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(54) **PACKAGE STRUCTURE AND MANUFACTURING METHOD THEREOF**

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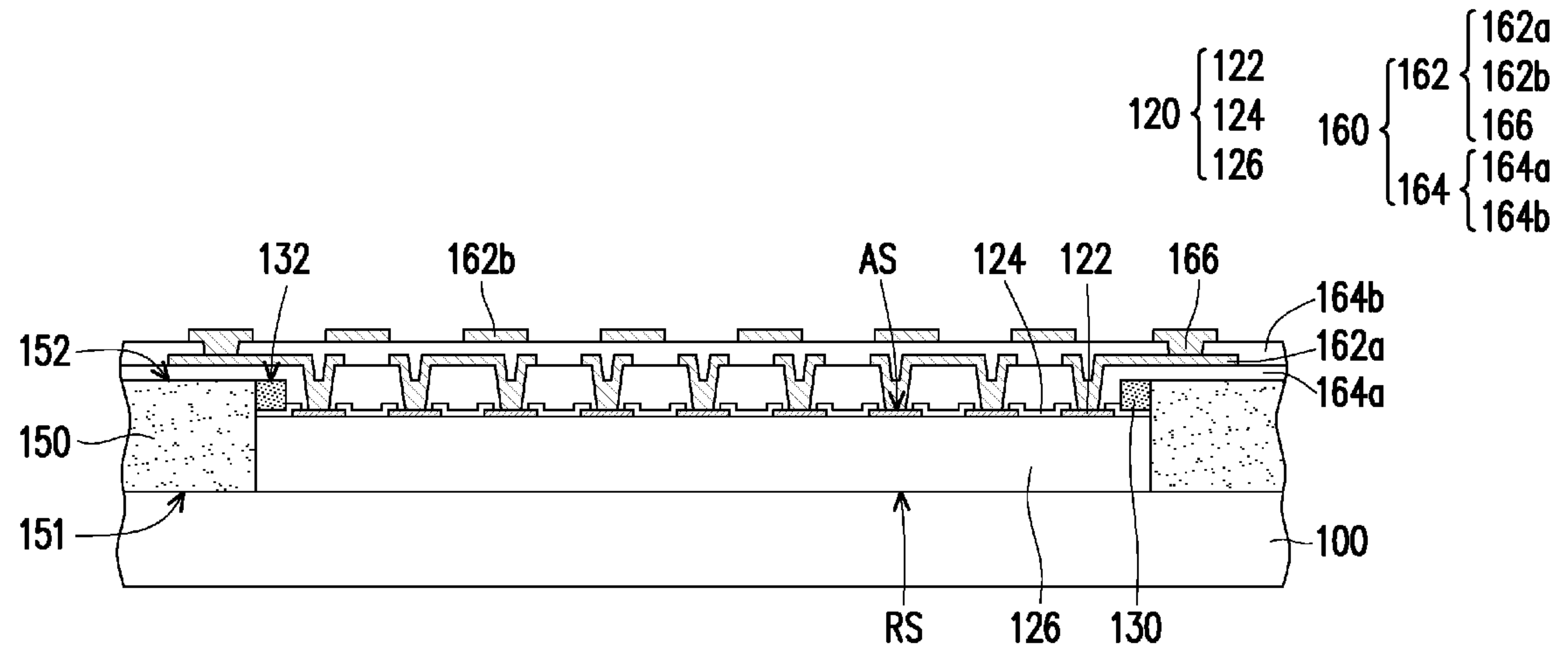
(57) **ABSTRACT**

A package structure includes a die, an encapsulant, a dam structure, and a redistribution structure. The die has an active surface and a rear surface opposite to the active surface. The encapsulant encapsulates sidewalls of the die. The encapsulant has a first surface and a second surface opposite to the first surface. The first surface is coplanar with the rear surface of the die. The second surface is located at a level height different from the active surface of the die. The dam structure is disposed on the active surface of the die. A top surface of the dam structure is substantially coplanar with the second surface of the encapsulant. The redistribution structure is over the encapsulant, the dam structure, and the die. The redistribution structure is electrically connected to the die.



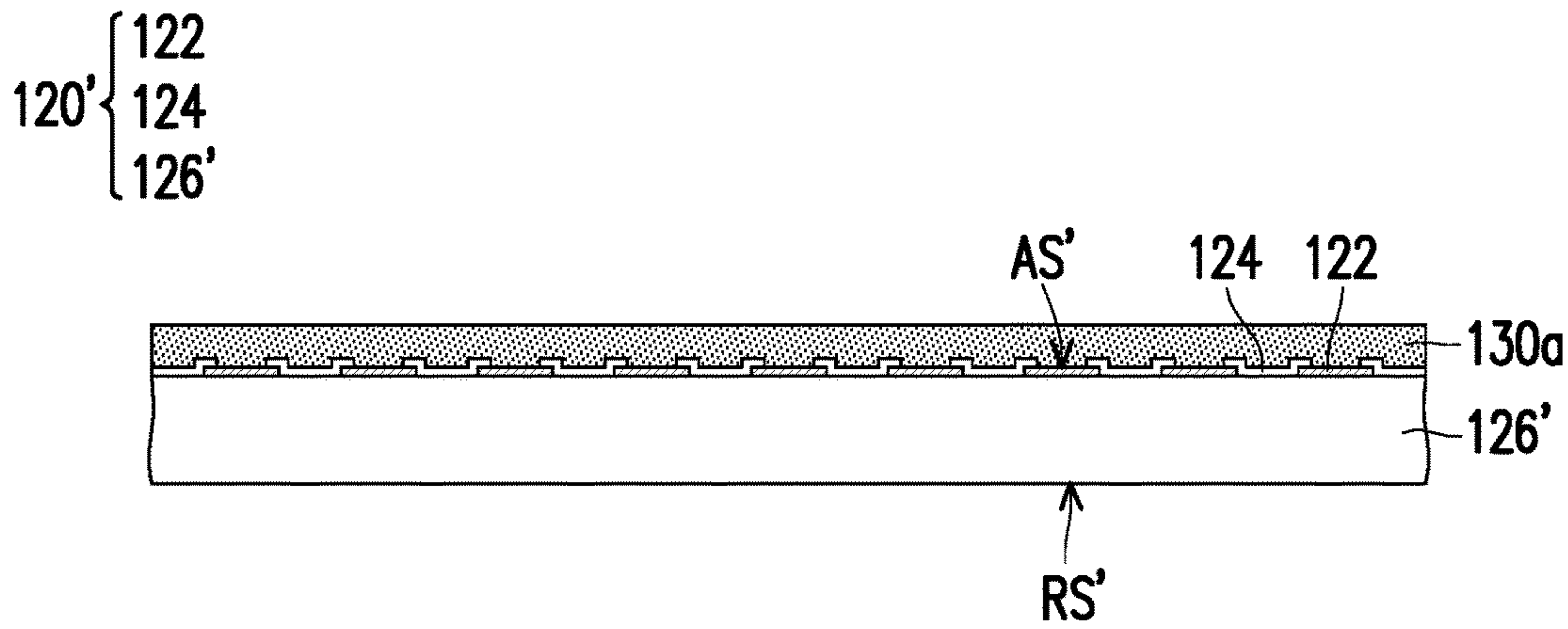


FIG. 1A

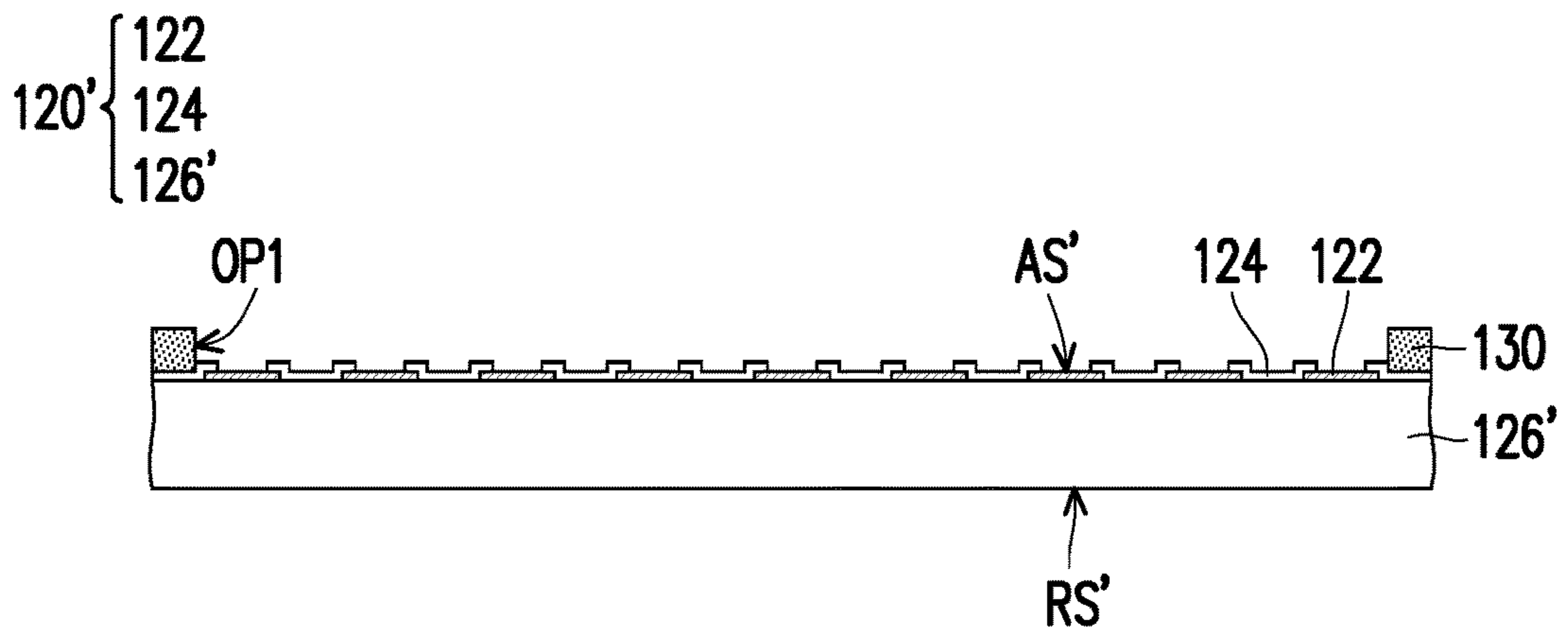


FIG. 1B

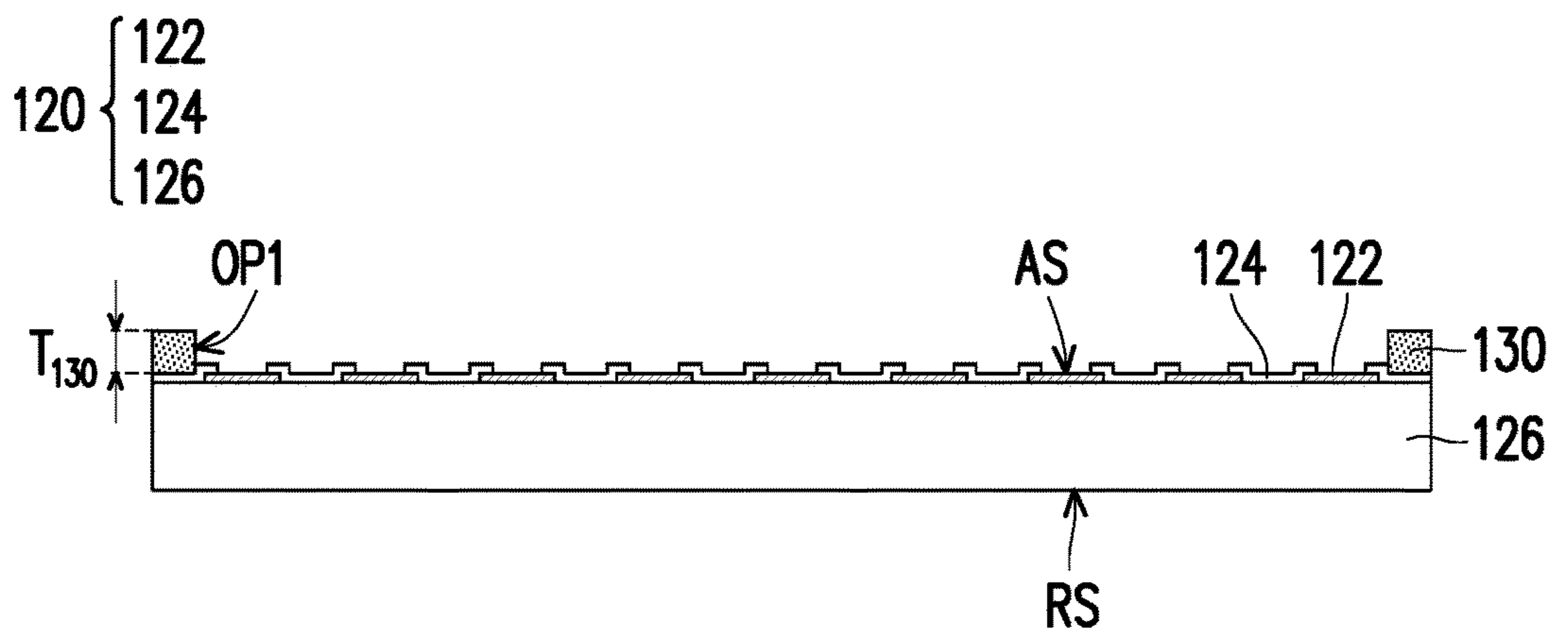


FIG. 1C

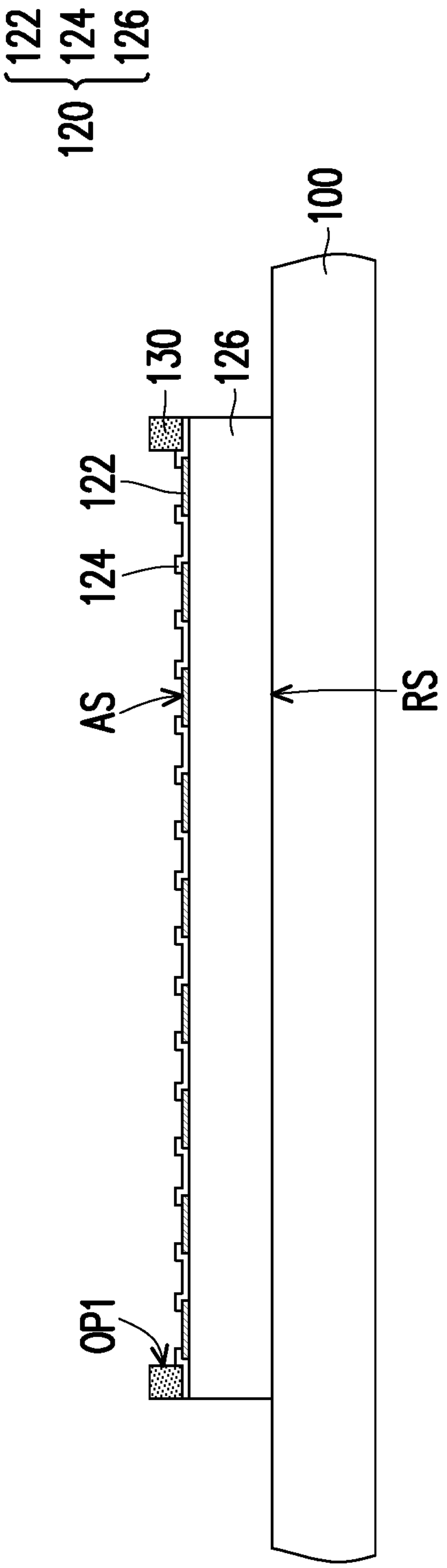

120
122
124
126
100
130
126
122
124
AS
RS
OP1

FIG. 1D

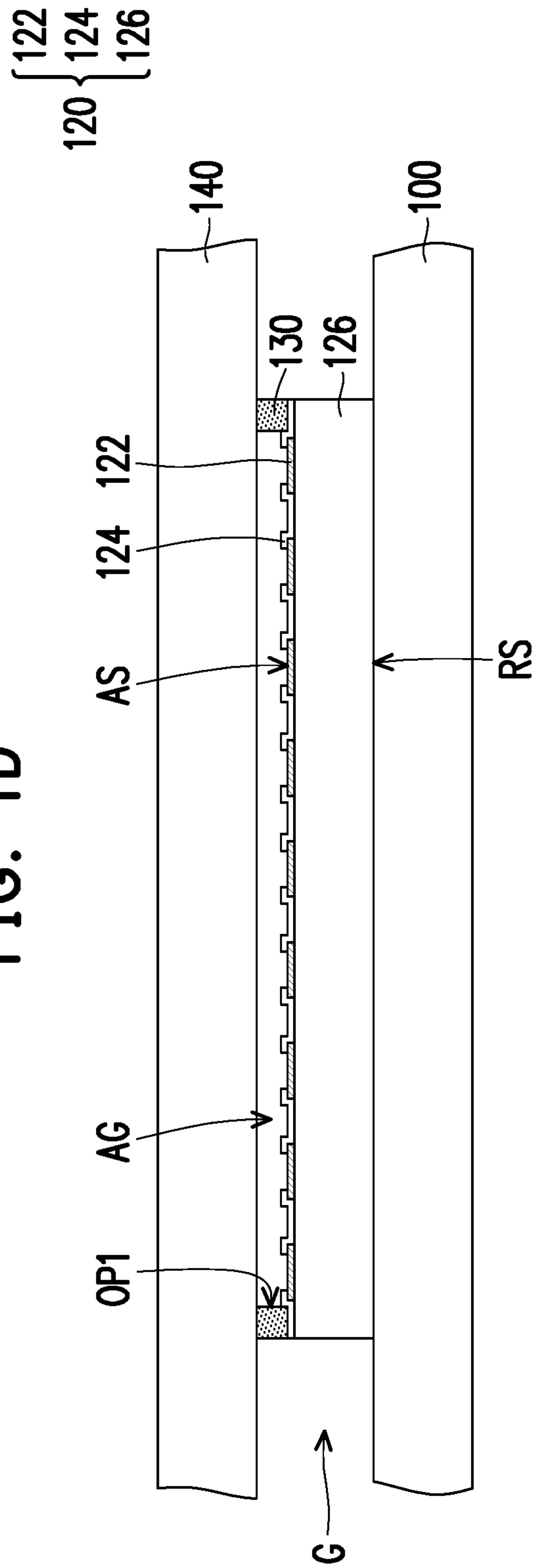

120
122
124
126
140
100
130
126
122
124
AS
RS
AG
OP1
G

FIG. 1E

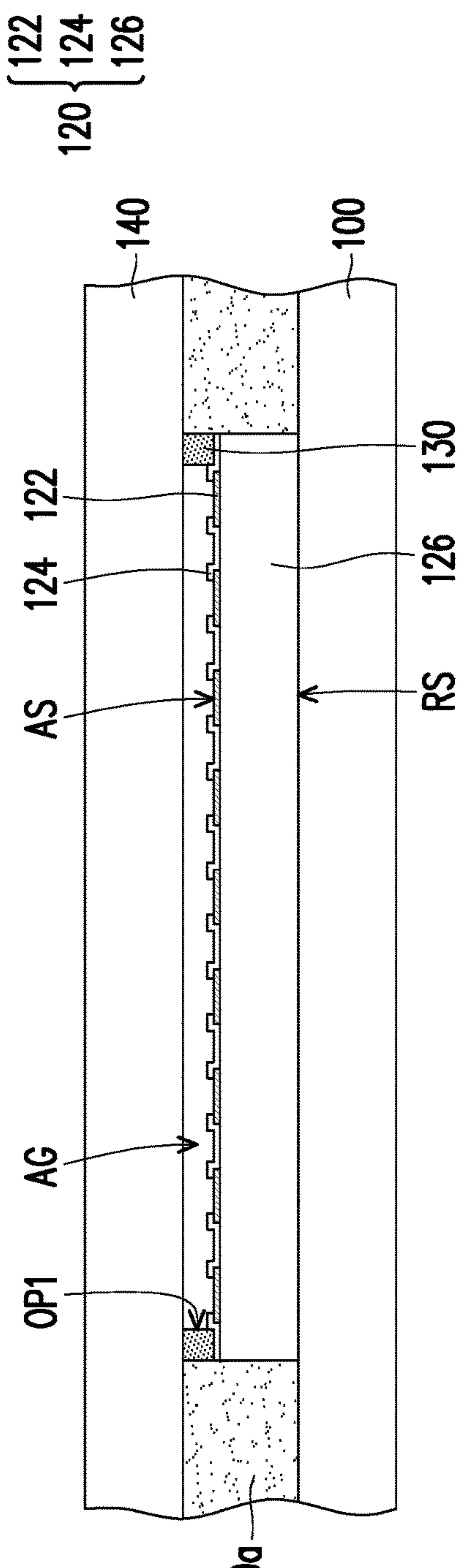

120
122
124
126
140
100
130
122
124
126
AS
RS
AG
OP1
150a

FIG. 1F

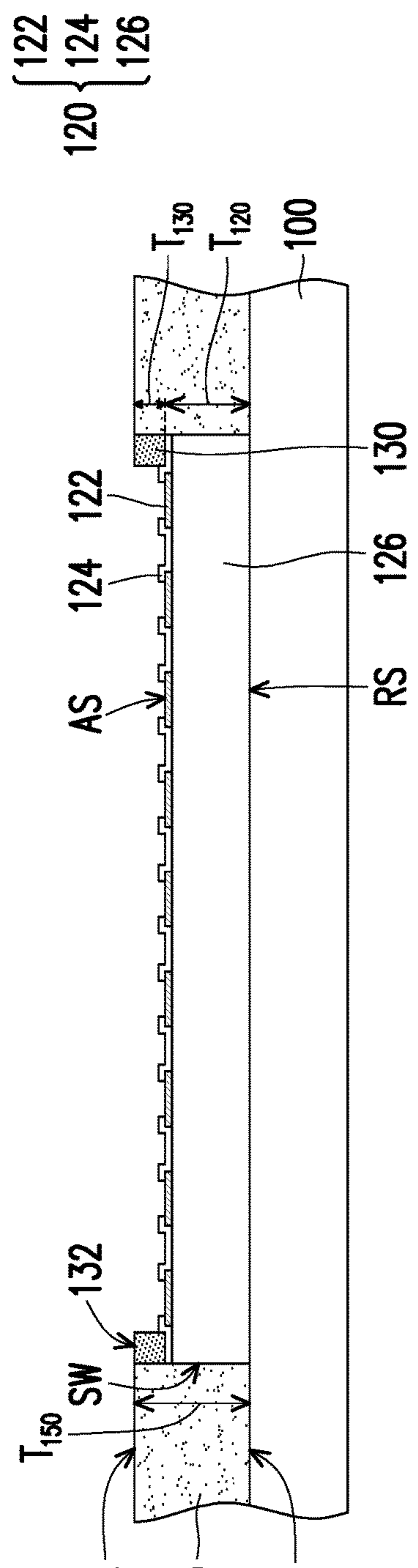

120
122
124
126
T130
T120
100
130
122
124
126
AS
RS
132
SW
T150
152
150
151

FIG. 1G

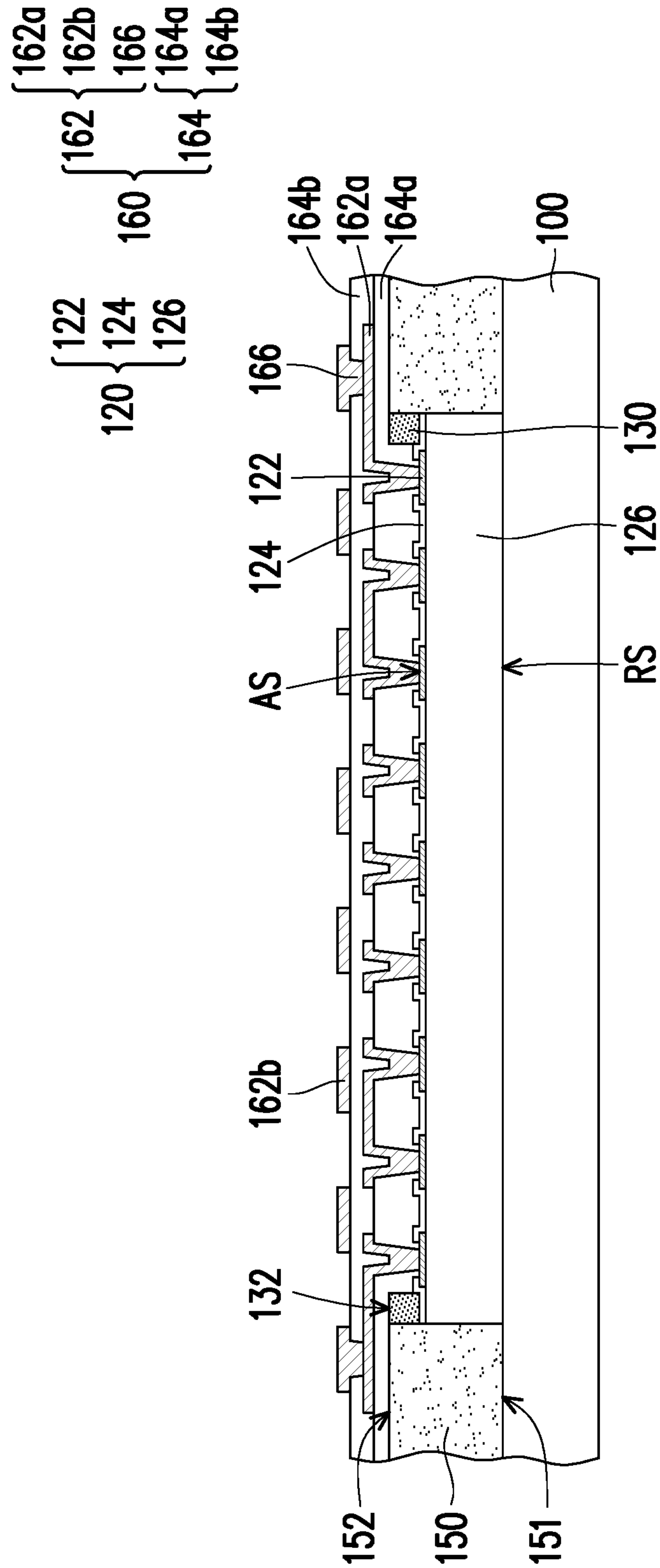

162a
162b
166
164a
164b
162
164
160
120
122
124
126
164b
162a
164a
100
166
130
122
126
124
AS
RS
162b
132
152
150
151

FIG. 1H

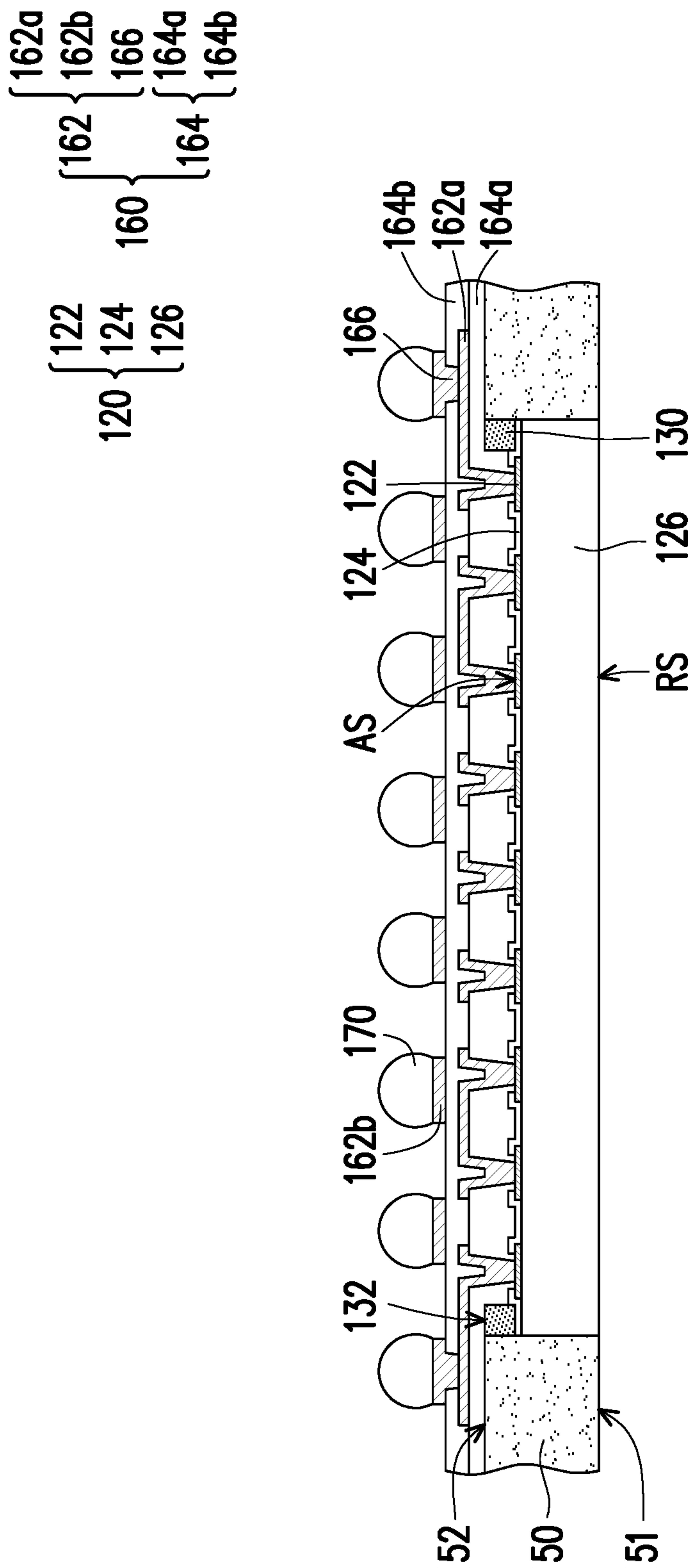
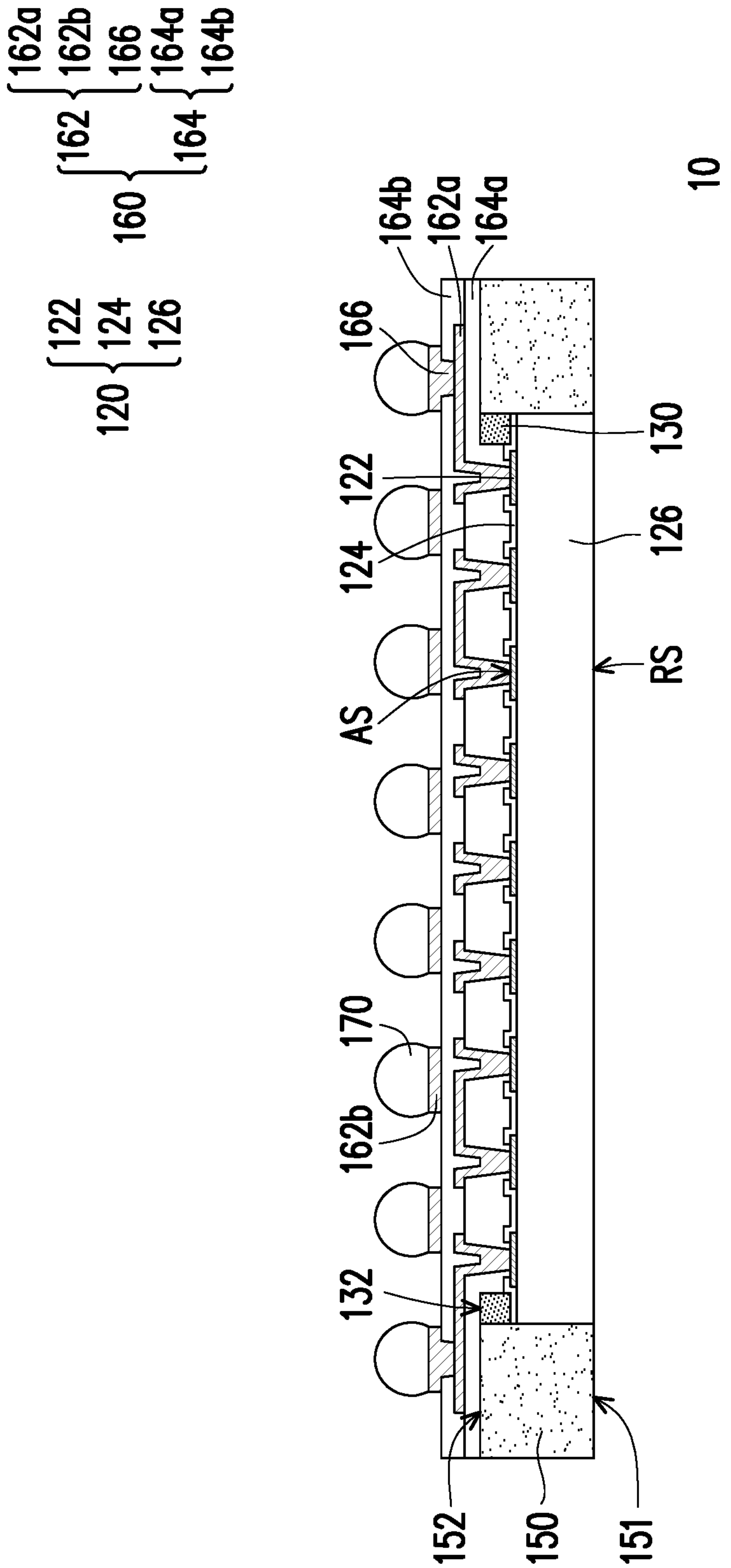

162a
162b
166
164a
164b
162
164
160
120
122
124
126
164b
162a
164a
166
130
122
124
126
AS
RS
170
162b
132
152
150
151

FIG. 1I



162a
162b
166
164a
164b
162
164
160
122
124
126
120
164b
162a
164a
166
130
122
124
126
AS
RS
170
162b
132
152
150
151
10

FIG. 1J

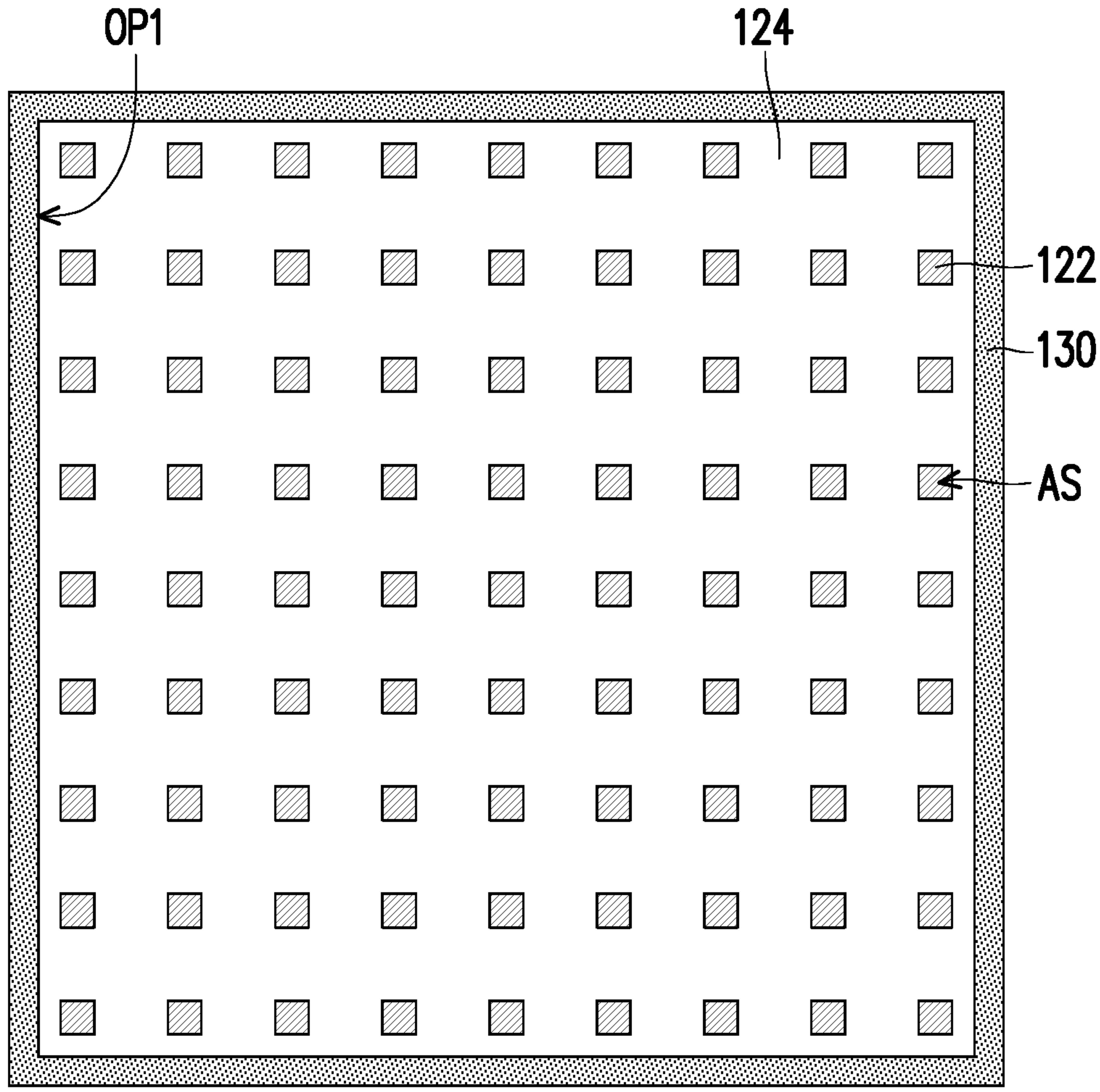


FIG. 2

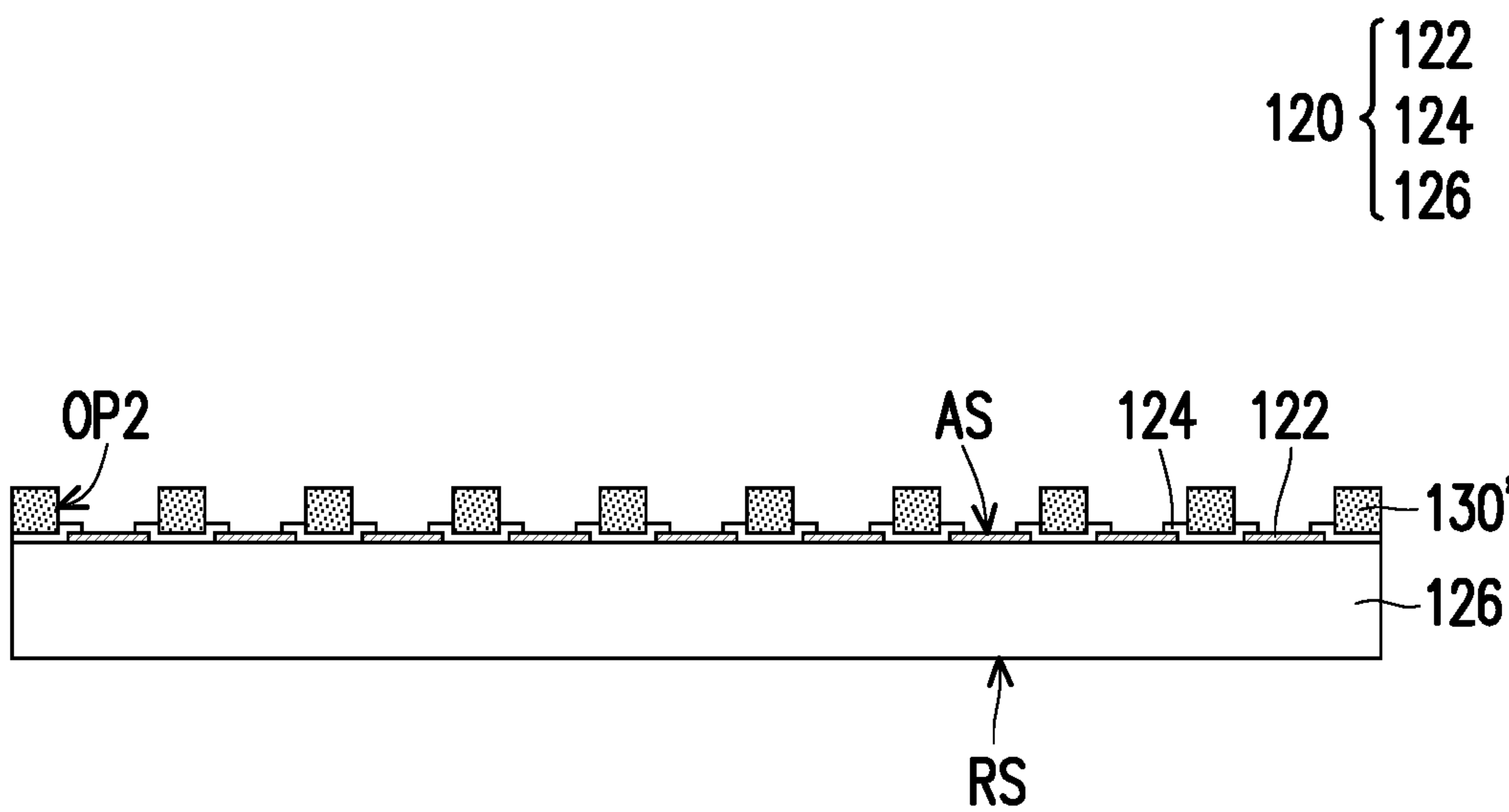


FIG. 3

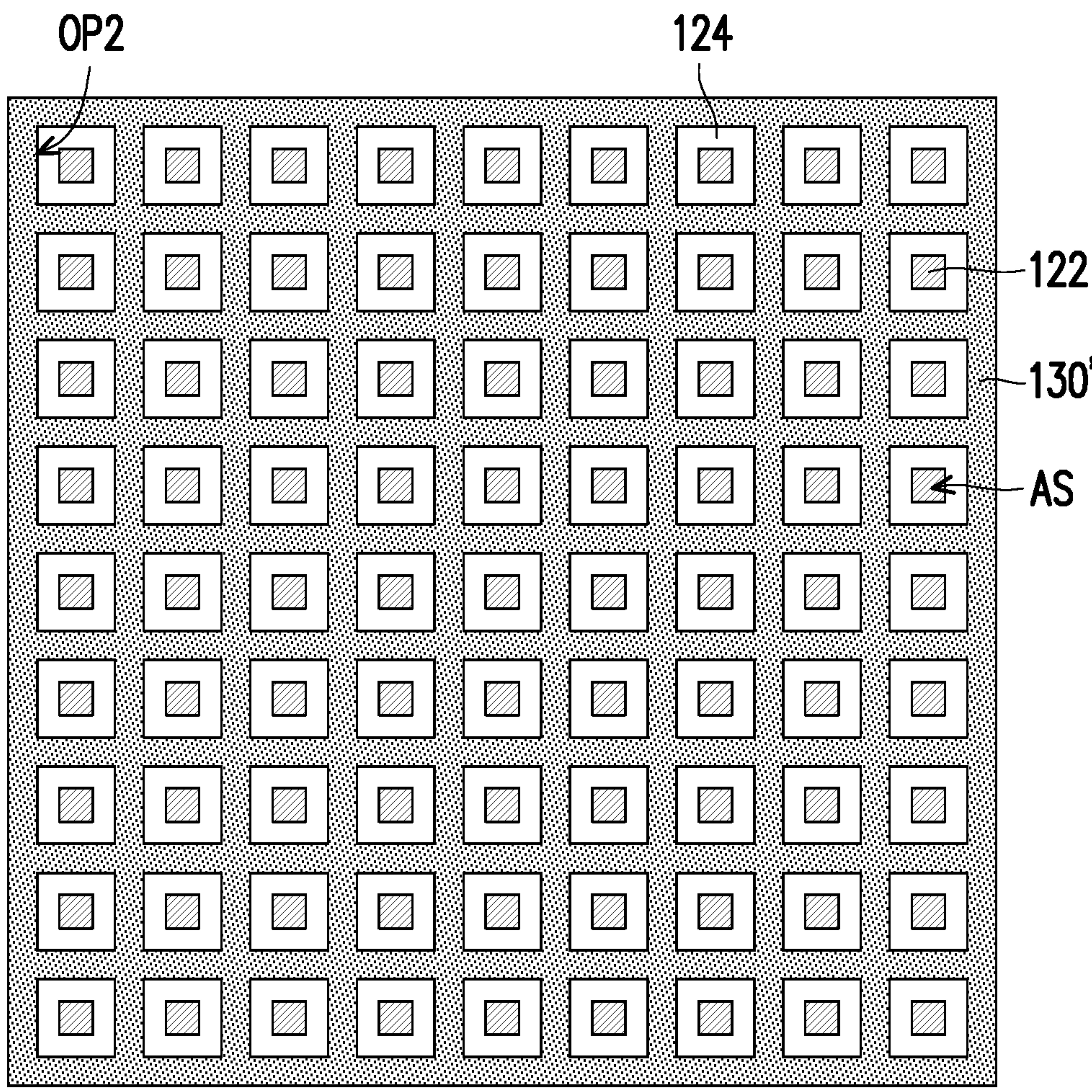


FIG. 4

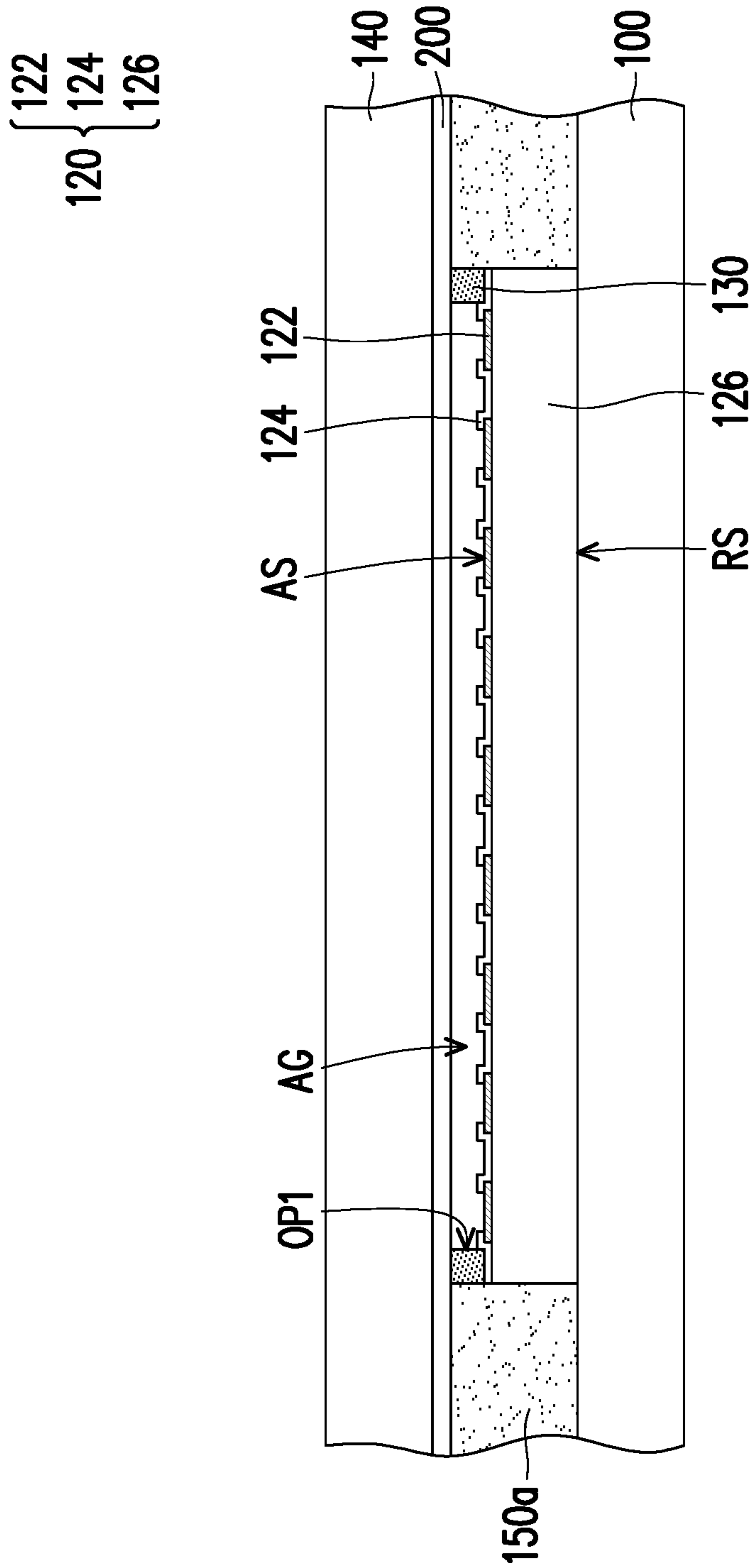


FIG. 5

PACKAGE STRUCTURE AND MANUFACTURING METHOD THEREOF

BACKGROUND

Technical Field

[0001] The disclosure generally relates to a package structure and a manufacturing method thereof, and in particular, to a package structure having a dam structure and a manufacturing method thereof.

Description of Related Art

[0002] Semiconductor package technology has been progressed in recent years in order to develop products with smaller volume, lighter weight, higher integration level, and lower manufacturing cost. Nevertheless, the process complexity of the semiconductor packages becomes increasingly challenging as the dimension of the semiconductor packages decreases. Therefore, simplifying the manufacturing process of the package while maintaining the reliability thereof has become a challenge to researchers in the field.

SUMMARY

[0003] The disclosure provides a package structure and a manufacturing method thereof, which effectively enhances the reliability of the package structure at lower manufacturing cost.

[0004] The disclosure provides a package structure including a die, an encapsulant, a dam structure, and a redistribution structure. The die has an active surface and a rear surface opposite to the active surface. The encapsulant encapsulates sidewalls of the die. The encapsulant has a first surface and a second surface opposite to the first surface. The first surface is coplanar with the rear surface of the die. The second surface is located at a level height different from the active surface of the die. The dam structure is disposed on the active surface of the die. A top surface of the dam structure is substantially coplanar with the second surface of the encapsulant. The redistribution structure is over the encapsulant, the dam structure, and the die. The redistribution structure is electrically connected to the die.

[0005] The disclosure provides a manufacturing method of a package structure. The method includes at least the following steps. At least one die having a dam structure formed thereon is provided. The die has an active surface and a rear surface opposite to the active surface. The die includes a plurality of connection pads on the active surface. The dam structure is disposed on the active surface and exposes the connection pads. Thereafter, the die having the dam structure formed thereon is placed on a carrier. A mold chase is placed on the dame structure. An encapsulation material is filled into a gap between the mold chase and the carrier. Subsequently, the encapsulation material is cured to form an encapsulant encapsulating sidewalls of the die. A redistribution structure is formed over the encapsulant, the dam structure, and the active surface of the die. Then, the carrier is separated from the encapsulant and the die.

[0006] Based on the above, the die is encapsulated by adaption of a mold chase directly over the dam structure. As such, certain steps in the conventional molding process (for example, mold grinding process) or the conventional die forming process (for example, the formation of conductive bumps over connection pads of the die) may be skipped to reduce the process complexity and manufacturing cost of the package structure. Moreover, the transfer molding process using the mold chase and the dam structure forms an encapsulant with flat surfaces. As such, the redistribution structure may be formed on the flat surface of the encapsulant to alleviate the problem of breakage in conductive elements within the redistribution structure. Furthermore, since the dam structure is formed at edges of the die and is sandwiched between the die and the redistribution structure, the stress of the redistribution structure accumulated at edges of the die may be effectively reduced. As such, the reliability of the redistribution structure and the package structure may be ensured.

[0007] To make the aforementioned more comprehensible, several embodiments accompanied with drawings are described in detail as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings are included to provide a further understanding of the disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the disclosure and, together with the description, serve to explain the principles of the invention.

[0009] FIG. **1**A to FIG. **1**J are schematic cross-sectional views illustrating a manufacturing method of a package structure according to some embodiments of the disclosure.

[0010] FIG. **2** is a schematic top view of the die and the dam structure in FIG. **1**C.

[0011] FIG. **3** is a schematic cross-sectional view illustrating an intermediate step of a manufacturing method of a package structure according to some alternative embodiments of the disclosure.

[0012] FIG. **4** is a schematic top view of the die and the dam structure in FIG. **3**.

[0013] FIG. **5** is a schematic cross-sectional view illustrating an intermediate step of a manufacturing method of a package structure according to some alternative embodiments of the disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0014] Reference will now be made in detail to the present preferred embodiments of the disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0015] FIG. **1**A to FIG. **1**J are schematic cross-sectional views illustrating a manufacturing method of a package structure **10** according to some embodiments of the disclosure. Referring to FIG. **1**A, a wafer **120'** is provided. The wafer **120'** includes a semiconductor substrate **126'**, a plurality of connection pads **122**, and a passivation layer **124**. The wafer **120'** has an active surface AS' and a rear surface RS' opposite to the active surface AS', and the connection pads **122** are disposed on the active surface AS'. In some embodiments, the semiconductor substrate **126'** may be a silicon substrate having active components and, optionally, passive components formed therein. Examples of the active components include transistor or the like. Examples of the passive components include resistors, capacitors, inductors, or the like. The connection pads **122** are distributed over the semiconductor substrate **126'**. In some embodiments, the connection pads **122** may include aluminum pads, copper pads, or other suitable metal pads. The passivation layer **124** is formed over the semiconductor substrate **126'** to cover a portion of each connection pad **122**. The passivation layer **124** has a plurality of contact openings exposing another portion of each connection pad **122**. In some embodiments, the passivation layer **124** may be made of polymeric materials. In some alternative embodiments, the passivation layer **124** may be a silicon oxide layer, a silicon nitride layer, a silicon oxy-nitride layer, or a dielectric layer formed by other suitable dielectric materials.

[0016] As illustrated in FIG. **1**A, a dam material layer **130***a* is formed over the active surface AS' of the wafer **120'**. The dam material layer **130***a* may be formed by suitable fabrication techniques such as spin-on coating, chemical vapor deposition (CVD), plasma-enhanced chemical vapor deposition (PECVD), or the like. The dam material layer **130***a* may completely cover the connection pads **122** and the passivation layer **124**. In some embodiments, the dam material layer **130***a* may include photosensitive material, epoxy, polyimide, silicone based material, or a combination thereof. In some embodiments, the dam material layer **130***a* may have elasticity to function as a buffer layer for the subsequently formed components. For example, a Young's modulus of the dam material layer **130***a* may range between 0.5 GPa and 3 GPa.

[0017] Referring to FIG. **1**B, a portion of the dam material layer **130***a* is removed to form a dam structure **130** having at least one opening OP**1**. It should be noted that since only a portion of the wafer **126'** is illustrated in FIG. **1**B, only one of the openings OP**1** is shown. The dam material layer **130***a* may be removed through, for example, a photolithography process followed by an etching process. In other words, the dam material layer **130***a* is patterned to form the dam structure **130**. As illustrated in FIG. **1**B, the opening OP**1** exposes the connection pads **122**. In some embodiments, the dam structure **130** extends over the scribe line and covers the scribe line.

[0018] Referring to FIG. **1**C, the wafer **120'** is diced to form a plurality of dies **120** having the dam structure **130** formed thereon. The wafer **120'** may be diced or singulated through, for example, cutting with rotating blades or laser beams. In some embodiments, a thickness T_{130} of the dam structure **130** ranges between 2 μm and 10 μm. FIG. **2** is a schematic top view of the die **120** and the dam structure **130** in FIG. **1**C. The detailed descriptions with respect to the die **120** and the dam structure **130** will be presented below in conjunction with FIG. **2**.

[0019] Referring to FIG. **1**C and FIG. **2**, each die **120** has an active surface AS and a rear surface RS opposite to the active surface AS. In some embodiments, each die **120** includes a semiconductor substrate **126**, the connection pads **122**, and the passivation layer **124**. The connection pads **122** are disposed on the active surface AS of the die **120**. On the other hand, the dam structure **130** is disposed on the active surface AS of the die **120**. As illustrated in FIG. **1**C and FIG. **2**, the dam structure **130** takes the form of a ring pattern disposed along edges of the active surface AS within the die **120**. For example, the dam structure **130** has one single opening OP**1** exposing a central region of the active surface AS of the die **120**. In some embodiments, since the connection pads **122** are disposed on the active surface AS of the die **120**, the opening OP**1** of the dam structure **130** exposes multiple connection pads **122** simultaneously. It should be noted that although FIG. **2** depicted the dam structure **130** as a squared ring pattern, the disclosure is not limited thereto. In some alternative embodiments, the dam structure **130** may be a circular ring pattern, a triangular ring pattern, or ring patterns with any other geometry. Moreover, in some alternative embodiments, the dam structure **130** may be a mesh pattern instead of a ring pattern. For example, other exemplary embodiment of the dam structure **130** will be discussed below in conjunction with FIG. **3** and FIG. **4**.

[0020] FIG. **3** is a schematic cross-sectional view illustrating an intermediate step of a manufacturing method of a package structure **10** according to some alternative embodiments of the disclosure. FIG. **4** is a schematic top view of the die **120** and the dam structure **130'** in FIG. **3**. Referring to FIG. **3** and FIG. **4**, the dam structure **130'** takes the form of a mesh pattern. For example, the dam structure **130** has a plurality of openings OP**2**. Each opening OP**2** exposes the corresponding connection pad **122**. In some embodiments, the dam structure **130'** is formed to surround each connection pad **122**, and each opening OP**2** of the dam structure **130'** exposes the corresponding connection pad **122** in a one-to-one manner. In some embodiments, the mesh pattern may increase the contact area between dam structure **130'** and the subsequently formed components. As such, the subsequently formed component may be stably placed on the dam structure **130'** so that the process simplicity and reliability may be realized.

[0021] Referring back to FIG. **1**D, a carrier **100** is provided. The die **120** having the dam structure **130** formed thereon (the structure illustrated in FIG. **1**C) is placed on the carrier **100**. In some embodiments, multiple dies **120** may be placed on the carrier **100**. For simplicity, one die **120** is illustrated in FIG. **1**D. As illustrated in FIG. **1**D, the die **120** is placed such that the active surface AS faces upward. In some embodiments, the rear surface RS of the die **120** is attached to the carrier **100**. The carrier **100** may be made of glass, silicon, plastic, or other suitable materials. However, the disclosure is not limited thereto. Other suitable substrate material may be adapted as the carrier **100** as long the material is able to withstand the subsequent processes while carrying the package structure formed thereon. In some embodiments, a die attach film (DAF; not shown) and/or a de-bonding layer (not shown) may be disposed between the die **120** and the carrier **100**. The DAF may be disposed between the die **120** and the carrier **100** to enhance the adhesion between the two. The de-bonding layer is formed over the carrier **100** to temporarily enhance the adhesion between the carrier **100** and the die **120**. The de-bonding layer may be a light to heat conversion (LTHC) adhesive layer or other suitable adhesive layers.

[0022] Referring to FIG. **1**E, a mold chase **140** is placed on the dam structure **130**. The dam structure **130** may be considered to be protruded from the die **120**. As such, the mold chase **140** is placed over the die in an elevated manner. For example, the mold chase **140** may seal the opening OP**1** of the dam structure **130** to create an air gap AG above the connection pads **122**. For example, the air gap AG is being tightly sealed among the passivation layer **124** of the die **120**, the connection pads **122** of the die **120**, the dam structure **130**, and the mold chase **140**. On the other hand, a gap G is formed between the mold chase **140** and the carrier **100**. In some embodiments, the mold chase **140** may be made of metallic materials having strong heat resistance. In some embodiments, the mold chase **140** may be made of materials able to withstand high temperature for the subsequent molding process. For example, a material of the mold chase **140** may include steel or the like.

[0023] Referring to FIG. **1**F, an encapsulation material **150***a* is filled into the gap G. The encapsulation material **150***a* may be a molding compound including polymers, epoxy, or other suitable resins. The encapsulation material **150***a* may be in solid form at room temperature. In some embodiments, the encapsulation material **150***a* is first melted. Subsequently, the encapsulation material **150***a* is pumped into the gap G. In some embodiments, the encapsulation material **150***a* is pumped into the gap G along a direction parallel to the rear surface RS of the die **120**. In some embodiments, the foregoing process may be referred to as a transfer molding process. During the transfer molding process, a clamp force may be applied to the mold chase **140** such that mold chase **140** is firmly pressed against the dam structure **130**. As mentioned above, the air gap AG above the connection pads **122** is tightly sealed among the passivation layer **124** of the die **120**, the connection pads **122** of the die **120**, the dam structure **130**, and the mold chase **140**. Therefore, the dam structure **130** may block the encapsulation material **150***a* from flowing into the air gap AG and damaging the connection pads **122** during the transfer molding process. For example, during the transfer molding process, the active surface AS of the die **120** is free from the encapsulation material **150***a*. As such, the electrical connection between the connection pads **122** and the subsequently formed elements may be ensured and the reliability of the subsequently formed package structure **10** may be enhanced. In some embodiments, a Young's modulus of the encapsulation material **150***a* ranges between 10 GPa and 20 GPa. As illustrated in FIG. **1**F, the mold chase **140** is directly in contact with the dam structure **130** and the encapsulation material **150***a*. However, the disclosure is not limited thereto. Other exemplary embodiment of the mold chase **140** will be discussed below in conjunction with FIG. **5**.

[0024] FIG. **5** is a schematic cross-sectional view illustrating an intermediate step of a manufacturing method of a package structure **10** according to some alternative embodiments of the disclosure. Referring to FIG. **5**, a sealing film **200** may be attached on the mold chase **140** prior to placing the mold chase **140** on the dam structure **130**. In some embodiments, the sealing film **200** may be a polyethylene terephthalate (PET) film, a high temperature resistance film, or a removable film (such as a releasing layer). For example, a material of the sealing film **200** may include thermostable epoxy resin, polyethylene terephthalate (PET), high temperature resistance materials, light-to-heat conversion (LTHC) material, or a combination thereof. The sealing film **200** may have elasticity. Furthermore, the sealing film **200** may be easily peeled off from the dam structure **130** and the encapsulation material **150***a*. For example, a Young's modulus of the sealing film **200** may be less than 1 GPa. As illustrated in FIG. **5**, the sealing film **200** is directly in contact with the dam structure **130** and the encapsulation material **150***a*. The sealing film **200** may seal the opening OP**1** of the dam structure **130** to create an air gap AG above the connection pads **122**. For example, the air gap AG is being tightly sealed among the passivation layer **124** of the die **120**, the connection pads **122** of the die **120**, the dam structure **130**, and the sealing film **200**. By adapting the sealing film **200**, the risk of molding penetration (a scenario where the encapsulation material **150***a* flows into the air gap AG) may be further reduced to ensure the reliability of the subsequently formed package structure **10**.

[0025] Referring back to FIG. **1**G, the mold chase **140** is removed and the encapsulation material **150***a* is cured to form an encapsulant **150**. In some embodiments, the curing temperature may range between 130° C. and 150° C. The encapsulant **150** encapsulates sidewalls SW of a die **120**. The encapsulant **150** has a first surface **151** and a second surface **152** opposite to the first surface **151**. Since the encapsulant **150** is formed to fill the gap G (shown in FIG. **1**E), the first surface **151** of the encapsulant **150** is coplanar with the rear surface RS of the die **120** while the second surface **152** of the encapsulant **150** is substantially coplanar with a top surface **132** of the dam structure **130**. In some embodiments, both of the first surface **151** and the second surface **152** of the encapsulant **150** are flat surfaces with little or no roughness. For example, a roughness of the first surface **151** and the second surface **152** ranges between 0 μm and 0.2 μm. In some embodiments, the second surface **152** of the encapsulant **150** is located at a level height different from the active surface AS of the die **120**. For example, as illustrated in FIG. **1**G, the second surface **152** of the encapsulant **150** is located at a level height higher than the active surface AS of the die **120**. In some embodiments, a thickness T_{150} of the encapsulant **150** is larger than a thickness T_{120} of the die **120**. In some embodiments, the thickness T_{150} of the encapsulant **150** may range between 50 μm and 500 μm while the thickness T_{120} of the die **120** may range between 40 μm and 498 μm. On the other hand, a sum of the thickness T_{120} of the die **120** and the thickness T_{130} of the dam structure **130** may be equal to the thickness T_{150} of the encapsulant **150**. It should be noted that since a thickness of the passivation layer **124** of the die **120** is negligible, the thickness T_{120} of the die **120** herein is defined as a sum of a thickness of the semiconductor substrate **126** and a thickness of the connection pads **122**.

[0026] Referring to FIG. **1**H, a redistribution structure **160** is formed over the encapsulant **150**, the dam structure **130**, and the active surface AS of the die **120**. The redistribution structure **160** is electrically connected to the connection pads **122** of the die **120**. The redistribution structure **160** may include at least one dielectric layer **164** and a plurality of conductive elements **162** embedded in the dielectric layer **164**. In some embodiments, the dielectric layers **164** may be formed by suitable fabrication techniques such as spin-on coating, chemical vapor deposition (CVD), plasma-enhanced chemical vapor deposition (PECVD), or the like. The dielectric layers **164** may be made of non-organic or organic dielectric materials such as silicon oxide, silicon nitride, silicon carbide, silicon oxynitride, polyimide, benzocyclobutene (BCB), or the like. On the other hand, the conductive elements **162** may be formed by sputtering, evaporation, electro-less plating, or electroplating. The conductive elements **162** may be made of copper, aluminum, nickel, gold, silver, tin, a combination thereof, or other suitable conductive materials. As illustrated in FIG. **1**H, the redistribution structure **160** includes two dielectric layers (a first dielectric layer **164***a* and a second dielectric layer **164***b*). However, the number of the dielectric layer **164** is not limited and may be adjusted based on circuit design. The conductive elements **162** may include a plurality of trace layers (a first trace layer **162***a* and a second trace layer **162***b*) and a plurality of interconnect structures **166** connecting the trace first layer **162***a* and the second trace layer **162***b*. The first dielectric layer **164***a* is disposed on the encapsulant **150**, the dam structure **130**, and the active surface AS of the die **120**. In some embodiments, the first dielectric layer **164***a* has a non-uniform thickness. For example, a thickness of the first dielectric layer **164***a* directly above the active surface AS of the die **120** is larger than a thickness of the first dielectric layer **164***a* directly above the second surface **152** of the encapsulant **150** and the top surface **132** of the dam structure **130**. The first dielectric layer **164***a* has a plurality of contact openings exposing the connection pads **122**. The first trace layer **162***a* extends into the contact opening to be directly in contact with the connection pads **122**, so electrical connection between the die **120** and the redistribution structure **160** may be realized. For example, the redistribution structure **160** is directly in contact with the connection pads **122** of the die **120**. The second dielectric layer **164***b* covers the first trace layer **162***a*. Similar to the first dielectric layer **164***a*, the second dielectric layer **164***b* also has a plurality of contact openings exposing part of the first trace layer **162***a* such that the first trace layer **162***a* may be electrically connected to other trace layers (for example, the second trace layer **162***b*) through the interconnect structures **166**. The second trace layer **162***b* is electrically connected to at least part of the first trace layer **162***a* exposed by the second dielectric layer **164***b*. The second trace layer **162***b* may be used for electrical connection with elements formed in the subsequent processes. In some embodiments, the second trace layer **162***b* may be referred to as under-bump metallization (UBM).

[0027] As mentioned above, the second surface **152** of the encapsulant **150** is substantially coplanar with the top surface **132** of the dam structure **130** while being a flat surface. As such, the redistribution structure **160** may be formed on the flat surface to alleviate the problem of breakage in conductive elements **162** within the redistribution structure **160**. Furthermore, since the dam structure **130** is formed at edges of the die **120** and is sandwiched between the die **120** and the redistribution structure **160**, the stress of the redistribution structure **160** accumulated at edges of the die **120** may be effectively reduced. As such, the reliability of the redistribution structure **160** may be ensured.

[0028] Referring to FIG. **1**I, the carrier **100** is separated from the first surface **151** of the encapsulant **150** and the rear surface RS of the die **120**. As mentioned above, a de-bonding layer (an LTHC layer; not shown) may be disposed between the carrier **100** and the die **120**. Upon irradiation with an UV laser, the de-bonding layer and the carrier **100** may be peeled off and separated from the die **120** and the encapsulant **150**. Upon removal of the carrier **100**, the first surface **151** of the encapsulant **150** and the rear surface RS of the die **120** are exposed. For example, the rear surface RS of the die **120** is exposed by the encapsulant **150**. As illustrated in FIG. **1**I, a plurality of conductive terminals **170** are formed over the redistribution structure **160**. The conductive terminals **170** may be formed by, for example, a ball placement process and a reflow process. In some embodiments, the conductive terminals **170** are disposed on the second trace layer **162***b*. In some embodiments, the conductive terminals **170** are conductive bumps such as solder balls. However, the disclosure is not limited thereto. Other possible forms and shapes of the conductive terminals **170** may be utilized. For example, the conductive terminals **170** may take the form of conductive pillars or conductive posts in some alternative embodiments. In some embodiments, the step of separating the carrier **100** from the encapsulant **150** and the die **120** precedes the step of forming the conductive terminals **170**. However, it construes no limitation in the disclosure. In some alternative embodiments, these two steps may be reversed. Namely, the step of forming the conductive terminals **170** may precede the step of separating the carrier **100** from the encapsulant **150** and the die **120**.

[0029] Referring to FIG. **1**J, a singulation process is performed on the structure illustrated in FIG. **1**I to obtain a plurality of package structures **10**. The singulation process includes, for example, cutting with rotating blades or laser beams.

[0030] In the light of the foregoing, the die is encapsulated by adaption of a mold chase directly over the dam structure. As such, certain steps in the conventional molding process (for example, mold grinding process) or the conventional die forming process (for example, the formation of conductive bumps over connection pads of the die) may be skipped to reduce the process complexity and manufacturing cost of the package structure. Moreover, the transfer molding process using the mold chase and the dam structure forms an encapsulant with flat surfaces. As such, the redistribution structure may be formed on the flat surface of the encapsulant to alleviate the problem of breakage in conductive elements within the redistribution structure. Furthermore, since the dam structure is formed at edges of the die and is sandwiched between the die and the redistribution structure, the stress of the redistribution structure accumulated at edges of the die may be effectively reduced. As such, the reliability of the redistribution structure and the package structure may be ensured.

[0031] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents

1. A package structure, comprising:

a die having an active surface and a rear surface opposite to the active surface;

an encapsulant encapsulating sidewalls of the die, wherein the encapsulant has a first surface and a second surface opposite to the first surface, the first surface is coplanar with the rear surface of the die, and the second surface is located at a level height different from the active surface of the die;

a dam structure disposed on the active surface of the die, wherein a top surface of the dam structure is substantially coplanar with the second surface of the encapsulant; and

a redistribution structure over the encapsulant, the dam structure, and the die, wherein the redistribution structure is electrically connected to the die, wherein the dam structure is spaced apart from a conductive element of the redistribution structure.

2. The package structure according to claim **1**, further comprising a plurality of conductive terminals over the redistribution structure.

3. The package structure according to claim **1**, wherein a thickness of the encapsulant is larger than a thickness of the die.

4. The package structure according to claim **1**, wherein a sum of a thickness of the die and a thickness of the dam structure is equal to a thickness of the encapsulant.

5. The package structure according to claim **1**, wherein the die comprises a plurality of connection pads and the dam structure comprises at least one opening, and the at least one opening exposes the plurality of connection pads.

6. The package structure according to claim **5**, wherein the redistribution structure is directly in contact with the plurality of connection pads.

7. The package structure according to claim **5**, wherein the dam structure comprises a ring pattern having one opening, the ring pattern is disposed along edges of the active surface within the die, and the one opening exposes the plurality of connection pads.

8. The package structure according to claim **5**, wherein the dam structure comprises a mesh pattern having a plurality of openings, and each of the plurality of openings exposes the corresponding connection pad.

9. The package structure according to claim **1**, wherein a material of the dam structure comprises photosensitive material, epoxy, polyimide, silicone based material, or a combination thereof.

10. The package structure according to claim **1**, wherein the rear surface of the die is exposed by the encapsulant.

11. A manufacturing method of a package structure, comprising:

providing at least one die having a dam structure formed thereon, wherein the at least one die has an active surface and a rear surface opposite to the active surface, the at least one die comprises a plurality of connections pads on the active surface, and the dam structure is disposed on the active surface and exposes the plurality of connection pads;

placing the at least one die having the dam structure formed thereon on a carrier;

placing a mold chase on the dam structure;

filling an encapsulation material into a gap between the mold chase and the carrier;

curing the encapsulation material to form an encapsulant encapsulating sidewalls of the at least one die;

forming a redistribution structure over the encapsulant, the dam structure, and the active surface of the at least one die; and

separating the carrier from the encapsulant and the at least one die.

12. The method according to claim **11**, further comprising:

forming a plurality of conductive terminals over the redistribution structure.

13. The method according to claim **12**, wherein the step of separating the carrier from the encapsulant and the at least one die precedes the step of forming the plurality of conductive terminals.

14. The method according to claim **12**, wherein the step of forming the plurality of conductive terminals precedes the step of separating the carrier from the encapsulant and the at least one die.

15. The method according to claim **11**, wherein the step of providing the at least one die having a dam structure formed thereon comprises:

providing a wafer having an active surface and a rear surface opposite to the active surface, wherein the wafer comprises the plurality of connections pads on the active surface thereof;

forming a dam material layer over the active surface of the wafer;

removing a portion of the dam material layer to form the dam structure having at least one opening, wherein the at least one opening exposes the plurality of connection pads; and

dicing the wafer to form a plurality of dies having the dam structure formed thereon.

16. The method according to claim **11**, wherein a material of the dam structure comprises photosensitive material, epoxy, polyimide, silicone based material, or a combination thereof.

17. The method according to claim **11**, further comprising:

attaching a sealing film on the mold chase prior to placing the mold chase on the dam structure.

18. The method according to claim **17**, wherein a material of the sealing film comprises thermostable epoxy resin, polyethylene terephthalate (PET), or a combination thereof.

19. The method according to claim **17**, wherein a Young's modulus of the sealing film is less than 1 GPa and a Young's modulus of the encapsulant ranges between 10 GPa and 20 GPa.

20. The method according to claim **11**, wherein during the step of filling the encapsulation material into gaps between the mold chase and the carrier, the active surface of the die is free from the encapsulation material.

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