaining again, the second electrode pattern **341** includes a first region **341-1** and a second region **341-2** connected to the first region **341-1**. A width of the first region **341-1** differs from a width of the second region **341-2**, and the width e of the first region **341-1** is greater than the width of the second region **341-2**. When providing the second region **341-2** with a smaller width than the width of the first region **341-1**, the ceramic layer **310**b is exposed outward, which may improve light reflection efficiency. The first region **341-1** is a region to which the wire **360** is bonded during wire bonding of the light emitting device **230**. This is equally applied even to the other second electrode patterns **342**, **343** and **344**.

Also, a contact area between the exposed ceramic layer **310**b and a light transmitting layer increases. Since a bonding force between the ceramic layer **310**b and silicon resin contained in the light transmitting layer is greater than a

bonding force between the second electrode pattern **341** formed of a metal and the light transmitting layer, the light emitting device package may achieve increased stability in an internal structure thereof.

A protrusion p may be formed at the corner of the second electrode pattern **341**. The ceramic layer **310**b constituting the package body is provided at a position corresponding to the protrusion p with a connection electrode of the above described via-hole type. Since the connection electrode serves to connect the second electrode pattern **341** to the lead frame, the connection electrode may be an extended pattern of the second electrode pattern **341**. The protrusion p and the extended pattern as described above may be electrically connected to the through-hole formed in the package body and be electrically connected to the lead frame provided in the lower portion of the package body. Referring to FIG. **14**B, the protrusion p, which is the extended pattern of the second electrode pattern **341**, is extended toward the sidewall of the cavity. At least a portion of the protrusion may be located below the sidewall of the cavity. Also, the through-hole, which is electrically connected to the protrusion p, may also be arranged to vertically overlap with the sidewall of the cavity. In the case in which the electrode pattern is formed on the package body having the through-hole, the through-hole may cause a corresponding portion of the electrode pattern to be depressed, having a negative effect on reliability. Therefore, providing the through-hole and the protrusion p below the sidewall of the cavity may prevent deterioration in reliability.

Referring to FIG. **13**B, the first electrode patterns **331** to **334** are patterned to define a region d corresponding to a reduced width of the electrode patterns. The ceramic layer **310**b is exposed from the region d corresponding to the reduced width of the first electrode patterns **331** to **334**. That is, owing to the region d corresponding to the reduced width of the first electrode patterns **331** to **334**, light emitted from the light emitting device is reflected from an increased area of the ceramic layer **310**b, which may improve light emission efficiency of the light emitting device package.

Explaining again, the first electrode pattern **331** includes a chip mounting region **331-1** and a plurality of edge regions **331-2** arranged around the chip mounting region **331-1**. The ceramic layer **310**b is exposed outward between the respective neighboring edge regions **331-2**, which may improve light reflection efficiency. This is equally applied even to the other first electrode patterns **332**, **333** and **334**. In FIG. **13**B, the edge regions **331-2** are illustrated as being located at corners of the chip mounting region **331-1** by way of example.

Referring to FIG. **13**C, the first electrode patterns **331** to **334** are patterned such that corners thereof are removed to provide the first electrode patterns **331** to **334** with reduced width portions. Effects of this configuration are identical to those as described above with reference to FIG. **13**B.

Explaining again, the first electrode pattern **331** includes the chip mounting region **331-1** and the plurality of edge regions **331-2** arranged around the chip mounting region **331-1**. The ceramic layer **310**b is exposed outward between the respective neighboring edge regions **331-2**, which may improve light reflection efficiency. This is equally applied even to the other first electrode patterns **332**, **333** and **334**. In FIG. **13**B, the edge regions **331-2** are illustrated as being located along sides of the chip mounting region **331-1** by way of example.

The above described configuration with reference to FIGS. **13**A to **13**C in which the electrode pattern has a reduced width portion to expose the ceramic layer may be applied to at least one of the four first electrode patterns **331** to **334** and the four second electrode patterns **341** to **344**.

Referring to FIG. **14**, assuming that the width f of each side of the second electrode pattern **341** is 0.35 mm, the width e of the corner may be 0.45 mm. Also, a distance h between the second electrode pattern **341** and the first electrode pattern **331** may be 0.1 mm, and a width g of a relatively wider region except for the corner may be 0.45 mm.

FIGS. **15** to **17** are views illustrating light emitting device packages according to a ninth embodiment. Contents overlapped with the above described embodiment will not be described again.

In the light emitting device package **400** according to the ninth embodiment, a package body includes a plurality of ceramic layers **410**a, **410**b, **410**c, **410**d and **410**e. The package body may be formed using an HTCC or LTCC method.

If the package body is a multilayered ceramic substrate, the respective layers may have the same thickness or have a difference in thickness. The package body may be formed of an insulating material, such as a nitride or oxide. For example, the package body may be formed of SiO2, SixNy, Si3N4, SixNy, SiOxNy, Al2O3, or AlN.

The plurality of ceramic layers **410**a, **410**b, **410**c, **410**d and **410**e may have different widths. Some layers **410**a, **410**b and **410**c may define the bottom of the light emitting device package **400** or a cavity, and the other layers **410**d and **410**e may define a sidewall of the cavity.

The light emitting device **230** is disposed on the bottom of the cavity that is defined by the plurality of ceramic layers **410**a, **410**b, **410**c, **410**d and **410**e as described above. In the present embodiment, at least one light emitting device may be provided. A molded part **450** may be disposed in the cavity to surround the light emitting device **230** and a wire **440**. The molded part **450** may contain silicon resin or a fluorescent substance **460**. The fluorescent substrate **460** serves to change a first wavelength of light emitted from the light emitting device **230** into a longer second wavelength of light. For example, if the first wavelength of light is ultraviolet light, and the second wavelength of light is visible light.

Since the package body is formed of an inorganic ceramic substrate, even if the light emitting device **230** including a deep-UV LED having a wavelength of about 260 nm to about 280 nm or a near-UV LED having a wavelength of about 365 nm to about 405 nm is used, there is no risk of the package body being discolored or deteriorated by ultraviolet light (a wavelength of about 260 nm to about 405 nm) emitted from the light emitting device **230**, and it is possible to maintain reliability of a light emitting module.

Referring to FIG. **15**, the light emitting device **230** is disposed on a surface of the package body. When the plurality of ceramic layers **410**a, **410**b, **410**c, **410**d and **410**e constituting the package body defines the cavity, the light emitting device **230** may be disposed on a surface of the ceramic layer **410**c that defines the bottom of the cavity.

In the embodiment, two light emitting devices **230** respectively come into contact with radiators **480**a and **480**b via conductive adhesive layers **445**. The radiators **480**a and **480**b may be formed of a material having excellent thermal conductivity and electric conductivity, and for example, may be formed of Cu or Cu alloys. The Cu alloys may further contain at least one of W and Mo, and for example, may include Cu—W, Cu—Mo, and Cu—W—Mo. As the radiators **480**a and **480**b are formed of an electrically conductive material and the light emitting devices **230** are attached to

the radiators **480**a and **480**b via the conductive adhesive layers **445**, direct conduction between the light emitting devices **230** and the radiators **480**a and **480**b may be realized without separate wire bonding.

A portion of each radiator **480**a or **480**b adjacent to the corresponding light emitting device **230** may have a width Wb equal to a width Wa of the light emitting device **230**, whereas a width We of the layer defining the bottom of the package body may be greater than the width Wa of the light emitting device **230**. That is, a portion of the radiator **480**a or **480**b coming into contact with the light emitting device **230** has a smaller width than an opposite side portion of the light emitting device **230**.

This is because it is sufficient for the radiators **480**a and **480**b to have the same width as the light emitting device **230** at a surface thereof coming into contact with the light emitting device **230** and increasing the width of the radiators **280**a and **280**b with increasing distance away from the light emitting device **230** may result in enhanced heat radiation efficiency. Moreover, when lower ends of the radiator **480**a and **480**b, from which heat is radiated, have a greater area, it is possible to ensure less thermal expansion of the radiators **480**a and **480**b than heat radiation through a small area.

Also, according to an embodiment, a width of the radiator **280**a and **280**b may increase with decreasing distance from the light emitting device **230**.

According to an embodiment, the radiators **480**a and **480**b may be configured such that a first portion, which is disposed adjacent to the light emitting device **230** and has a relatively small width, and a second portion, which is disposed at an opposite side of the light emitting device **230** and has a greater width than the first portion, may be formed of different materials. For example, the first portion may be formed of an alloy layer containing Cu, and the second portion may be formed of a Cu layer. The alloy layer containing Cu may further contain at least one of W and Mo, and for example, may contain Cu—W, Cu—Mo and Cu—W—Mo.

A Cu layer has low processability, but has very excellent heat transfer properties. However, the Cu layer has a high coefficient of thermal expansion, which is considerably different from that of the light emitting device **230**. Accordingly, thermal expansion and contraction stress is transmitted to the light emitting device **230** upon temperature change, which may cause damage to the light emitting device **230**. To solve this problem, in the embodiment, the radiators **480**a and **480**b may be configured such that the lower second portion is formed of a Cu layer and the upper first portion is formed of an alloy layer containing Cu. With this configuration, the light emitting device **230** comes into contact with the alloy layer other than the Cu layer. Since a Cu—W alloy layer and a Cu—Mo alloy layer have coefficients of thermal expansion similar to that of the light emitting device **230**, it is possible to prevent damage to the light emitting device **230** due to temperature change.

The two radiators **480**a and **480**b may be electrically connected to each other via an electrode pattern **475**c that is formed on the ceramic layer **410**c. The radiator **480**b may be electrically connected to an electrode pattern **475**b that is formed in the ceramic layer **410**b, and the electrode pattern **475**b may be connected to an electrode pattern **475**a beneath the ceramic layer **410**a via a through-hole **477**a. The through-hole **477**a is filled with a conductive material.

The light emitting device **230** may be bonded to an electrode pattern **471**d on a surface of the ceramic layer **410**c via the wire **440**. The electrode pattern **471**d may be connected to an electrode pattern **471**a beneath the ceramic layer **410**a via electrode patterns **471**b and **471**c and through-holes **473**a, **473**b and **473**c which are respectively formed in the ceramic layers **410**a, **410**b and **410**c and are filled with a conductive material. A pair of electrode patterns **471**a and **475**a as described above may act as electrode pads that directly electrically come into contact with a circuit board.

As illustrated, two or four light emitting devices **230** may be arranged on the above described ceramic layer **410**c. The electrode patterns **471**d and **475**d, which are electrically connected to the respective light emitting devices **230**, have the same polarity, and thus may be electrically connected to each other.

An anti-bulging layer **490** may be disposed beneath the radiators **480**a and **480**b. The anti-bulging layer **490** may be a green sheet, and may support the lowermost ceramic layer **410**a of the package body and the radiators **480**a and **480**b so as to seal the radiators **480**a and **480**b and prevent thermal expansion of the radiators **480**a and **480**b.

In the embodiment illustrated in FIG. **16**, the anti-bulging layer **490** is disposed beneath the ceramic layer **410**a constituting the package body. The electrode pattern **471**a may be electrically connected to an electrode pad **492**a beneath the green sheet **490** via a through-hole **491**a which is formed in the green sheet **490** and is filled with a conductive material. The electrode pattern **475**a may be electrically connected to an electrode pad **492**b beneath the green sheet **490** via a through-hole **491**b which is formed in the green sheet **490** and is filled with a conductive material.

In the above described embodiments, the anti-bulging layer **490** may be a support plate that maintains the shape of the radiators **480**a and **480**b, or may be a light-transmitting thin film. The anti-bulging layer **490** may be formed of the same material as the ceramic layer **410**a.

In the embodiment illustrated in FIG. **17**, an anti-bulging layer **495** is disposed over the ceramic layer **410**c that defines the bottom of the cavity. The light emitting device **230** may be bonded to the electrode patterns **471**d and **475**d on a surface of the anti-bulging layer **495** via the wire **440**. The electrode pattern **471**d may be electrically connected to an electrode pattern **497**a via a through-hole **496**a which is formed in the anti-bulging layer **495** and is filled with a conductive material. The plurality of electrode patterns **471**d and **475**d may be electrically connected to each other.

Two light emitting devices **230** may be electrically connected to an electrode pattern **498** formed over the ceramic layer **410**c via the conductive adhesive layer **445**. The electrode pattern **498** may electrically come into contact with the radiator **480**b, and the radiator **480**b may be electrically connected to the electrode pattern **475**a beneath the ceramic layer **410**a via the electrode patterns **475**b and **475**c and through-holes **477**a and **477**b that are filled with a conductive material. Also, the two radiators **480**a and **480**b may be electrically connected to each other.

In the present embodiment, the anti-bulging layer **495** may be disposed at a region corresponding to the radiators **480**a and **480**b, which may prevent the surfaces of the radiators **480**a and **480**b from being roughened upon thermal expansion of the radiators **480**a and **480**b. A portion of the anti-bulging layer **495** not corresponding to the light emitting device **230** may serve to balance the height of the package body.

FIG. **18** is a detailed view illustrating the radiator included in the light emitting device package according to the ninth embodiment.

FIGS. **18**(a) and **18**(b) illustrate two radiators **480**a and **480**b, and FIGS. **18**(c) and **18**(d) illustrate four radiators

480a to 480d. The arrangement of the plurality of radiators may minimize thermal deformation of the radiators during fabrication of the light emitting device package, and thus may prevent tilting of the light emitting device or the light emitting device package, and consequently, achieve a balanced light emission angle.

In FIGS. 18(a) and 18(b), the width We of the lower portion of the respective radiators 480a and 480b may be greater than the width Wb of the upper portion of the radiators 480a and 480b. The respective radiators 480a and 480b are spaced apart from each other by a distance Wd. The above described distance Wd may be a width of a ceramic layer disposed between the respective radiators 480a and 480b.

In FIGS. 18(c) and 18(d), four radiators 480a, 480b, 480c and 480d may be arranged to correspond to four light emitting devices, respectively. The respective radiators 480a, 480b, 480c and 480d are spaced apart from one another by the same distance Wd, and a ceramic layer may be disposed between the respective radiators 480a, 480b, 480c and 480d. The four radiators 480a, 480b, 480c and 480d are symmetrically arranged.

Contents of the electrode pattern according to the above described eighth embodiment may be applied to the light source module according to the ninth embodiment, and a description of such overlapping contents will be omitted hereinafter.

FIGS. 19 and 20 are views illustrating a light source module according to a tenth embodiment.

Referring to FIG. 19, the light source module according to the tenth embodiment includes a package body 510 having a through-hole 510a, a radiator 520 disposed in the through-hole 510a, a sub-mount 530 disposed on the radiator 520, and at least one light emitting device 230 disposed on the sub-mount 530.

The package body 510 may be a single layer ceramic substrate or a multilayered ceramic substrate. If the package body 510 is a multilayered ceramic substrate, for example, the package body 510 may be formed using a HTCC or LTCC method.

In the case of the package body 510 in the form of the multilayered ceramic substrate, the respective layers may have the same thickness or have a difference in thickness, although the disclosure is not limited thereto.

A plurality of electrode patterns may be provided in the package body 510 and be electrically connected to the light emitting device 230 to apply current required to drive the light emitting device 230.

The package body 510 may include a cavity 512 that is defined by a sidewall 512a and a bottom portion 512b. As illustrated in FIG. 19, the sidewall 512a of the package body 510 may include an inclined surface. The inclined surface may reflect light emitted from the light emitting device 230 to direct the reflected light to an open upper end of the cavity 512, which may improve light extraction efficiency of the light source module.

A reflective layer may be coated, plated or deposited on at least a part of the sidewall 512a and the bottom portion 512b of the cavity 512.

A ceramic substrate is easy to form a cavity and has high heat resistance as compared to a metal substrate that has difficulty in forming a cavity. However, in consideration of the fact that the ceramic substrate has a lower thermal conductivity than the metal substrate, to compensate for heat radiation properties, a radiator 520 formed of a metal slug may be subjected to a thermal treatment, such as co-firing or Ag—Cu bonding, prior to inserting the radiator 520 into the ceramic substrate.

In the case in which the package body 510 has the through-hole 510a and the cavity 512, the through-hole 510a may be formed in the bottom portion 512b of the cavity 512. The radiator 520 is inserted into and disposed in the through-hole 510a.

An inner surface of the through-hole 510a and an outer surface of the radiator 520, which come into contact with each other, may be provided with patterns to increase a contact area, which may increase heat radiation effects.

Although FIG. 19 illustrates the pattern as having a stepped shape by way of example, the pattern shape is not particularly limited.

The radiator 520 may be formed of a metal having excellent thermal conductivity, and for example, may be formed of at least one of Cu alloys, such as Cu—W and Cu—Mo, Cu, Mo, W, and Ag.

In consideration of coefficients of thermal expansion of the package body 510 and the radiator 520, for example, if the package body 510 is formed using HTCC technology, inserting the radiator 520 formed of Cu—W is more stable to heat. If the package body 510 is formed using LTCC technology, inserting the radiator 520 formed of Ag is more stable to heat.

The sub-mount 530 is disposed on the radiator 520. The sub-mount 530 may be a conductive substrate or an insulating substrate, and for example, may be formed of materials selected in consideration of thermal conductivity and a high coefficient of thermal expansion, such as Si, SiC, AlN and the like.

A conductive adhesive layer 540 is disposed on the sub-mount 530, and the light emitting device 230 may be attached via the conductive adhesive layer 540.

Since heat generated from the light emitting device 230 is discharged to the outside through the radiator 520 by way of the sub-mount 530, the sub-mount 530 may be formed of a material having excellent thermal conductivity.

As a result of placing the sub-mount 530 on the radiator 520, heat generated from the light emitting device 230 is discharged to the outside through the radiator 520 having excellent thermal conductivity, instead of the package body 510 having relatively low thermal conductivity, which may improve reliability of the light source module.

In the case in which the light emitting device 230 is directly mounted onto the radiator 520, the light emitting device 230 may be unintentionally separated or be unstably bonded if an upper surface of the radiator 520 is not flat, which may result in deterioration in heat radiation efficiency and reliability. This problem may be minimized by placing the light emitting device 230 on the sub-mount 530.

The radiator 520 serves to discharge heat generated from the light emitting device 230 to the outside, thereby maintaining reliability of the light source module. Thus, the light emitting device 230 and the radiator 520 may be arranged to vertically overlap with each other.

Although FIG. 19 illustrates only three light emitting devices 230 by way of example, more or fewer light emitting devices may be provided according to the embodiments.

Since the package body 510 is formed of an inorganic material, even if the light emitting device 230 including a deep-UV LED having a wavelength of about 260 nm to about 280 nm or a near-UV LED having a wavelength of about 365 nm to about 405 nm is used, there is no risk of the package body 510 being discolored or deteriorated by ultraviolet light (a wavelength of about 260 nm to about 405 nm)

emitted from the light emitting device **230**, and it is possible to maintain reliability of a light emitting module.

A glass part **550** may be disposed to cover the open upper end of the cavity **512** of the package body **510**.

The glass part **550** may be formed of a transparent material and a non-reflective coating film, to transmit light emitted from the light emitting device **230** to the outside without absorption. For example, the glass part **550** may be formed of SiO_2 (quartz, UV fused silica), Al_2O_3 (Sapphire), or LiF, MgF_2, CaF_2, low iron transparent glass, B_2O_3, and the like.

If the light emitting device **230** is a UV LED, the glass part **550** serves to prevent ultraviolet light emitted from the light emitting device **230** from breaking or deteriorating organic matters at the outside of the light source module.

A space **560** between the glass part **550** and the cavity **512** may be in a vacuum state, or may be filled with N_2 gas or forming gas.

The package body **510** formed of a ceramic substrate may be provided at an upper end of the sidewall **512**a of the cavity **512** with a support portion **514** to support the edge of the glass part **550**.

Alternatively, as illustrated in FIG. **20**, instead of the glass part **550**, a molded part **565** may be formed in the cavity **512** of the package body **510** to surround the light emitting device **230**.

The molded part **565** may be formed of high-refraction or low-refraction silicon resin mixed with a fluorescent substance, silicon resin strong to ultraviolet light, hybrid-based resin, and the like, but the disclosure is not limited thereto.

A radiating pad **570** may be disposed beneath the package body **510** and the radiator **520**.

In consideration of the fact that heat generated from the light emitting device **230** is discharged to the outside by way of the sub-mount **530**, the radiator **520** and the radiating pad **570**, the radiating pad **570** may be formed of a material having excellent thermal conductivity. For example, the radiating pad **570** may be formed of any one metal selected from among Ag, Au and Cu.

A thermal sheet **575** may be disposed between the radiating pad **570** and the package body **510** and between the radiating pad **570** and the radiator **520**. The thermal sheet **575** has excellent thermal conductivity, electric insulation and flame-resistance, and serves to assist the radiating pad **570** in coming into close contact with a heating region, thereby maximizing heat transfer effects.

FIG. **21** is a view illustrating a light source module according to an eleventh embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source module according to the eleventh embodiment includes the package body **510** having the through-hole **510**a, the radiator **520** disposed in the through-hole **510**a, and the at least one light emitting device **230** disposed on the radiator **520**.

A difference between the present embodiment and the above described tenth embodiment is that the light source module does not include the sub-mount **530** and the light emitting device **230** is directly disposed on the radiator **520**.

The radiator **520** may have conductivity and the light emitting device **230** is bonded onto the conductive adhesive layer **540**. Thus, direct conduction between the light emitting device **230** and the radiator **520** may be realized without separate wire bonding.

FIG. **22** is a view illustrating a light source module according to a twelfth embodiment. Contents overlapped with the above described embodiment will not be described again.

In the light source module according to the twelfth embodiment, the package body **510** includes a zener diode bonding portion **580**, and a zener diode **585** is disposed on the zener diode bonding portion **580**.

The zener diode bonding portion **580** may be separated from a space in which the light emitting device **230** is disposed. The reason of separating or isolating the zener diode **585** from the space in which the light emitting device **230** is disposed is that light emitted from the light emitting device **230** may be absorbed, or scattered or reflected by the zener diode **585**, which may deteriorate light emission efficiency of the light emitting device **230**.

For example, if the package body **510** includes the cavity **512**, the zener diode bonding portion **580** may be disposed at a region except for the cavity **512**.

The zener diode bonding portion **580** may be provided with a molded part **590**, in which, e.g., silicon resin is filled to protect the zener diode **585** and an Au wire.

FIG. **23** is a view illustrating a light source module according to a thirteenth embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source module according to the thirteenth embodiment includes a substrate **620**, which includes a light source **600** disposed on a surface thereof and an electrode pad **610** electrically connected to the light source **600**, and a holder **630** which is disposed on the substrate **620** and has a cavity **632** formed at a position corresponding to the electrode pad **610**. The electrode pad **610** comes into contact with protruding electrodes **631** that are arranged in the cavity **632** and are electrically connected to wires **634** and **635** respectively.

The light source **600** includes a light emitting device, and may be a Chip On Board (COB) type in which the light emitting device in the form of a chip is mounted on a substrate.

The substrate **620** may be a metal substrate or ceramic substrate, on which a circuit pattern is formed.

The ceramic substrate may be formed into a single layer or multiple layers. If the substrate **620** is a multilayered ceramic substrate, for example, the substrate **620** may be realized using HTCC or LTCC technology.

If the light emitting device is a UV LED including a deep-UV LED having a wavelength of about 260 nm to about 280 nm or a near-UV LED having a wavelength of about 365 nm to about 405 nm, the substrate **620** may be formed of a ceramic substrate so as not to be discolored or deteriorated by ultraviolet light (a wavelength of about 260 nm to about 405 nm) emitted from the light emitting device.

The electrode pad **610** electrically connected to the light source **600** is disposed at an upper surface of the substrate **620**.

The electrode pads **610** may include a plurality of electrode pads **610** according to the embodiments.

Although the electrode pad **610** may be disposed adjacent to the edge of the substrate **620**, the position of the electrode pad **610** may be changed according to the embodiments, and the disclosure is not limited thereto.

The electrode pad **610** may be directly disposed on the upper surface of the substrate **620**, or may be disposed in a recess **614** formed in the substrate **620**.

More specifically, a thickness of a portion of the substrate **620** corresponding to the electrode pad **610** may be different

from a thickness of the remaining portion of the substrate **620** not corresponding to the electrode **610**. For example, the portion of the substrate **620** corresponding to the electrode pad **610** may have a smaller thickness.

The electrode pad **610** includes an anode electrode pad **611** which is electrically connected to a first electrode of the light source **600**, and a cathode electrode pad **612** which is spaced apart from the anode electrode pad **611** and is electrically connected to a second electrode of the light source **600**.

The anode electrode pad **611** and the cathode electrode pad **612** may be arranged parallel to each other in the same direction, but the disclosure is not limited thereto.

Although FIG. **23** illustrates the light source module as having two electrode pads **610**, i.e. a first electrode pad **610**a and a second electrode pad **610**b by way of example, a light source module having only one electrode pad or three or more electrode pads may be possible according to the embodiments.

If two or more electrode pads **610** are provided, it is possible to select and use any one of the electrode pads **610** disposed at a convenient position without changing the position or direction of the light source module based on a position of an external power source.

The holder **630** is disposed on the substrate **620** and includes the cavity **632** corresponding to the electrode pad **610**. The wires **634** and **635** arranged in the cavity **632** come into contact with the electrode pad **610**.

More specifically, the wires **634** and **635** connected to the external power source are arranged in the cavity **632** of the holder **630**, and the protruding electrodes **631** electrically connected to the wires **634** and **635** come into contact with the anode electrode pad **611** and the cathode electrode pad **612**, respectively, to apply current to the light source module.

The internal configuration of the holder **630** and the contact configuration between the holder **630** and the electrode pad **610** will be described hereinafter with reference to FIGS. **25** and **26**.

If the light emitting device includes a UV LED, the holder **630** may be formed of an inorganic material so as not to be discolored or deteriorated by ultraviolet light emitted from the light emitting device.

Although FIG. **23** illustrates the holder **630** as being provided only on the first electrode pad **610**a for easy explanation of the shape of the electrode pad **610**, the holder **630** is also provided on the second electrode pad **610**b.

FIG. **24** is a view illustrating a light source module according to a fourteenth embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source module according to the fourteenth embodiment includes the substrate **620**, which includes the light source **600** disposed on the surface thereof and the electrode pad **610** electrically connected to the light source **600**, and the holder **630** which is disposed on the substrate **620** and has the cavity **632** formed at a position corresponding to the electrode pad **610**. The electrode pad **610** comes into contact with the protruding electrode **631** that is arranged in the cavity **632** and is electrically connected to the wire **634**.

The light source **600** includes a light emitting device, and may be a Chip On Board (COB) type in which the light emitting device in the form of a chip is mounted on a substrate.

The electrode pad **610** includes the anode electrode pad **611** which is electrically connected to the first electrode of the light source **600**, and the cathode electrode pad **612** which is spaced apart from the anode electrode pad **611** and is electrically connected to the second electrode of the light source **600**.

In this case, differently from the above described thirteenth embodiment, the anode electrode pad **611** and the cathode electrode pad **612** are not arranged parallel to each other in the same direction, but are arranged respectively at different regions of the substrate **620**.

FIG. **24** illustrates the anode electrode pad **611** as being disposed at a partial edge region of the substrate **620** and the cathode electrode pad **612** as being disposed at a remote position diagonally spaced apart from the anode electrode pad **611**.

Also, differently from the above described thirteenth embodiment, the anode electrode pad **611** and the cathode electrode pad **612** are remotely spaced apart from each other, and therefore the holder **630** is also divided to cover the anode electrode pad **611** and the cathode electrode pad **612** respectively. Thus, a single wire connected to the external power source is disposed in the cavity **632** formed in each holder **630**.

More specifically, a difference between the holder **630** of the thirteenth embodiment and the holder **630** of the fourteenth embodiment is that the holder **630** of the thirteenth embodiment is a single holder to cover both the anode electrode pad **611** and the cathode electrode pad **612**, and thus the two wires **634** and **635** having different polarities are arranged in the cavity **632**, whereas the holder **630** of the fourteenth embodiment includes one holder to cover the anode electrode pad **611** and the other holder to cover the cathode electrode pad **612**, and thus the wires **634** and **635** having different polarities are arranged respectively in the cavities **632** of the two holders.

FIG. **24** illustrates the holder **630** as being disposed only on the anode electrode pad **611** for easy explanation of the shape of the electrode pad **610**, the holder **630** is also provided on the second electrode pad **612**.

FIG. **25** is a view illustrating a holder fastening configuration. Hereinafter, a fastening structure of the holder **630** disposed in the light source module according to the embodiment will be described with reference to FIG. **25**.

FIG. **25** illustrates only a lower surface of the holder **630** except for an upper surface thereof. The holder **630** includes at least one first fastening portion **637**, and may be fixed to the substrate **620** that is disposed at the lower surface of the holder **630** using a fastener **638**.

Although not illustrated, the substrate **620** may be provided with a fastening portion at a position corresponding to the first fastening portion **637**.

In FIG. **25**, the fastening portion **637** may include two through-holes formed in the lower surface of the holder **630** by way of example, and the fastener **638** may include a screw fastened through the fastening portion **637** of the holder **630** and the fastening portion of the substrate **620** to fix the holder **630** to the substrate **620**.

The shape and number of the first fastening portion **637** and the kind of the fastener **638** may be changed in various ways according to the embodiments and are not particularly limited.

FIGS. **26**A and **26**B are sectional views illustrating an embodiment of a contact configuration between the wire disposed in the holder and the electrode pad on the substrate.

Referring to FIG. **26**A, the holder **630** has the cavity **632** at a position corresponding to the electrode pad **610** on the substrate **620**, and the protruding electrode **631** electrically

connected to the wire **634** is disposed in the cavity **632** so as to come into contact with the electrode pad **610**.

The substrate **620** is provided with the recess **614** and the electrode pad **610** may be disposed in the recess **614**.

The electrode pad **610** is connected to a circuit pattern **617** formed in the substrate **620**.

Although the wire **634** connected to the external power source and the electrode pad **610** on the substrate **620** have been electrically connected to each other by soldering in the related art, soldering may cause environmental contamination due to use of heavy metals, such as lead, and consequently cause a wire connection failure due to cold soldering.

According to the embodiment, the wire **634** disposed in the holder **630** mechanically comes into contact with the electrode pad **610** via the protruding electrode **631**. This contact configuration causes no environmental contamination and minimizes a wire connection failure, resulting in improved reliability of a light emitting module.

A spring **639** to support the protruding electrode **631** may be provided in the cavity **632** of the holder **630**.

When the wire **634** comes into contact with the electrode pad **610** via the protruding electrode **631**, the spring **639** assists the protruding electrode **631** in more firmly coming into contact with the electrode pad **610** by elasticity thereof.

An outer surface of the spring **639** is coated with an insulating material to prevent short-circuiting between the wire **634** and the electrode pad **610**.

Alternatively, as illustrated in FIG. **26**B, the wire **634** and the electrode pad **610** may be electrically connected to each other via a second electrode **633**. Here, the second electrode **633** is an integral unit of the spring **639** and the protruding electrode **631** of FIG. **26**A.

In this case, a support portion **615** is formed at a surface of the cavity **632** such that one side of the second electrode **633** penetrates through the support portion **615** thereby be supported by the support portion **615**.

The holder **630** includes at least one protrusion **636** formed at a lower surface thereof facing the substrate **620**, and the substrate **620** has at least one receiving recess **618** formed at a position corresponding to the protrusion **636**. The holder **630** may be fitted into the substrate **620** via engagement between the protrusion **636** and the receiving recess **618**.

The protrusion **636** and the receiving groove **618**, as described above in relation to FIG. **25**, assist the holder **630** and the substrate **620** in more firmly being coupled to each other, along with the fastener **638**.

Although FIGS. **26**A and **26**B illustrate the wire **634** electrically connected to the anode electrode pad **611** by way of example, the above description may be equally applied even to the wire **635** electrically connected to the cathode electrode pad **612**.

Also, although not illustrated, if the single holder **630** is disposed to cover both the anode electrode pad **611** and the cathode electrode pad **612** as illustrated in FIG. **23**, the two wires **634** and **635** having different polarities are disposed in the cavity **632** of the holder **630**. The wires **634** and **635** may be electrically connected to the anode electrode pad **611** and the cathode electrode pad **612** arranged on the substrate **620** respectively.

FIG. **27** is a view illustrating a light source module according to a fifteenth embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source module according to the fifteenth embodiment includes the substrate **620**, which includes the light source **600** disposed on the surface thereof and the electrode pad **610** electrically connected to the light source **600**, and the holder **630** which is disposed on the substrate **620** and has the cavity **632** formed at a position corresponding to the electrode pad **610**. The electrode pad **610** comes into contact with the protruding electrode **631** that is arranged in the cavity **632** and is electrically connected to the wire **634**.

The light source **600** includes a light emitting device package, and may be a Package On Board (POB) type in which a light emitting device package is mounted on a substrate.

The electrode pad **610** is disposed on the upper surface of the substrate **620**, and includes the anode electrode pad **611** which is electrically connected to the first electrode of the light source **600**, and the cathode electrode pad **612** which is spaced apart from the anode electrode pad **611** and is electrically connected to the second electrode of the light source **600**.

As described above, although the number and positions of the electrode pads **610** and the number and positions of the anode electrode pads **611** and the cathode electrode pads **612** included in the electrode pads **610** may be changed in various ways, FIG. **27** illustrates the single anode electrode pad **611** as being disposed at a partial edge region of the substrate **620** and the single cathode electrode pad **612** as being remotely spaced apart from the anode electrode pad **611** by way of example.

Also, the holders **630** are respectively positioned to correspond to the anode electrode pad **611** and the cathode electrode pad **612** so as to cover the anode electrode pad **611** and the cathode electrode pad **612**.

The holders **630** are similar to the above description in relation to the thirteenth and fourteenth embodiments, and thus a detailed description thereof will be omitted.

Although FIG. **27** illustrates the holder **630** as being disposed only on the anode electrode pad **611** for easy explanation of the shape of the electrode pad **610**, the holder **630** is also disposed on the cathode electrode pad **612**.

The substrate **620** may be a metal plate or ceramic plate provided with a circuit pattern.

The ceramic substrate may be formed into a single layer or multiple layers. If the substrate **620** is a multilayered ceramic substrate, for example, the substrate **620** may be realized using HTCC or LTCC technology.

FIG. **28** is a view illustrating a light source module according to a sixteenth embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source module according to the sixteenth embodiment includes the substrate **620**, which includes the light source **600** disposed on the surface thereof and the electrode pad **610** electrically connected to the light source **600**, a holder **700**, which is disposed on the substrate **620** and has an opening **710** corresponding to the light source **600**, and a diffusion member **720**, which is fixed in the opening **710** so as to be disposed on the light source **600**.

The light source **600** includes a light emitting device, and may be a Chip On Board (COB) type in which the light emitting device in the form of a chip is mounted on the substrate **620**.

The substrate **620** may be a metal plate or ceramic plate provided with a circuit pattern.

The ceramic substrate may be formed into a single layer or multiple layers. If the substrate **620** is a multilayered ceramic substrate, for example, the substrate **620** may be realized using HTCC or LTCC technology.

The holder **700** may include a support plate **730**, which is positioned to correspond to at least a partial edge region of the substrate **620**, and at least one cover unit **800** having a cavity corresponding to the electrode pad **610**.

Referring to FIG. **28**, the support plate **730** may include a first support plate **731**, which is positioned to correspond to one of four edge regions of the substrate **620**, and a second support plate **732**, which is disposed to face the first support plate **731**.

In this case, inner surfaces of the first support plate **731** and the second support plate **732** define the opening **710**.

An inner circumferential surface of the opening **710**, i.e. the inner surfaces of the first support plate **731** and the second support plate **732** are provided with insertion grooves **736**, such that the diffusion member **720** is inserted into and coupled to the insertion grooves **736**.

As described above, although the support plate **730** may be positioned to correspond to at least a partial edge region of the substrate **620**, the support plate **730** may be symmetrically positioned, in consideration of the fact that the inner surface of the support plate **730** defines the opening **710** and the diffusion member **720** is coupled to the insertion groove **736** formed at the inner surface of the opening **710**.

The support plate **730** may come into contact with the upper surface of the substrate **620** at the edge region of the substrate **620**.

The cover unit **800** is disposed on the substrate **620** to cover the electrode pad **610** disposed on the substrate **620**.

Although FIG. **28** illustrates two first and second cover units **800**a and **800**b by way of example, more or fewer cover units may be provided according to the number or positions of the electrode pads **610**.

The cover unit **800** may include the plurality of cover units **800**a and **800**b according to the embodiments.

Although not illustrated, for example, if the anode electrode pad **611** and the cathode electrode pad **612** are arranged in parallel and adjacent to each other, only a single cover unit **800** configured to cover both the anode electrode pad **611** and the cathode electrode pad **612** may be provided.

Alternatively, for example, if two or more anode and cathode electrode pads **611** and **612** are arranged in parallel and adjacent to each other, two or more cover units **800** may be provided.

In FIG. **28**, the anode electrode pad **611** is disposed on at least a partial edge region of the substrate **620** and the cathode electrode pad **612** is remotely spaced apart from the anode electrode pad **611**. Thus, the first cover unit **800**a to cover the anode electrode pad **611** and the second cover unit **800**b to cover the cathode electrode pad **612** are respectively provided.

Although the cover unit **800** and the support plate **730** may be individually formed, and thereafter be coupled to each other, they may be integrally formed with each other as illustrated in FIG. **28**.

FIG. **29**A is a partial perspective view of the support plate when viewed from the top, and FIG. **29**B is a partial perspective view of the support plate when viewed from the bottom.

Referring to FIG. **29**A, the support plate **730** may be provided with at least one first fastening portion **742**, and a fastener **744** to be fastened into the first fastening portion **742** may be provided.

FIG. **29**A illustrates the first fastening portion **742** in the form of a through-hole and the fastener **744** in the form of a screw by way of example, but the disclosure is not limited thereto.

Although not illustrated, the substrate **620** may be provided at a region thereof corresponding to the first fastening portion **742** with a fastening portion, such that the holder **700** may be fixed to the substrate **620** by the fastener **744**.

The shape and number of the first fastening portions **742** and the kind of the fastener **744** may be changed in various ways, and are not particularly limited.

Referring to FIG. **29**B, the support plate **730** may be provided with at least one protrusion **746** at a surface thereof facing the substrate **620**.

Although not illustrated, a receiving recess may be formed in a region of the substrate **620** corresponding to the protrusion **746**, such that the holder **700** may be fixed to the substrate **620** as the protrusion **746** is fitted into the receiving recess.

The shape, number and positions of the protrusions **746** may be changed in various ways, and are not particularly limited.

Referring again to FIG. **28**, the inner circumferential surface of the opening **710**, i.e. the inner surfaces of the first support plate **731** and the second support plate **732** are provided with insertion grooves **736**, such that the diffusion member **720** is inserted into and coupled to the insertion grooves **736**.

The diffusion member **720** serves to expand a light incidence angle to the maximum extent by refracting and scattering light directed from the light source **600**, which may ensure uniform diffusion of light.

The diffusion member **720** may be formed of a transparent material that transmits light emitted from the light source **600** without absorption, so as to improve light extraction efficiency of a light emitting module.

If the light source **600** includes a UV LED, the diffusion member **720** may be formed of an inorganic material, and for example, may be formed of a glass material or a light transmitting resin material, to prevent the diffusion member **720** from being discolored or deteriorated by light emitted from the light source **600**.

Additionally, a light extraction pattern or a pattern for intercepting light having a selected wavelength may be disposed on a surface of the diffusion member **720**.

The light extraction pattern may improve light extraction efficiency via scattered reflection of light generated from the light source **600**. The light extraction pattern may be periodically or non-periodically formed, and for example, may be of a Micro Lens Array (MLA) type.

The pattern for intercepting light having a selected wavelength may serve as a color filter, and may selectively transmit only light within a selected wavelength band among various wavelength bands of light generated from the light source **600**.

Although not illustrated, a first prism sheet, a second prism sheet, and a protective sheet may be inserted into the insertion grooves **736** so as to be disposed above the diffusion member **720**. The placement sequence of these sheets may be changed.

The first prism sheet may include a support film, and a polymeric material formed on a surface of the support film, the polymeric material having light transmittance and elasticity. The polymer material may include a prism layer in which a plurality of 3-dimensional structures is repeatedly formed. The first prism sheet may have a stripe pattern in which ridges and valleys are repeatedly formed.

Ridges and valleys of the second prism sheet may be arranged orthogonally to the ridges and valleys on the surface of the support film of the first prism sheet.

FIG. 30 is a view illustrating a light source module according to a seventeenth embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source module according to the seventeenth embodiment includes the substrate **620**, which includes the light source **600** disposed on the surface thereof and the electrode pad **610** electrically connected to the light source **600**, the holder **700**, which is disposed on the substrate **620** and has the opening **710** corresponding to the light source **600**, and the diffusion member **720**, which is fixed in the opening **710** so as to be disposed on the light source **600**.

The light source **600** includes a light emitting device, and may be a Chip On Board (COB) type in which the light emitting device in the form of a chip is mounted on the substrate **620**.

The holder **700** may include the support plate **730**, which is positioned to correspond to at least a partial edge region of the substrate **620**, and the at least one cover unit **800** having a cavity corresponding to the electrode pad **610**.

Referring to FIG. **30**, the support plate **730** may include the first support plate **731**, which is disposed to correspond to one of four edge regions of the substrate **620**, the second support plate **732**, which is disposed to face the first support plate **731**, a third support plate **733**, which connects one end of the first support plate **731** and one end of the second support plate **732** to each other, and a fourth support plate **734**, which is disposed to face the third support plate **733** and connects the other end of the first support plate **731** and the other end of the second support plate **732** to each other.

In this case, inner surfaces of the first, second, third and fourth support plates **731** to **734** define the opening **710**.

Configurations of the third support plate **733** and the fourth support plate **734** are identical to the above described configurations of the first and second support plates **731** and **732**, and thus a detailed description thereof will be omitted.

The inner circumferential surface of the opening **710**, i.e. the inner surfaces of the first, second, third and fourth support plates **731** to **734** may be provided with the insertion grooves **736**, and the diffusion member **720** may be inserted into and coupled in the insertion grooves **736**.

The diffusion member **720** serves to expand a light incidence angle to the maximum extent by refracting and scattering light directed from the light source **600**, which may ensure uniform diffusion of light.

The diffusion member **720** may be formed of a transparent material that transmits light emitted from the light source **600** without absorption, so as to improve light extraction efficiency of a light emitting module.

If the light source **600** includes a UV LED, the diffusion member **720** may be formed of an inorganic material, and for example, may be formed of a glass material, to prevent the diffusion member **720** from being discolored or deteriorated by light emitted from the light source **600**.

The cover unit **800** and the first to fourth support plates **731** to **734** may be integrally formed with each other.

FIG. **31** is a view illustrating a light source module according to an eighteenth embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source module according to the eighteenth embodiment includes the substrate **620**, which includes the light source **600** disposed on the surface thereof, the holder **700**, which is disposed on the substrate **620** and has the opening **710** corresponding to the light source **600**, and the diffusion member **720**, which is fastened to the opening **710** so as to be disposed on the light source **600**. A heat radiating member **1000** is provided beneath the substrate **620**.

The light source **600** includes a light emitting device, and may be a Chip On Board (COB) type in which the light emitting device in the form of a chip is mounted on a substrate.

The holder **700** may include the support plate **730**, which is positioned to correspond to at least a partial edge region of the substrate **620**, and the at least one cover unit **800** having a cavity corresponding to the electrode pad **610**.

In FIG. **31**, although the support plate **730** is illustrated as including the first support plate **731**, which is disposed to correspond to one of four edge regions of the substrate **620**, the second support plate **732**, which is disposed to face the first support plate **731**, the third support plate **733**, which connects one end of the first support plate **731** and one end of the second support plate **732** to each other, and the fourth support plate **734**, which is disposed to face the third support plate **733** and connects the other end of the first support plate **731** and the other end of the second support plate **732** to each other, the support plate **730** may include only two symmetrical support plates **731** and **732**, or **733** and **734**.

The inner circumferential surface of the opening **710**, i.e. the inner surfaces of the first, second, third and fourth support plates **731** to **734** may be provided with the insertion grooves **736**, and the diffusion member **720** may be inserted into and coupled in the insertion grooves **736**.

The diffusion member **720** expands a light incidence angle to the maximum extent via refraction and scattering of light directed from the light source **600**, to ensure uniform diffusion of light.

The heat radiating member **1000** serves to discharge heat generated from the light source **600** to the outside, and thus may be formed of a material having excellent thermal conductivity.

The heat radiating member **1000** may include a plurality of radiating fins **1010** extending downward from a lower surface thereof. The radiating fins **1010** increase a contact area between the heat radiating member **1000** and outside air, which may improve heat radiation effects.

A thermal conductive member **1020** may be disposed between the heat radiating member **1000** and the substrate **620**. The thermal conductive member **1020** has excellent thermal conductivity, and electric insulation and flame-resistance properties, and serves to assist the heat radiating member **1000** in coming into close contact with a heating region, thereby maximizing heat transfer effects.

The support plate **730** may include one or more second fastening portions **750** protruding from the support plate **730**.

The second fastening portions **750** may be extended on the same plane as the support plate **730**, and may protrude beyond a width of the substrate **620** that is disposed beneath the holder **700**.

The heat radiating member **1000** is provided with fastening portions **1015** at regions corresponding to the second fastening portions **750** of the support plate **730**, such that the holder **700** may be fixed to the heating member **1000** by fasteners **755**.

Although FIG. **31** illustrates the second fastening portions **750** as being formed in the first support plate **731** and the second support plate **732** by way of example, the disclosure is not limited thereto.

The second fastening portions **750** may be symmetrically formed at the two facing support plates **731** and **732**, or **733** and **734**, to ensure that the holder **700** may be more firmly fixed to the heat radiating member **1000**.

Although the holder **700** may be fixedly coupled to the substrate **620** as described in the above embodiments, the substrate **620** may have difficulty in forming the fastening portions due to, e.g., the circuit pattern formed thereon. Therefore, when providing the holder **700** with the second fastening portions **750**, the holder **700** may be fixed to the heat radiating member **1000** by the fasteners **755**.

Alternatively, according to the embodiments, the holder **700** may be fixedly coupled to both the substrate **620** and the heat radiating member **1000**.

As described above, the thermal conductive member **1020** may be disposed between the substrate **620** and the heat radiating member **1000**, so as to fix the substrate **620** to the heat radiating member **1000**. However, by fixing the holder **700** to the heat radiating member **1000** by the fasteners **755** in consideration of a high price of the thermal conductive member **1020**, the substrate **620** may be fixed to the heat radiating member **1000** without the thermal conductive member **1020**, which may reduce manufacturing costs of a light emitting module.

FIG. **32** is a view illustrating a light source module according to a nineteenth embodiment, and FIG. **33** is a view illustrating a light source module according to a twentieth embodiment. FIG. **34** illustrates a light source module according to a twenty-first embodiment. Contents overlapped with the above described embodiment will not be described again.

The light source modules according to the embodiments include the substrate **620**, which includes the light source **600** disposed on the surface thereof and the electrode pad **610** electrically connected to the light source **600**, the holder **700**, which is disposed on the substrate **620** and has the opening **710** corresponding to the light source **600**, and the diffusion member **720**, which is fastened to the opening **710** so as to be disposed on the light source **600**.

The light source **600** includes a light emitting device package, and may be a Package On Board (COB) type in which the light emitting device package is mounted on a substrate.

The holder **700** may include the support plate **730**, which is positioned to correspond to at least a partial edge region of the substrate **620**, and the at least one cover unit **800** having a cavity corresponding to the electrode pad **610**.

The nineteenth, twentieth, and twenty-first embodiments are respectively similar to the sixteenth, seventeenth, and eighteenth embodiments except for the light source **600** including a light emitting device package, and thus, a detailed description thereof will be omitted.

FIG. **35** is a view illustrating an embodiment of a head lamp including the light source module according to the above described embodiments.

Referring to FIG. **35**, light emitted from a light source module **1101** may be reflected by a reflector **1102** and a shade **1103**, and thereafter, may be directed forward of a vehicle body through a lens **1104**.

The light source module **1101** may be the light source module according to the above described embodiments, and may be a Chip On Board (COB) type in which a light emitting device is mounted on a substrate, or a Package On Board (POB) type in which a light emitting device package is mounted on a substrate.

As is apparent from the above description, according to the embodiments, a radiator included in a light emitting device package exhibits less thermal volumetric expansion, which may minimize thermal deformation during fabrication, achieve a balanced light emission angle, and improve reliability of the light emitting device package.

Further, direct conduction between a light emitting device and the radiator is possible, which may simplify fabrication of the light emitting device package.

The light emitting device package includes gold-plated electrodes, which have high oxidation-resistance and durability and reduced short-circuiting therebetween. As the gold-plated electrodes, which have a relatively low photoelectric reflectivity in a short wavelength band of UV light, are reduced in area, a ceramic layer, which has a relatively high UV photoelectric reflectivity, is increased in exposure area. This results in improved light extraction efficiency and stability of a structure owing to increased bonding force between the exposed ceramic substrate and silicon resin in a molded part.

Furthermore, a light source module and an external power source are mechanically connected to each other without soldering. In this way, an eco-friendly light source module may be obtained without a risk of environmental contamination. The resulting light source module may achieve improved reliability with a minimized wire connection failure.

In addition, a diffusion member is coupled to a holder without requiring a separate support member for the diffusion member, which may simplify the configuration of the light source module and minimize an attachment failure of the diffusion member.

Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

[**1**. A light emitting device package comprising:
a package body;
at least one light emitting device on the package body; and
at least one pad electrode electrically connected to the at least one light emitting device,
wherein the at least one pad electrode comprises a center pad portion adjacent to an edge of the at least one light emitting device, a first pad portion extended from the center pad portion in a first direction, a second pad portion extended from the center pad portion in a second direction, and the center pad portion is disposed between the first pad portion and the second pad portion, and
wherein the center pad portion comprises a rounded recess portion adjacent to the edge of the at least one light emitting device.]

[**2**. The light emitting device package according to claim **1**, wherein a width of the first pad portion is different from a width of the second pad portion.]

[**3**. The light emitting device package according to claim **1**, wherein the first direction of the first pad portion is vertical to the second direction of the second pad portion.]

[**4**. The light emitting device package according to claim **1**, wherein the at least one light emitting device comprises four light emitting devices, and
wherein the at least one pad electrode comprises the first pad electrode, the second pad electrode, a third pad

electrode, and a fourth pad electrode at one side of the four light emitting device.]

[5. The light emitting device package according to claim 4, wherein a first distance between the first pad electrode and the second pad electrode is same as a second distance between the third pad electrode and the fourth pad electrode.]

[6. The light emitting device package according to claim 1, wherein the at least one pad electrode comprises the first pad electrode, the second pad electrode, and a zener diode bonding portion therebetween.]

[7. The light emitting device package according to claim 6, wherein a width of the first pad electrode is same as a width of zener diode bonding portion.]

[8. The light emitting device package according to claim 1, wherein the center pad portion comprises a center protrusion at a corner thereof.]

9. A light emitting device package comprising:

a first electrode pattern;

a light emitting device on the first electrode pattern;

a second-first electrode pattern spaced apart from the first electrode pattern in a first direction; and

a second-second electrode pattern spaced apart from the first electrode pattern in a second direction perpendicular to the first direction,

wherein the first electrode pattern has a first width in the first direction in a central region where the light emitting device is disposed,

wherein the first electrode pattern has a second width in the first direction in a peripheral region where the light emitting device is not disposed,

wherein the first width is greater than the second width,

wherein the first electrode pattern has a third width in the second direction in the central region where the light emitting device is disposed,

wherein the first electrode pattern has a fourth width in the second direction in the peripheral region where the light emitting device is not disposed,

wherein the third width is greater than the fourth width,

wherein the second-first electrode pattern includes a plurality of regions having different widths in the first direction,

wherein a second-first region having a minimum width in the first direction of the second-first electrode pattern is overlapped in the first direction with a first-first region having the first width in the first electrode pattern,

wherein the second-second electrode pattern includes a plurality of regions having different widths in the second direction, and

wherein a second-second region having a maximum width in the second direction of the second-second electrode pattern is overlapped in the second direction with a first-second region having the third width in the first electrode pattern.

10. A light emitting device package comprising:

a first electrode pattern;

a light emitting device on the first electrode pattern;

a second-first electrode pattern spaced apart from the first electrode pattern in a first direction; and

a second-second electrode pattern spaced apart from the first electrode pattern in a second direction perpendicular to the first direction,

wherein the first electrode pattern has a first width in the first direction in a central region where the light emitting device is disposed,

wherein the first electrode pattern has a second width in the first direction in a peripheral region where the light emitting device is not disposed,

wherein the first width is greater than the second width,

wherein the first electrode pattern has a third width in the second direction in the central region where the light emitting devices is disposed,

wherein the first electrode pattern has a fourth width in the second direction in the peripheral region where the light emitting device is not disposed,

wherein the third width is greater than the fourth width,

wherein the second-first electrode pattern includes a plurality of regions having different widths in the first direction, and

wherein the second width of the first electrode pattern in the first direction is greater than a width of the second-first electrode pattern in the first direction.

11. The light emitting device package according to claim 9, wherein the fourth width of the first electrode pattern in the second direction is greater than a width of the second-second electrode pattern in the second direction.

12. The light emitting device package according to claim 9, wherein the first electrode pattern comprises a plurality of first electrode patterns and each of the first electrode patterns has same shape.

13. The light emitting device package according to claim 12, comprising

a second-fourth, a second-fifth, a second-eight electrode patterns spaced apart from the first electrode pattern in the first direction, and

a second-third, a second-sixth, a second-seventh electrode patterns spaced apart from the first electrode pattern in the second direction,

wherein at least one pair of the second-first electrode pattern and the second-eight electrode pattern, the second-second electrode pattern and the second-third electrode pattern, the second-fourth electrode pattern and the second-fifth electrode pattern, the second-sixth electrode pattern and the second-seventh electrode pattern is mutually line-symmetrical each other.

14. The light emitting device package according to claim 13, wherein the at least one pair of the second-first electrode pattern and the second-second electrode pattern, the second-third electrode pattern and the second-fourth electrode pattern, the second-fifth electrode pattern and the second-sixth electrode pattern, the second-seventh electrode pattern and the second-eight electrode pattern is formed integrally with each other.

15. The light emitting device package according to claim 14, wherein at least two of the plurality of first electrode patterns are line-symmetrical.

16. The light emitting device package according to claim 14, comprising a third electrode pattern respectively disposed between the second-first electrode pattern and the second-eight electrode pattern and between the second-fourth electrode pattern and the second-fifth electrode pattern, and

wherein each of the third electrode pattern is overlapped with each other in the first direction.

17. The light emitting device package according to claim 16, wherein the second-first electrode pattern and the second-eight electrode pattern, the second-fourth electrode pattern and the second-fifth electrode pattern are symmetrical based on one of the third electrode patterns.

18. The light emitting device package according to claim 17, comprising a protection device disposed on any one of the third electrode patterns.

19. The light emitting device package according to claim 18, wherein the protection device comprises a Zener diode.

20. The light emitting device package according to claim 16, comprising a fourth electrode pattern respectively disposed between the second-second electrode pattern and the second-third electrode pattern and between the second-sixth electrode pattern and the second-seventh electrode pattern, and

wherein each of the fourth electrode pattern is overlapped with each other in the first direction.

21. The light emitting device package according to claim 20, wherein the second-second electrode pattern and the second-third electrode pattern, the second-sixth electrode pattern and the second-seventh electrode pattern are symmetrical based on one of the fourth electrode patterns.

22. The light emitting device package according to claim 21, wherein one of the fourth electrode patterns is electrically connected to at least one of the plurality of first electrode patterns.

23. The light emitting device package according to claim 21, wherein one of the fourth electrode patterns is formed integrally with one of the plurality of first electrode patterns.

24. The light emitting device package according to claim 23, wherein the second-first electrode pattern has a plurality of regions having different horizontal widths in the first direction,

wherein the second-second electrode pattern has a plurality of regions having different horizontal widths in the second direction,

wherein one of horizontal widths in the first direction of the second-first electrode pattern is greater than one of horizontal widths in the second direction of the second-second electrode pattern.

25. The light emitting device package according to claim 24, wherein one of horizontal widths in the second direction of the second-second electrode pattern is greater than one of horizontal widths in the first direction of the second-first electrode pattern.

26. A lighting device comprising the light emitting device package of claim 9.

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