

(12) **United States Patent**  
**Cha et al.**

(10) **Patent No.:** **US 12,393,100 B2**  
(45) **Date of Patent:** **Aug. 19, 2025**

(54) **CAMERA MODULE AND OPTICAL DEVICE**  
**COMPRISING SAME**

(71) Applicant: **LG INNOTEK CO., LTD.**, Seoul (KR)

(72) Inventors: **Won Jun Cha**, Seoul (KR); **Youn Baek Jeong**, Seoul (KR); **Ji Yoon Hong**, Seoul (KR)

(73) Assignee: **LG INNOTEK CO., LTD.**, Seoul (KR)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/680,209**

(22) Filed: **May 31, 2024**

(65) **Prior Publication Data**

US 2024/0319564 A1 Sep. 26, 2024

**Related U.S. Application Data**

(63) Continuation of application No. 16/982,487, filed as application No. PCT/KR2019/003110 on Mar. 18, 2019, now Pat. No. 12,032,279.

(30) **Foreign Application Priority Data**

Mar. 20, 2018 (KR) ..... 10-2018-0031894  
Mar. 23, 2018 (KR) ..... 10-2018-0033651

(51) **Int. Cl.**  
**G03B 5/00** (2021.01)  
**G02B 7/09** (2021.01)  
(Continued)

(52) **U.S. Cl.**  
CPC ..... **G03B 5/00** (2013.01); **G02B 7/09** (2013.01); **G02B 27/646** (2013.01); **G03B 13/36** (2013.01); **G03B 2205/0007** (2013.01)

(58) **Field of Classification Search**  
None

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

2013/0010176 A1\* 1/2013 Kagaya ..... G03B 11/00  
348/340  
2013/0128108 A1\* 5/2013 Oh ..... H04N 23/54  
348/374

(Continued)

**FOREIGN PATENT DOCUMENTS**

CN 104811589 A 7/2015  
CN 105739218 A 7/2016

(Continued)

**OTHER PUBLICATIONS**

Extended European Search Report for European Application No. 19770601.3, dated Nov. 8, 2021.

*Primary Examiner* — Bao-Luan Q Le

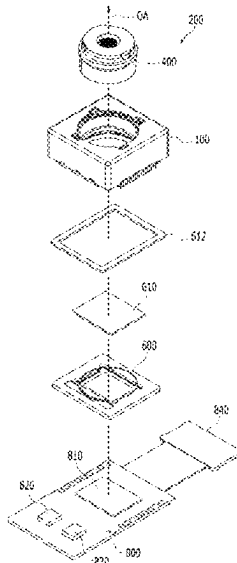
*Assistant Examiner* — Danell L Owens

(74) *Attorney, Agent, or Firm* — Birch, Stewart, Kolasch & Birch, LLP

(57) **ABSTRACT**

A camera module includes a lens barrel moving in the direction of the optical axis, a holder disposed below the lens barrel and having a seating portion recessed in the top surface thereof, a filter disposed on the bottom surface of the seating portion of the holder, a first adhesive member disposed between the bottom surface of the seating portion and a lower surface of the filter and comprising a second opening, a second adhesive member disposed in the groove portion to be coupled to the filter, and an image sensor disposed under the filter.

**20 Claims, 22 Drawing Sheets**



- (51) **Int. Cl.**  
**G02B 27/64** (2006.01)  
**G03B 13/36** (2021.01)

(56) **References Cited**

U.S. PATENT DOCUMENTS

|              |    |         |             |
|--------------|----|---------|-------------|
| 2016/0187670 | A1 | 6/2016  | Kim         |
| 2017/0038661 | A1 | 2/2017  | Ha          |
| 2017/0123178 | A1 | 5/2017  | Wang et al. |
| 2018/0329277 | A1 | 11/2018 | Han et al.  |

FOREIGN PATENT DOCUMENTS

|    |                 |   |         |
|----|-----------------|---|---------|
| CN | 106973210       | A | 7/2017  |
| JP | 2005-252990     | A | 9/2005  |
| JP | 2006-106716     | A | 4/2006  |
| JP | 2013-110593     | A | 6/2013  |
| KR | 10-2010-0011209 | A | 2/2010  |
| KR | 10-2010-0132477 | A | 12/2010 |
| KR | 10-2016-0009866 | A | 1/2016  |
| KR | 10-2016-0080263 | A | 7/2016  |
| KR | 10-2016-0080627 | A | 7/2016  |
| KR | 10-2017-0085704 | A | 7/2017  |

\* cited by examiner

FIG.1

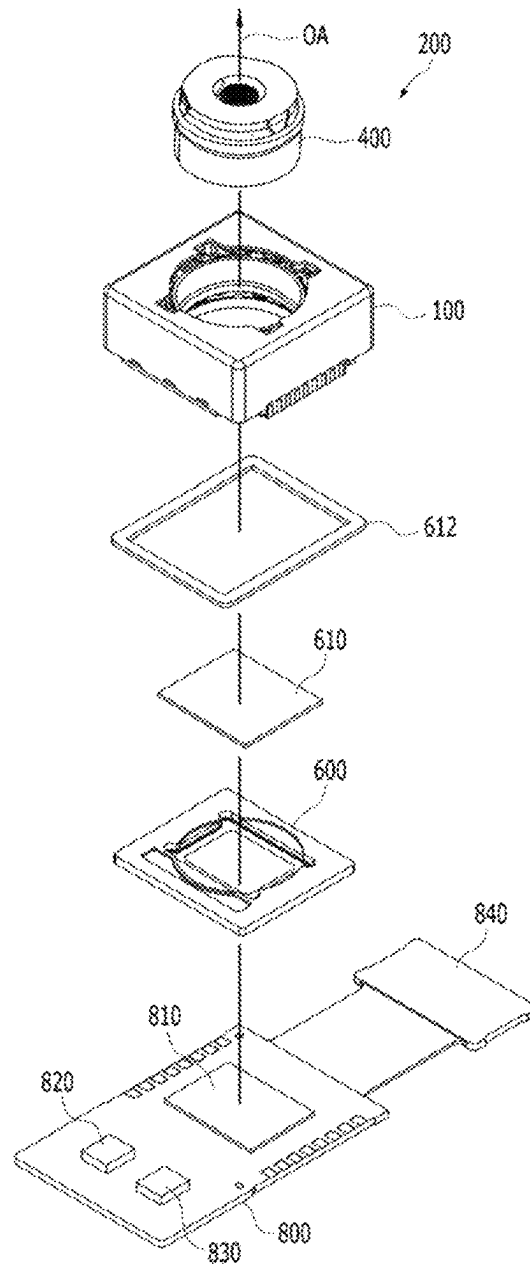


FIG.2A

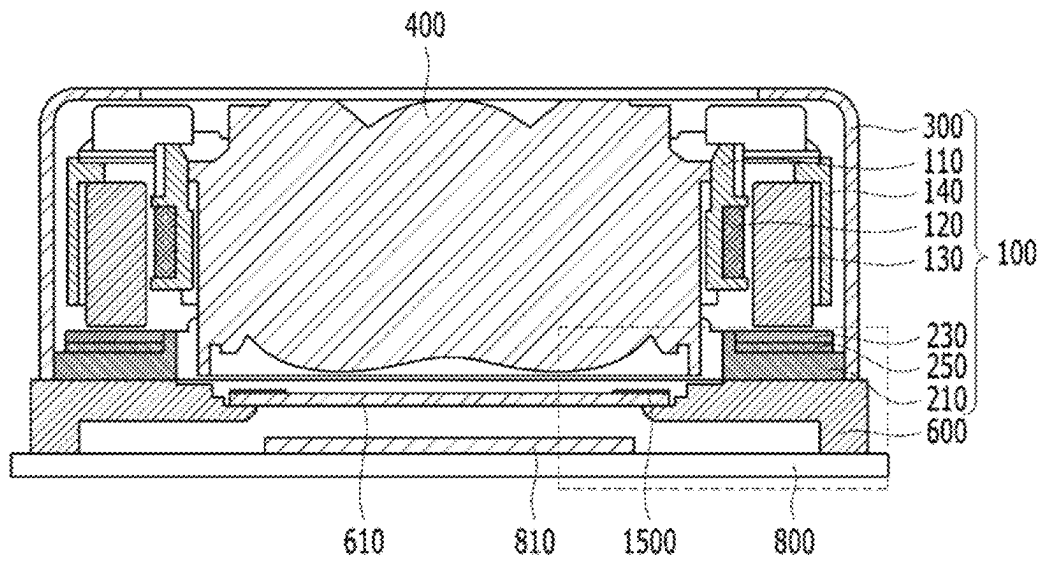


FIG.2B

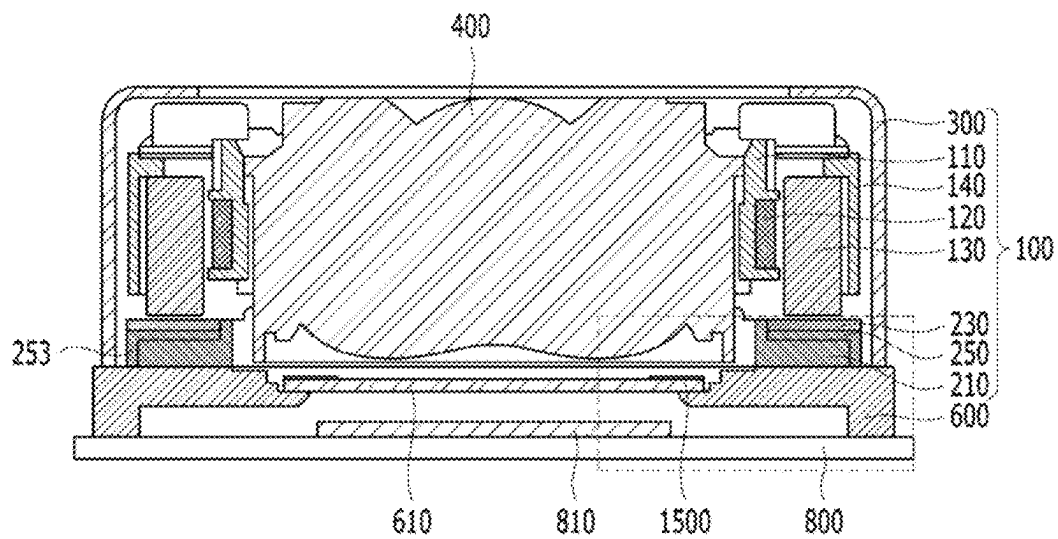


FIG.3

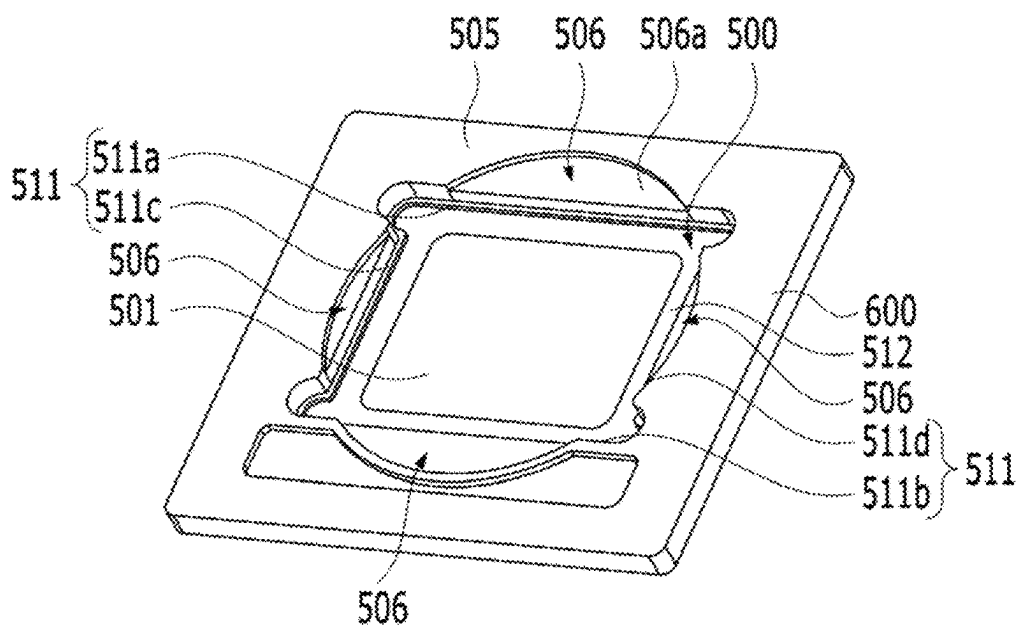


FIG. 4

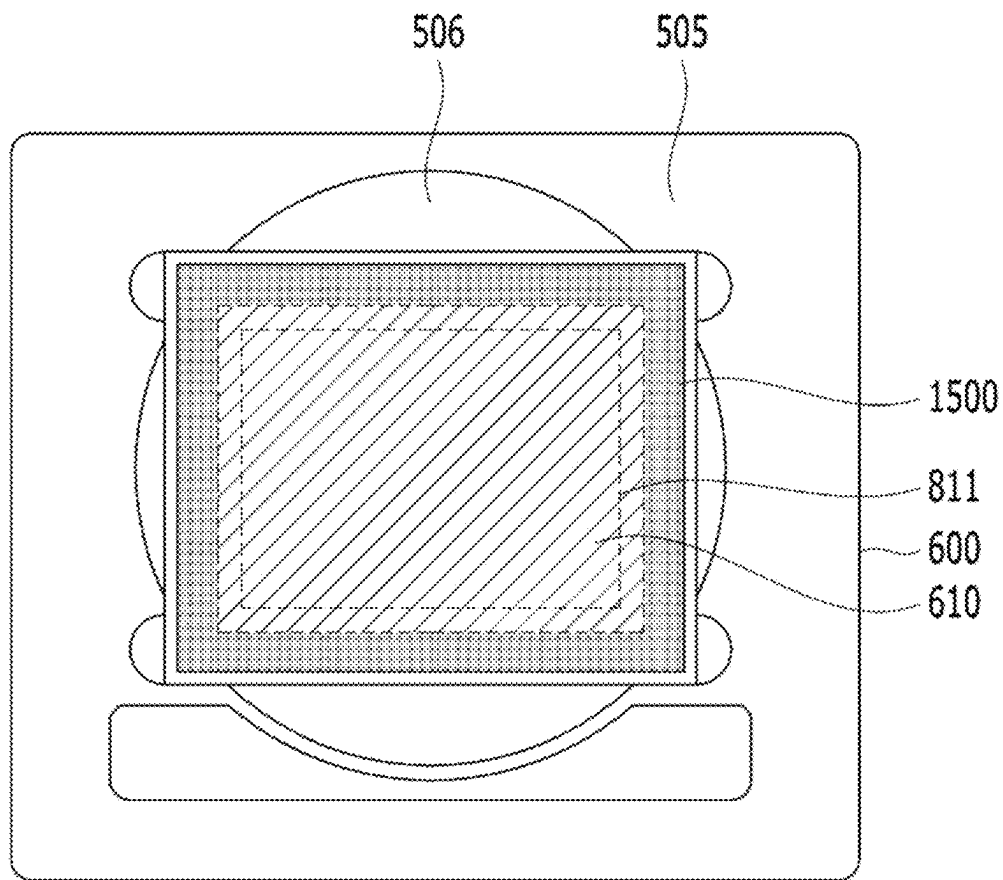


FIG.5

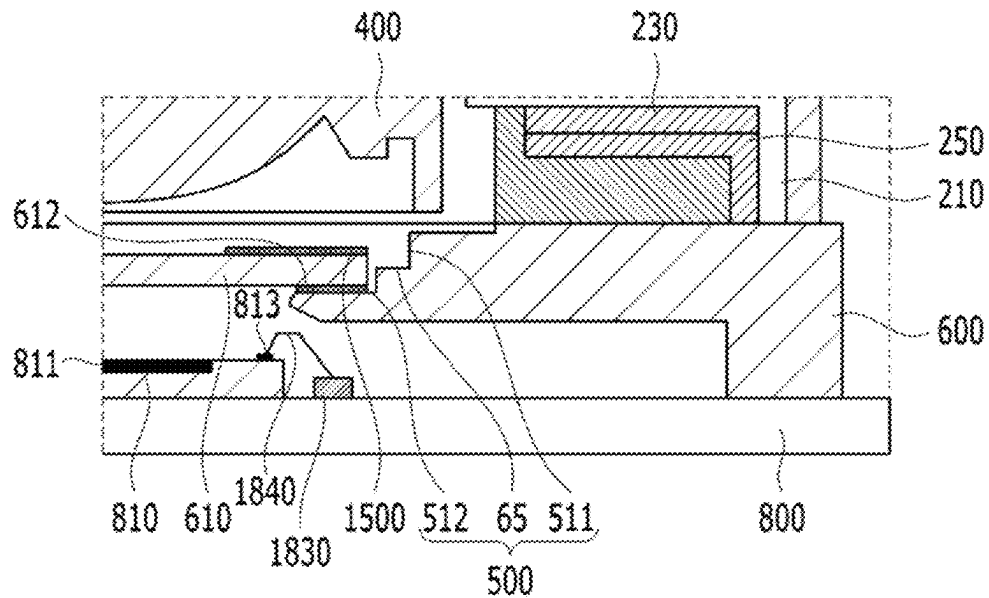


FIG.6

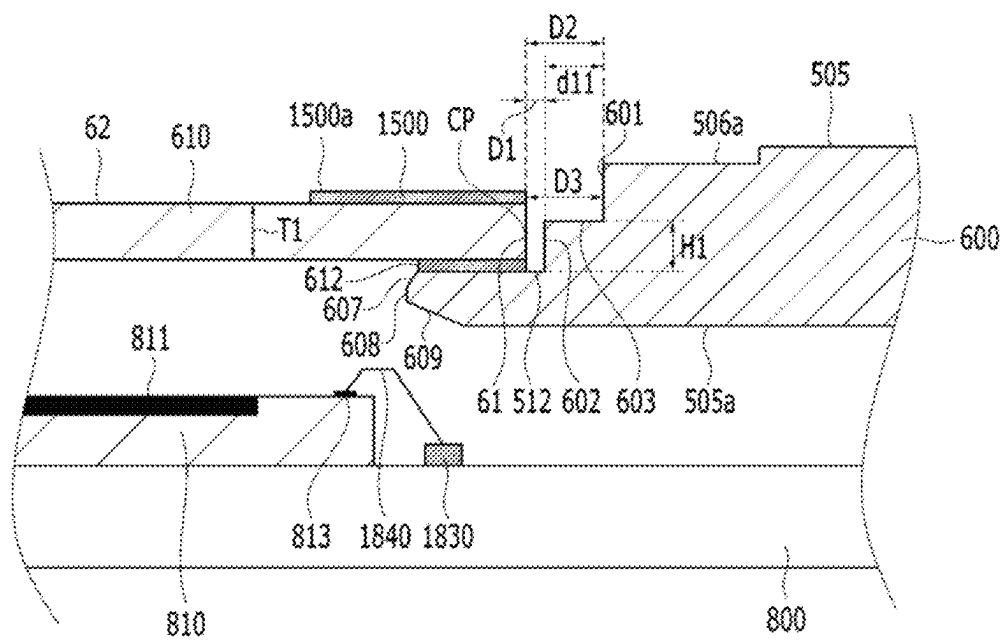


FIG.7

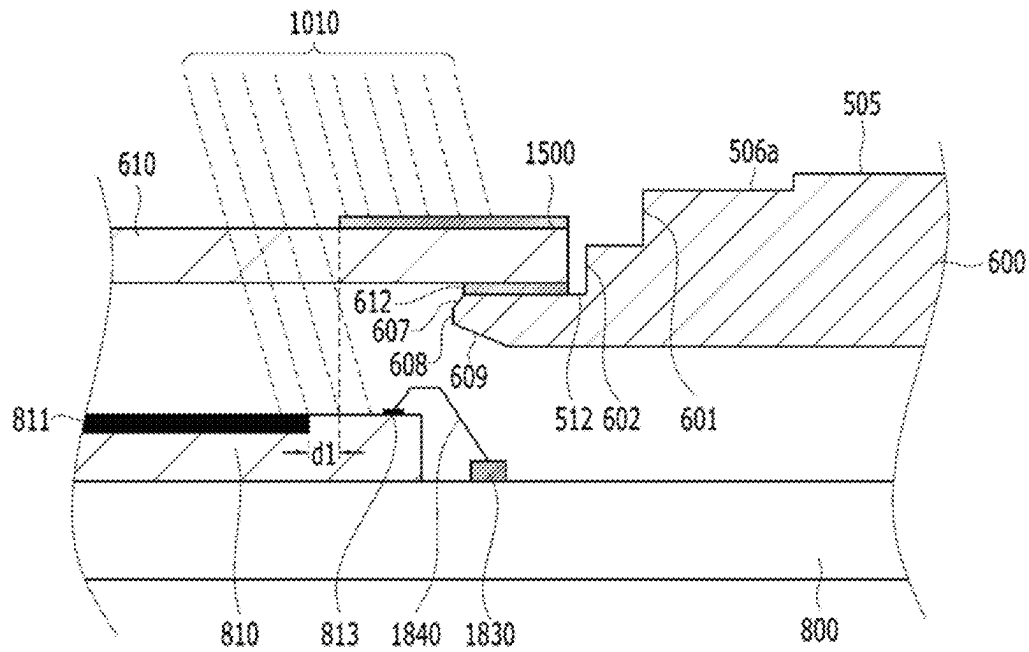


FIG.8

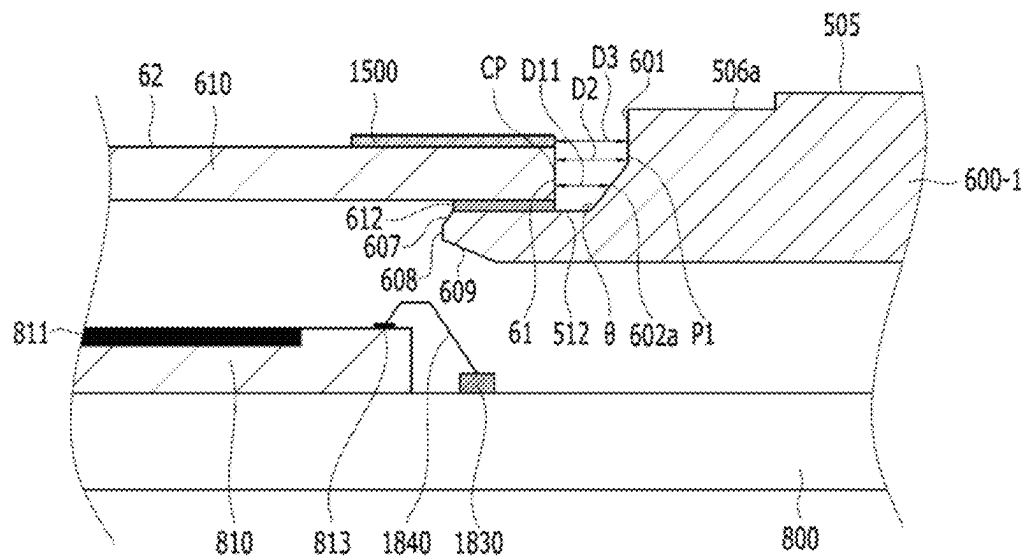




FIG.9

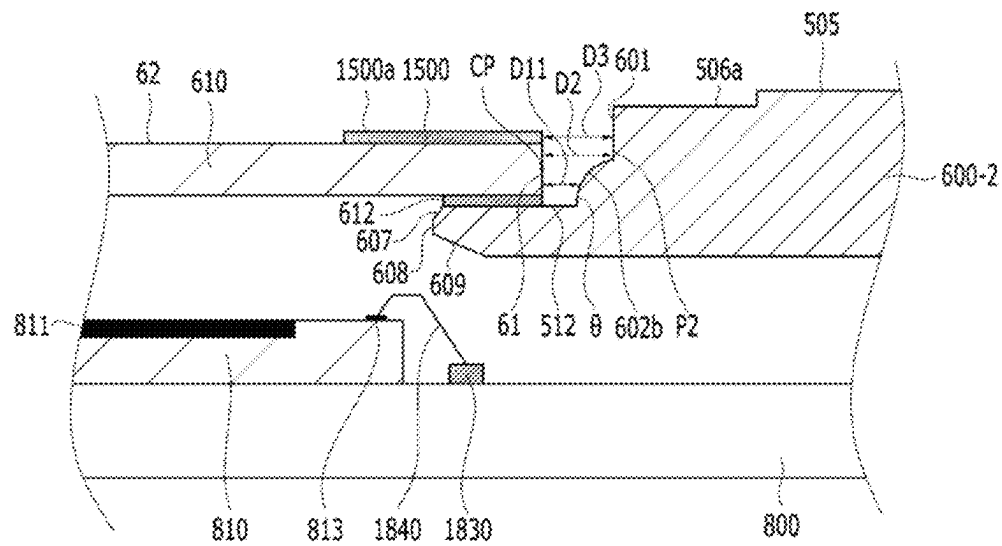


FIG.10

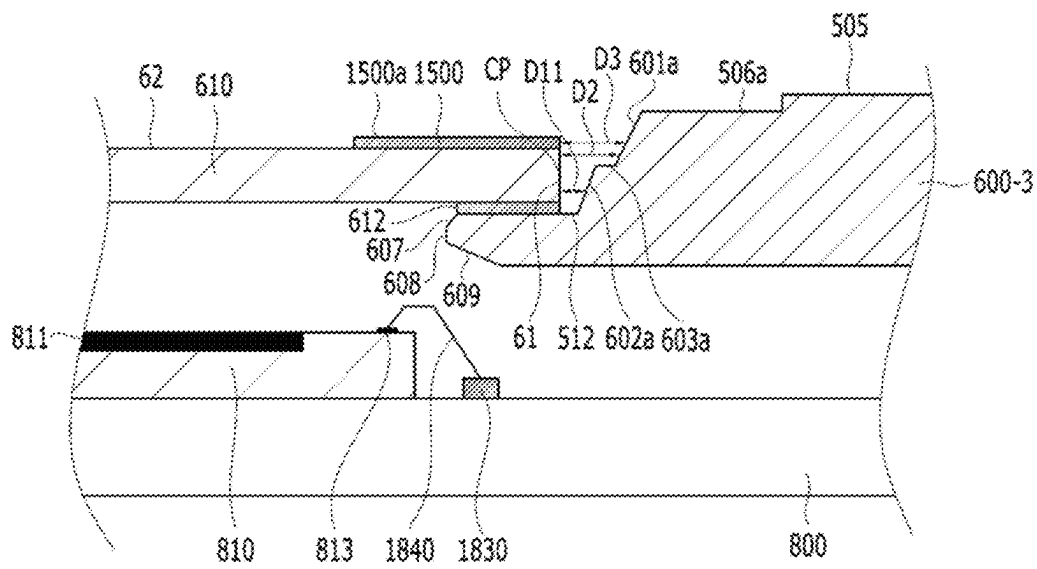


FIG. 11

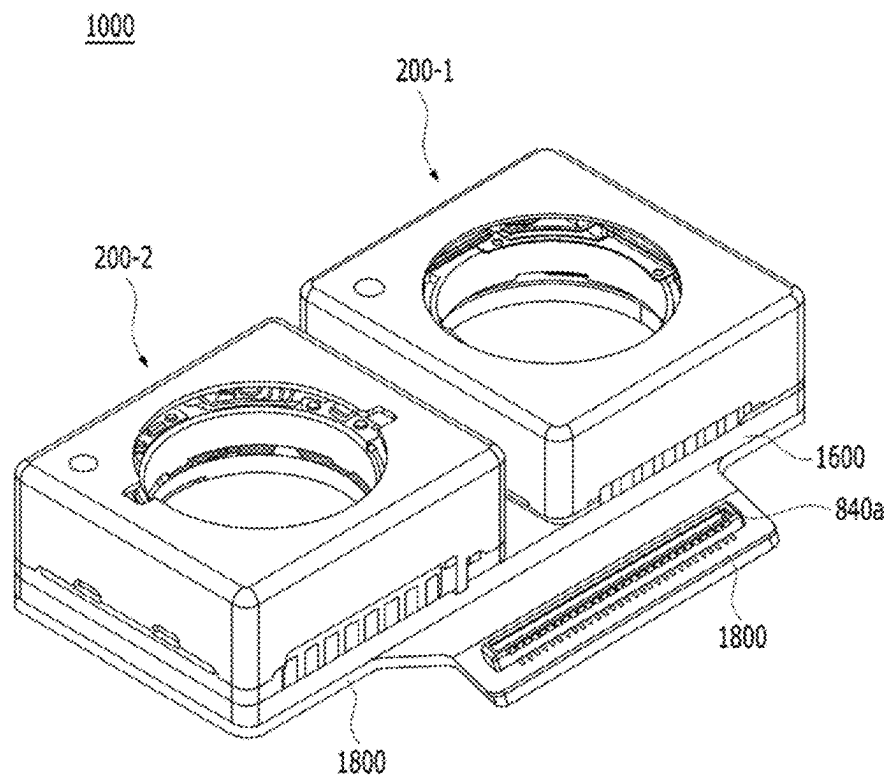


FIG.12

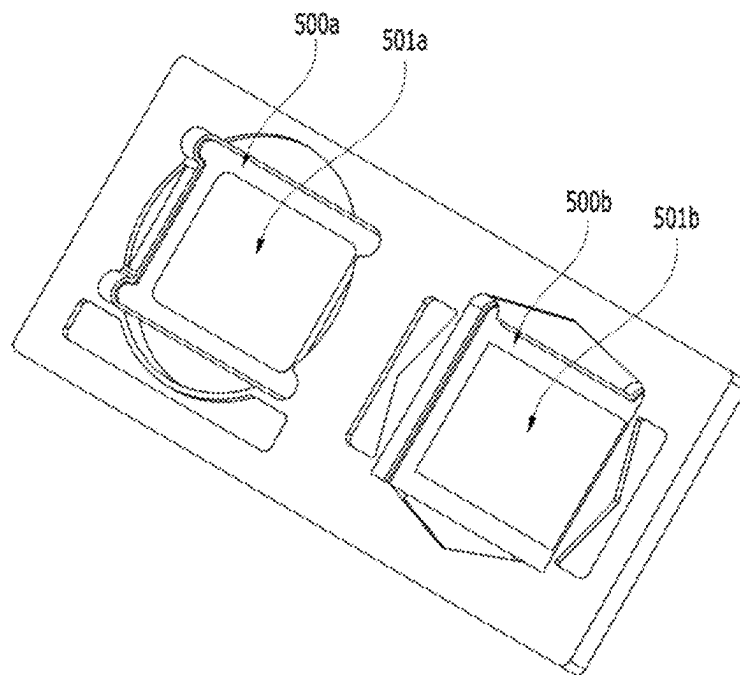


FIG.13

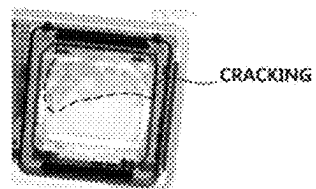


FIG.14

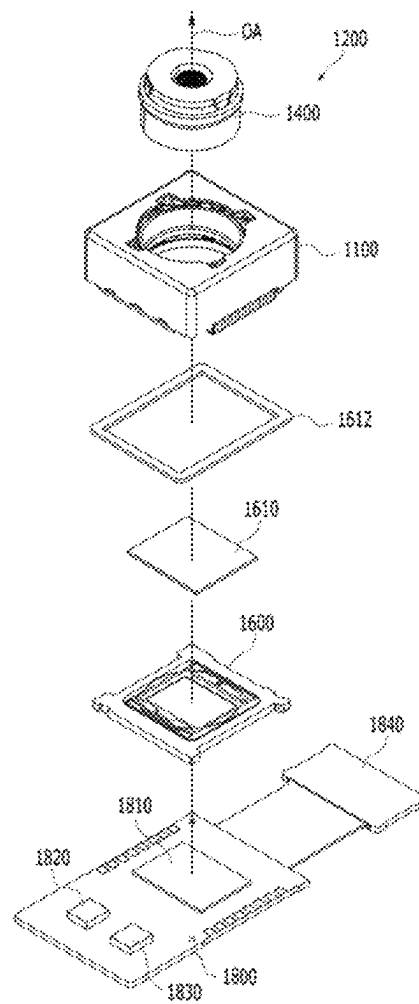


FIG.15A

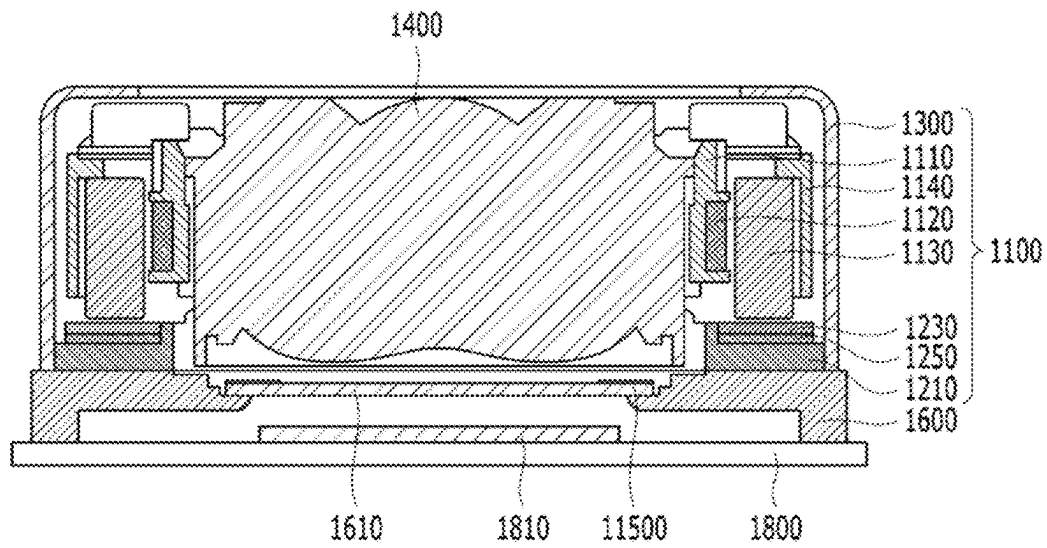


FIG.15B

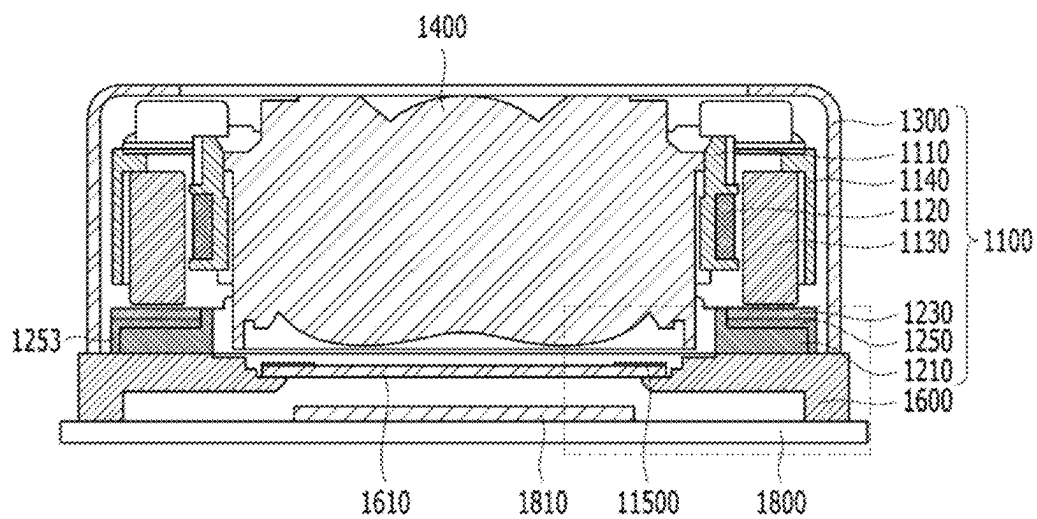


FIG. 16

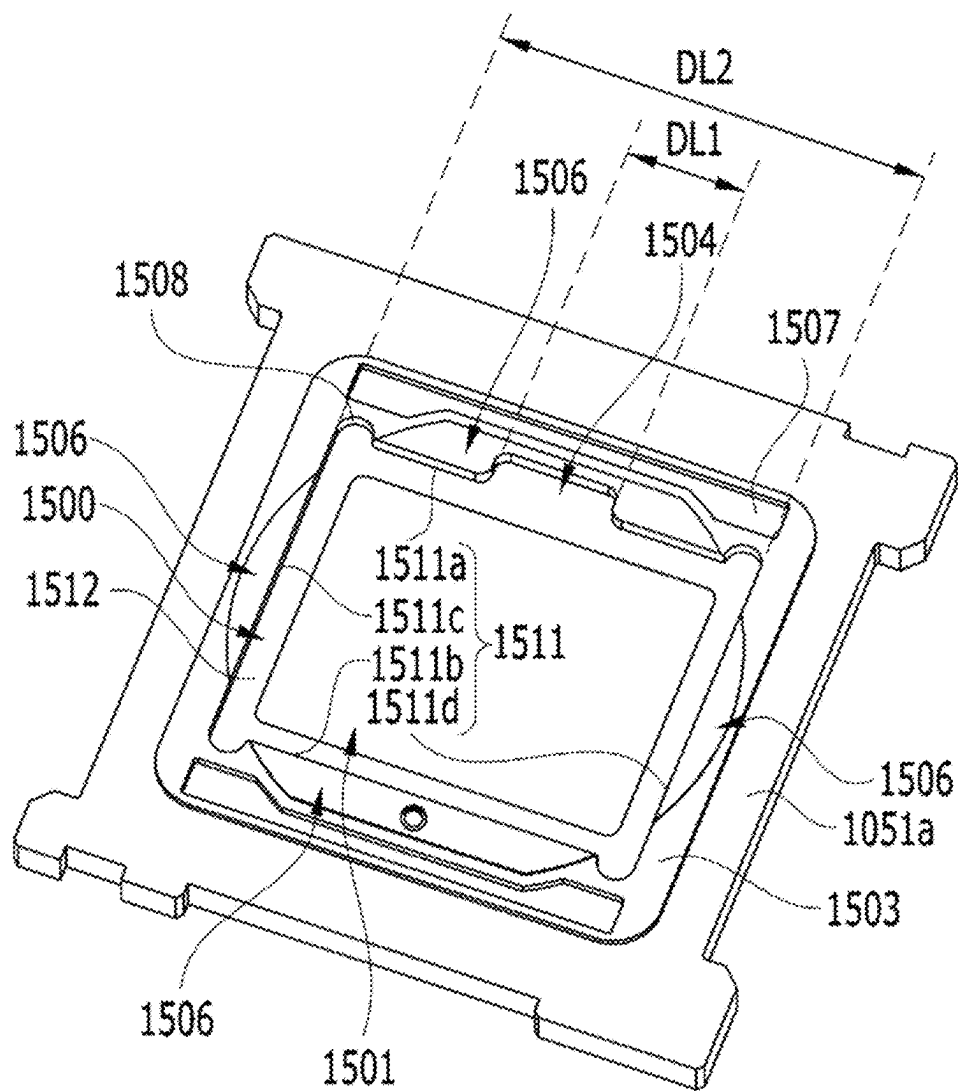


FIG.17

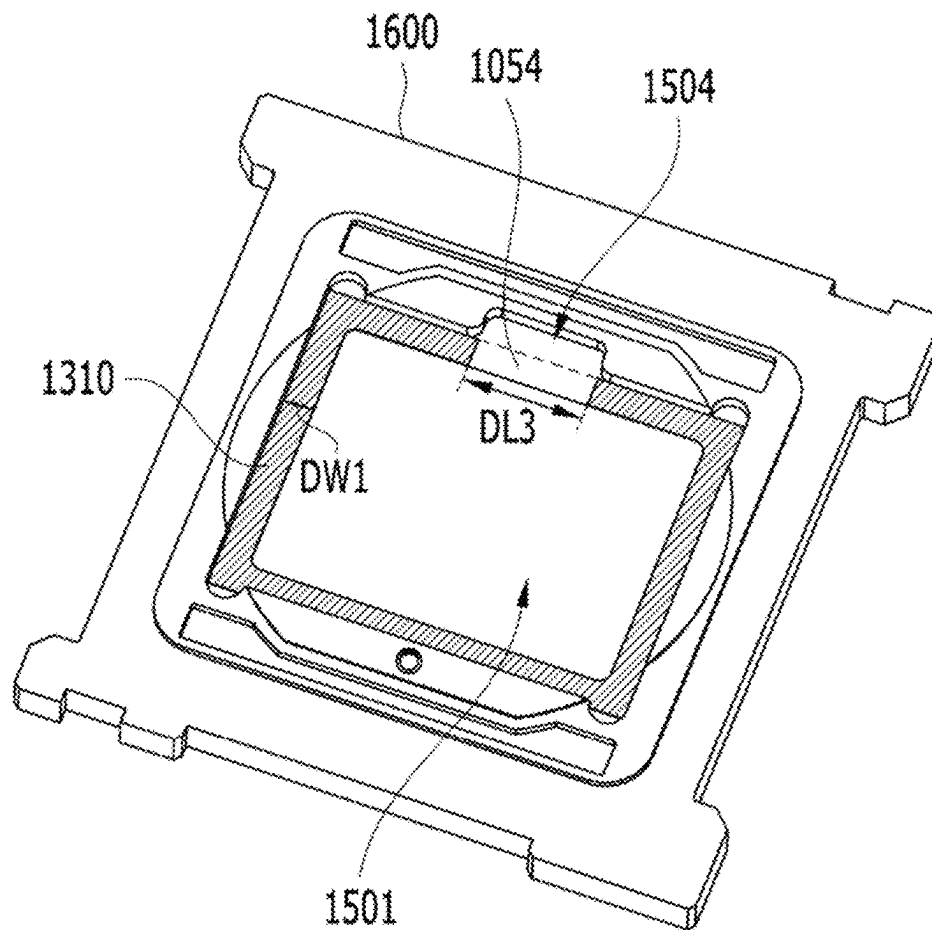


FIG.18

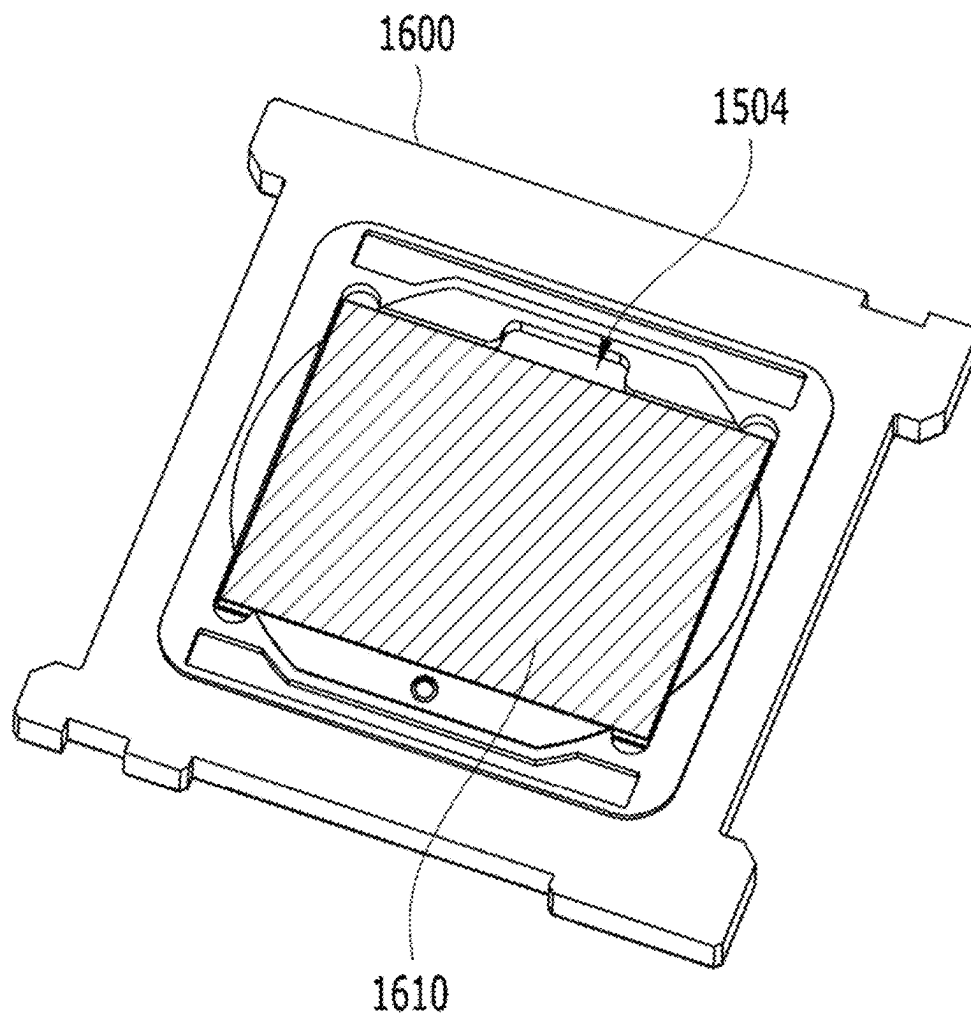




FIG.19

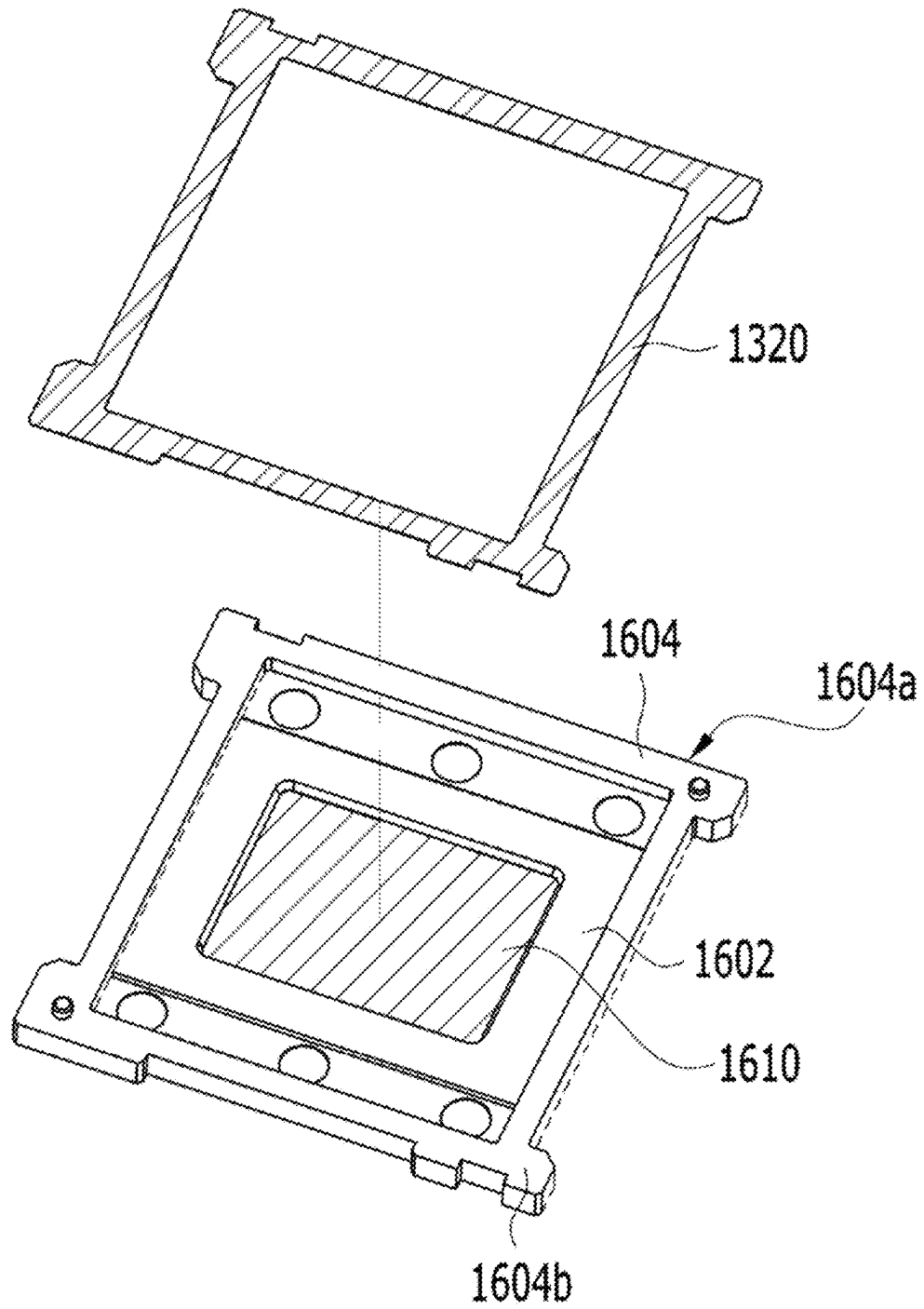


FIG.20

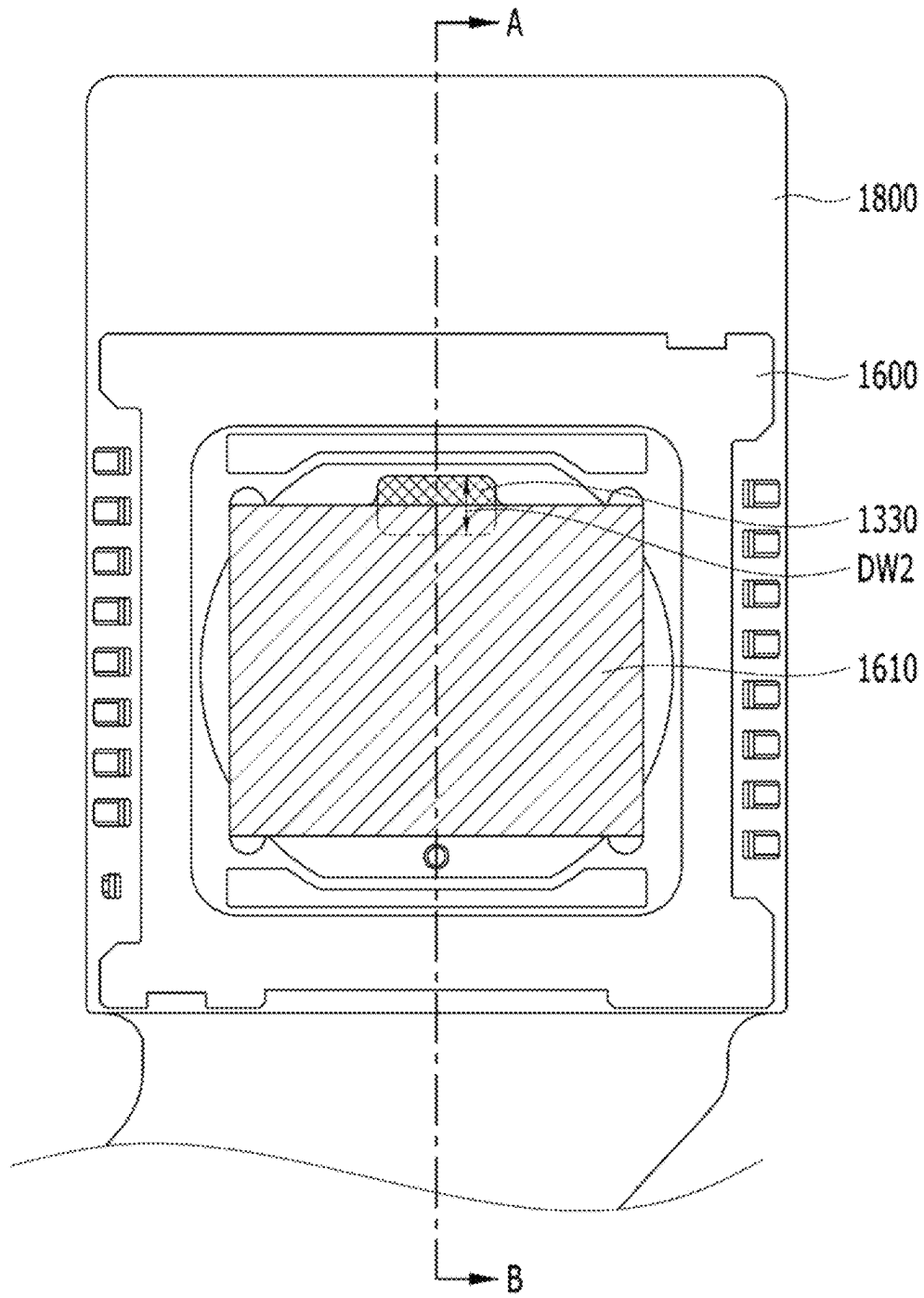


FIG.21

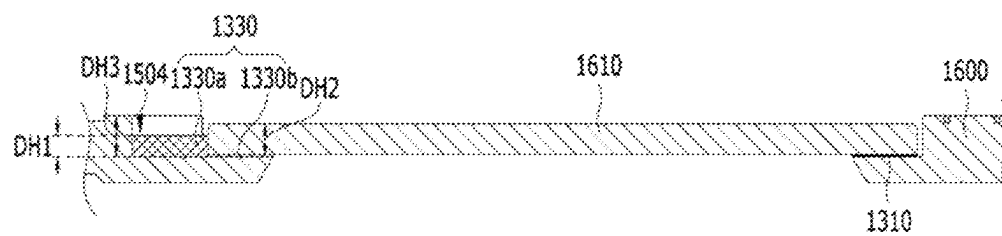


FIG.22

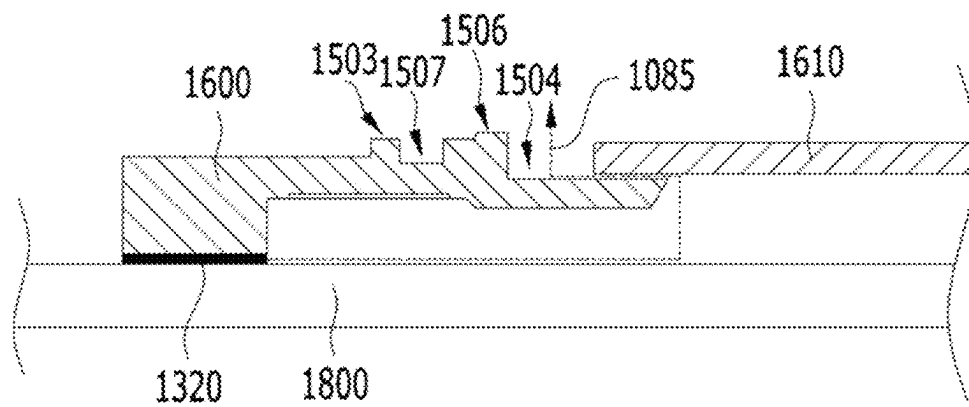


FIG.23A

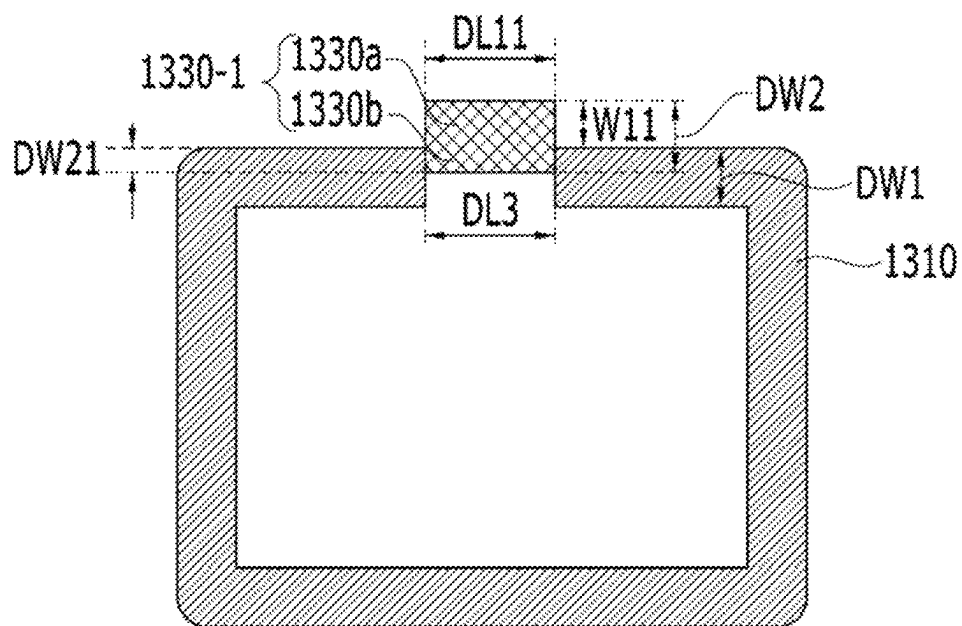


FIG.23B

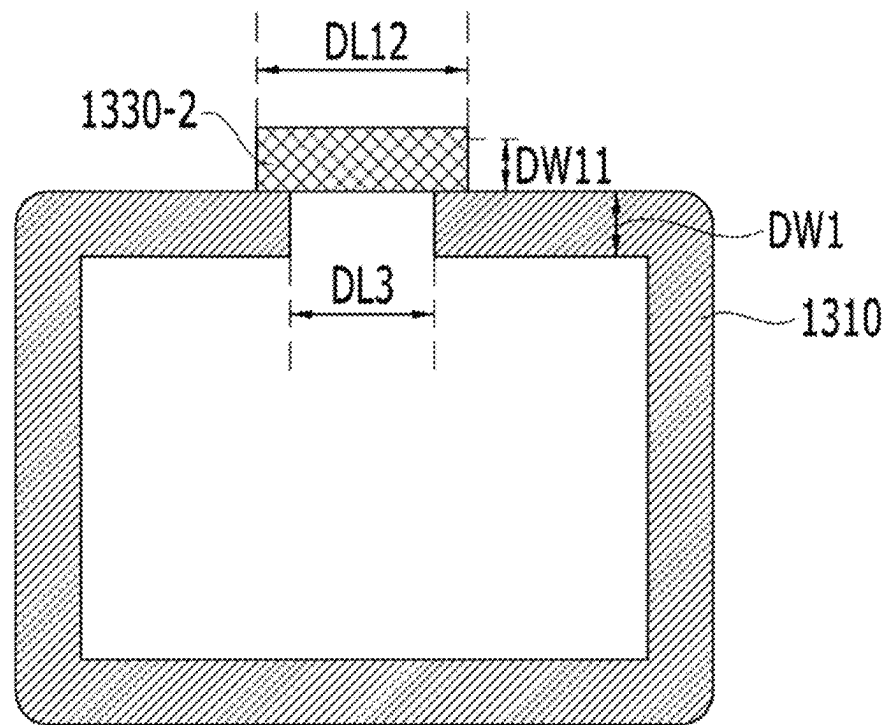


FIG.23C

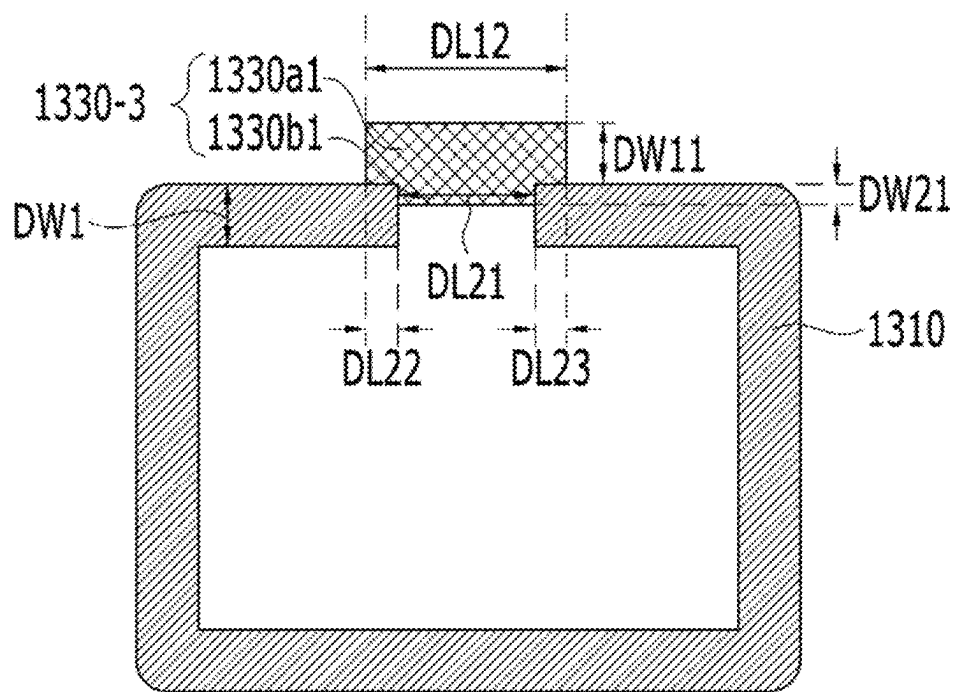


FIG.24

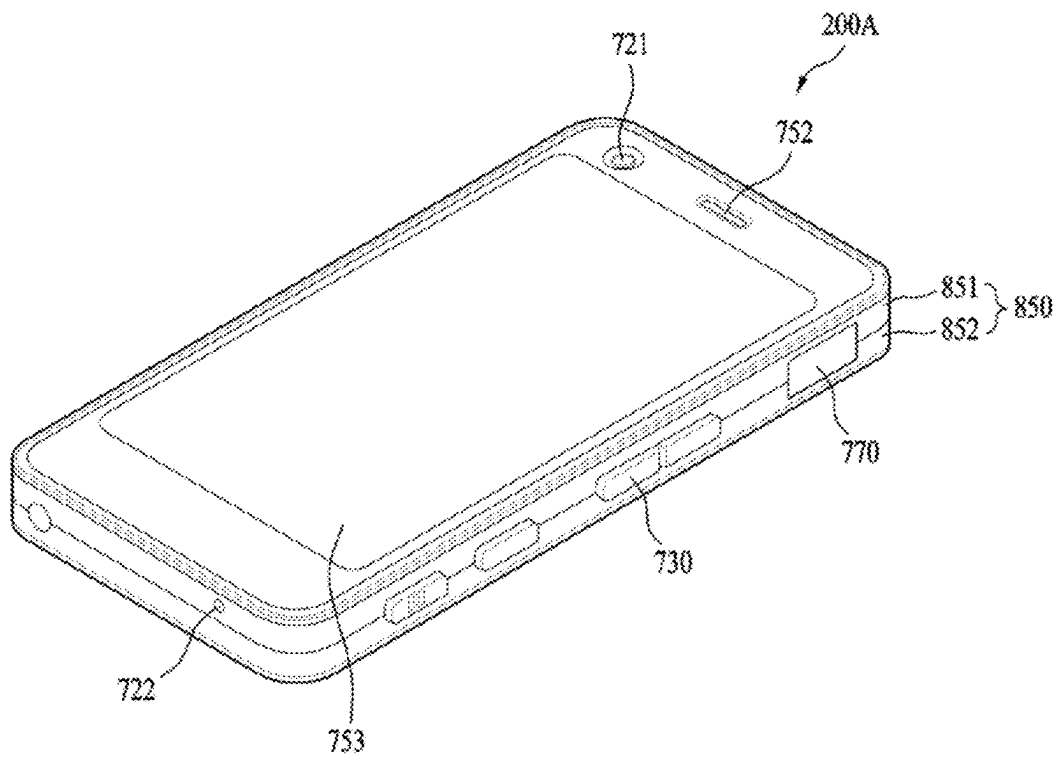
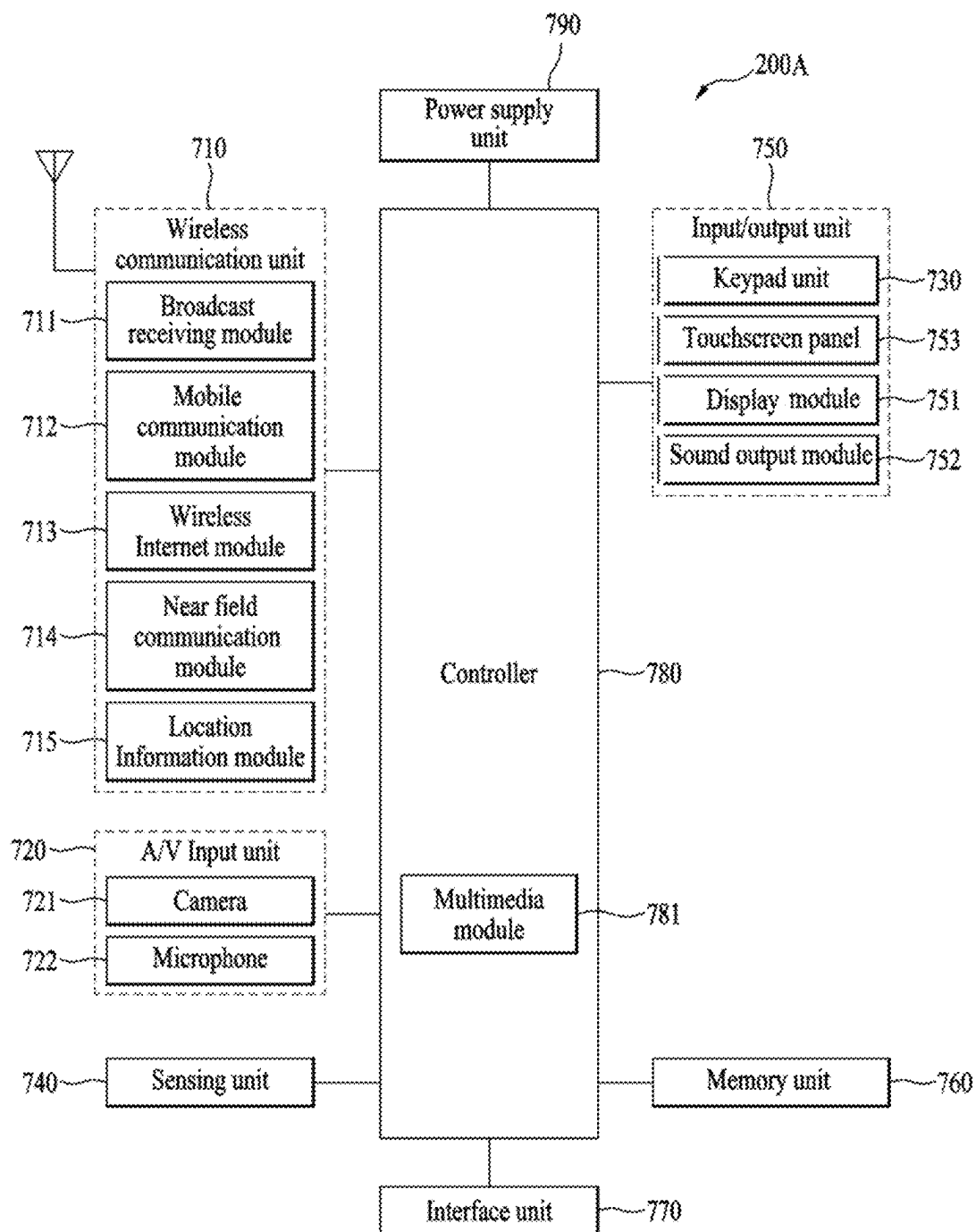


FIG. 25





1

## CAMERA MODULE AND OPTICAL DEVICE COMPRISING SAME

### CROSS REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of U.S. application Ser. No. 16/982,487, filed on Sep. 18, 2020, which is the National Phase of PCT International Application No. PCT/KR2019/003110, filed on Mar. 18, 2019, which claims priority under 35 U.S.C. 119 (a) to Patent Application No. 10-2018-0031894, filed in the Republic of Korea on Mar. 20, 2018, and Patent Application No. 10-2018-0033651, filed in the Republic of Korea on Mar. 23, 2018, all of these applications are hereby expressly incorporated by reference into the present application.

### TECHNICAL FIELD

Embodiments relate to a camera module and an optical device including the same.

### BACKGROUND ART

Technology of a voice coil motor (VCM), which is used in conventional general camera modules, is difficult to apply to a micro-scale camera module intended to exhibit low power consumption, and study related thereto has been actively conducted.

In the case of a camera module configured to be mounted in a small electronic product, such as a smartphone, the camera module may frequently receive shocks when in use, and may undergo fine shaking due to, for example, user hand tremor while capturing an image. In consideration of this fact, technology for additionally installing a device for inhibiting transfer of hand tremor to a camera module has recently been developed.

### DISCLOSURE

#### Technical Problem

Embodiments provide a camera module and an optical device capable of suppressing or preventing collision of a filter and a blocking member with a holder due to external impacts and suppressing shifting or rotation of the filter when the filter is attached to a seating portion of the holder.

In addition, embodiments provide a camera module and an optical device capable of preventing bursting and cracking of a thermosetting adhesive due to voids formed in a process of curing the thermosetting adhesive and reducing the time taken for the curing process for attaching a printed circuit board and a holder.

#### Technical Solution

A camera module according to an embodiment includes a lens barrel configured to be movable in an optical-axis direction, a holder disposed under the lens barrel and including a seating portion recessed from the upper surface thereof, a filter disposed on the bottom surface of the seating portion of the holder, a blocking member disposed on the upper surface of the filter, and an image sensor disposed under the filter. The seating portion includes an inner side surface facing a side surface of the filter, and the inner side surface of the seating portion includes a first surface and a second surface positioned under the first surface. The spac-

2

ing distance from the first surface to the side surface of the filter is greater than the spacing distance from the second surface to the side surface of the filter, and the thickness of the filter is greater than the spacing distance from the second surface to the side surface of the filter.

The spacing distance from the first surface to a side surface of the blocking member may be greater than the spacing distance from the second surface to the side surface of the filter.

The camera module may further include an adhesive member disposed between the lower surface of the filter and the bottom surface of the seating portion, and the distance from the adhesive member to the upper surface of the filter may be greater than the spacing distance from the second surface to the side surface of the filter.

The camera module may further include an adhesive member disposed between the lower surface of the filter and the bottom surface of the seating portion, and the distance from the adhesive member to the upper surface of the blocking member may be greater than the spacing distance from the second surface to the side surface of the filter.

The distance from the lower surface of the filter to the upper surface of the blocking member may be greater than the spacing distance from the second surface to the side surface of the filter.

The thickness of the filter may be greater than or equal to the length obtained by subtracting the spacing distance from the second surface to the side surface of the filter from the spacing distance from the first surface to the side surface of the filter.

The second surface may protrude in a direction from the first surface toward the side surface of the filter, and may be disposed so as to surround the side surface of the filter.

An opening corresponding to the image sensor may be formed in the bottom surface of the seating portion, the outer side surface of the blocking member may be contiguous with the side surface of the filter, and the blocking member may overlap the bottom surface of the seating portion in the optical-axis direction.

The inner side surface of the seating portion may further include a third surface connecting the first surface and the second surface and formed to be parallel to the bottom surface of the seating portion, and the height from the bottom surface of the seating portion to the third surface may be greater than the height to the center point of the side surface of the filter disposed in the seating portion.

The height to the third surface may be equal to or less than the height to the upper surface of the blocking member.

The upper end of the first surface may be positioned higher than the upper surface of the blocking member.

The first surface and the second surface of the seating portion may be contiguous with each other. The portion at which the first surface and the second surface are contiguous with each other may be positioned higher than the center point of the side surface of the filter, and may be positioned lower than or at the same height as the upper surface of the blocking member.

The spacing distance from the first surface to the side surface of the blocking member may gradually increase in a direction from the lower surface of the holder toward the upper surface of the holder.

Each of the angle at which the first surface is inclined with respect to the bottom surface of the seating groove and the angle at which the second surface is inclined with respect to the bottom surface of the seating groove may be a right angle or an obtuse angle.

3

The ratio of the spacing distance from the second surface to the side surface of the filter to the spacing distance from the first surface to the side surface of the filter may be 1:2.8 to 1:8.

The holder may include a stopper, which faces a portion of the lower portion of the lens barrel in the optical-axis direction and is recessed from the upper surface of the seating portion. The bottom surface of the stopper may be positioned higher than the upper surface of the filter disposed in the seating portion in the optical-axis direction on the basis of the bottom surface of the seating portion.

A camera module according to an embodiment includes a lens barrel configured to be movable in an optical-axis direction, a holder disposed under the lens barrel and including a seating portion recessed from the upper surface thereof, an opening formed in the bottom surface of the seating portion, and a groove portion formed in the inner side surface of the seating portion, a filter disposed on the bottom surface of the seating portion, a first adhesive member disposed between the bottom surface of the seating portion and the lower surface of the filter, a second adhesive member disposed in the groove portion in the holder to be coupled to the filter, and an image sensor disposed under the filter.

The groove portion may be positioned in a first inner side surface, which is positioned between two adjacent corners of the seating portion.

The inner side surface of the seating portion may include a first inner side surface facing a first side surface of the filter. The groove portion in the seating portion may be formed in the first inner side surface, and may be recessed from the first inner side surface in a direction from the first side surface of the filter toward the first inner side surface.

The groove portion may be open to the upper surface of the holder, and may be connected to the bottom surface of the seating portion.

The groove portion may not overlap the filter in the optical-axis direction.

The length of the opening in the first adhesive member in the longitudinal direction of the first inner side surface may be less than the length of the groove portion in the longitudinal direction of the first inner side surface.

The second portion of the second adhesive member may protrude from the first adhesive member.

The width of the second adhesive member may be greater than the width of the first adhesive member.

The camera module may further include a printed circuit board disposed under the holder and a third adhesive member disposed between the printed circuit board and the lower surface of the holder.

Each of the first and second adhesive members may be a UV curable adhesive member, and the third adhesive member may be a thermosetting adhesive member.

The first adhesive member and the second adhesive member may be formed of the same material as each other.

#### Advantageous Effects

Embodiments are capable of suppressing or preventing collision of a filter and a blocking member with a holder due to external impacts and suppressing shifting or rotation of the filter when the filter is attached to a seating portion of the holder.

In addition, embodiments are capable of preventing bursting and cracking of a thermosetting adhesive due to voids formed in a process of curing the thermosetting adhesive and

4

reducing the time taken for the curing process for attaching a printed circuit board and a holder.

#### DESCRIPTION OF DRAWINGS

FIG. 1 is an exploded perspective view of a camera module according to an embodiment.

FIG. 2A is a cross-sectional view of an embodiment of the camera module of FIG. 1.

FIG. 2B is a cross-sectional view seen in a direction perpendicular to the cross-sectional view of FIG. 2A.

FIG. 3 is a perspective view of a holder.

FIG. 4 is a plan view of the holder, a filter, and a blocking member.

FIG. 5 is an enlarged view of the portion indicated by the dotted line in FIG. 2.

FIG. 6 is a partial enlarged view of FIG. 5.

FIG. 7 is a view for explaining the function of the blocking member.

FIG. 8 shows a holder according to another embodiment.

FIG. 9 shows a holder according to still another embodiment.

FIG. 10 shows a holder according to still another embodiment.

FIG. 11 is a perspective view of a camera module according to another embodiment.

FIG. 12 is a perspective view of a holder of the camera module of FIG. 11.

FIG. 13 shows an X-ray image of a crack formed in a filter of a camera module during a drop test.

FIG. 14 is an exploded perspective view of a camera module according to an embodiment.

FIG. 15A is a first cross-sectional view of the camera module of FIG. 14.

FIG. 15B is a second cross-sectional view of the camera module of FIG. 14.

FIG. 16 is a perspective view of the holder of FIG. 14.

FIGS. 17 to 20 show an order in which a holder, a filter, and a printed circuit board according to an embodiment are coupled.

FIG. 21 is a partial enlarged view of the cross-section taken in the direction AB in FIG. 20.

FIG. 22 is a partial enlarged view of the cross-sectional view of FIG. 20 before a second adhesive member is formed after the attachment of a holder and a printed circuit board.

FIG. 23A shows another embodiment of the second adhesive member.

FIG. 23B shows still another embodiment of the second adhesive member.

FIG. 23C shows still another embodiment of the second adhesive member.

FIG. 24 is a perspective view of a portable terminal according to an embodiment.

FIG. 25 is a configuration diagram of the portable terminal shown in FIG. 24.

#### BEST MODE

Hereinafter, embodiments of the present disclosure, which may concretely realize the objects described above, will be described with reference to the accompanying drawings.

In the following description of the embodiments, it will be understood that, when each element is referred to as being "on" or "under" another element, it can be directly on or under the other element, or can be indirectly formed such that one or more intervening elements are also present. In

addition, when an element is referred to as being “on or under”, “under the element” as well as “on the element” may be included based on the element.

In addition, the relational terms “first”, “second”, “on/upper part/above”, and “under/lower part/below” are used herein only to distinguish between one subject or element and another subject or element without necessarily requiring or involving any physical or logical relationship or sequence between such subjects or elements. Wherever possible, the same reference numerals will be used throughout the drawings to refer to the same parts.

Additionally, the terms “comprises”, “includes”, and “has” described herein should be interpreted not to exclude other elements but to further include such other elements, since the corresponding elements may be inherent unless mentioned otherwise. In addition, the term “corresponding to” herein may encompass at least one of the meanings of “facing” and “overlapping”.

Hereinafter, a camera module and an optical device including the same according to embodiments will be described with reference to the accompanying drawings. For convenience of description, a camera module according to the embodiments will be described using the Cartesian coordinate system (x, y, z), but the embodiments are not limited thereto, and may be described using other coordinate systems. In the respective drawings, the x-axis and the y-axis may be directions perpendicular to the z-axis, which is an optical-axis (OA) direction, the z-axis direction, which is the optical-axis (OA) direction, may be referred to as a ‘first direction’, the x-axis direction may be referred to as a ‘second direction’, and the y-axis direction may be referred to as a ‘third direction’. In addition, hereinafter, the term “terminal” may be referred to as a pad, an electrode, or a conductive layer.

A ‘hand tremor compensation function’ applied to a small camera module of a mobile device such as a smartphone or a tablet PC may be a function of moving a lens in a direction perpendicular to the optical-axis direction or tilting the lens with respect to the optical axis so as to cancel vibration (or motion) caused by user hand tremor.

In addition, an ‘autofocus function’ may be a function of automatically focusing on an object by moving the lens in the optical-axis direction according to the distance to the object so that an image sensor obtains a clear image of the object.

FIG. 1 is an exploded perspective view of a camera module 200 according to an embodiment.

Referring to FIG. 1, the camera module 200 may include a lens or a lens barrel 400, a lens-moving apparatus 100, a filter 610, a holder 600, a printed circuit board 800, and an image sensor 810. Hereinafter, the “camera module” may be referred to as an “image-capturing device” or a “photographing device”, and the holder may be referred to as a sensor base.

In addition, the camera module 300 may further include a blocking member 1500 disposed on the filter 610.

In addition, the camera module 300 may further include an adhesive member 612.

In addition, the camera module 300 may further include a motion sensor 820, a controller 830, and a connector 840.

The lens or the lens barrel 400 may be mounted in a bobbin 110 of the lens-moving apparatus 100, and may be configured to be movable in the optical-axis direction.

The holder 600 may be disposed under the base 210 of the lens-moving apparatus 100.

For example, the holder 600 may be disposed under the lens or the lens barrel 400.

The filter 610 is mounted to the holder 600.

The holder 600 may include a seating portion 500, which is recessed from the upper surface thereof and on which the filter 610 is seated. The filter 610 may be disposed in the seating portion 500.

The seating portion 500 may be a recess, a cavity, or a hole, which is concavely formed in the upper surface of the holder 600.

The adhesive member 612 may couple or attach the base 210 of the lens-moving apparatus 100 to the holder 600. For example, the adhesive member 612 may be disposed between the lower surface of the base 210 and the upper surface of the holder 600, and may bond these two components to each other.

The adhesive member 612 may serve not only to bond components, as described above, but also to prevent foreign substances from entering the lens-moving apparatus 100. For example, the adhesive member 612 may be an epoxy, a thermosetting adhesive, or an ultraviolet curable adhesive.

The seating portion 500 of the holder 600 may include an inner side surface 511 and a bottom surface 512.

The filter 610 may be disposed on the bottom surface 512 of the seating portion 500 of the holder 600.

The holder 600 may have an opening 501, which is formed in the region thereof in which the filter 610 is mounted or disposed so that light passing through the filter 610 enters the image sensor 810.

For example, the opening 501 may penetrate the holder 600 in the optical-axis direction, and may be referred to as a “through-hole”.

For example, the opening 501 may penetrate the center of the holder 600, and may be disposed so as to correspond to or face the image sensor 810.

For example, the opening 501 may be provided in the bottom surface 512 of the seating portion 500, and the area of the opening 501 may be smaller than the area of the filter 610.

For example, the filter 610 may be disposed on the bottom surface 512 of the seating portion 500 of the holder 600.

The filter 610 may serve to block light in a specific frequency band, among the light passing through the lens barrel 400, from entering the image sensor 810.

For example, the filter 610 may be an infrared cut-off filter, without being limited thereto. For example, the filter 610 may be disposed parallel to the x-y plane, which is perpendicular to the optical axis OA.

The filter 610 may be attached to the bottom surface 512 of the seating portion 500 of the holder 600 using an adhesive member (not shown) such as UV epoxy.

The printed circuit board 800 may be disposed under the holder 600, and the image sensor 810 may be mounted or disposed on the printed circuit board 800. The image sensor 810 may be a part on which the light that has passed through the filter 610 is incident and in which an image included in the light is formed.

The printed circuit board 800 may be provided with various circuits, elements, and controllers in order to convert an image formed by the image sensor 810 into an electrical signal and to transmit the electrical signal to an external device.

A circuit pattern, which is electrically connected to the image sensor and various elements, may be formed on the printed circuit board 800.

The holder 600 may be referred to as a first holder, and the printed circuit board 800 may be referred to as a second holder.

The image sensor **810** may receive an image included in the light introduced through the lens-moving apparatus **100**, and may convert the received image into an electrical signal.

For example, the image sensor **810** may include a photographing area **811** (refer to FIG. 6) for sensing the light that has passed through the lens or the lens barrel **400**. Here, the photographing area **811** may be referred to as an effective area, a light reception area, or an active area.

The filter **610** and the image sensor **810** may be disposed so as to be spaced apart from each other and to face each other in the optical-axis (OA) direction or the first direction.

The motion sensor **820** may be mounted or disposed on the printed circuit board **800**, and may be electrically connected to the controller **830** via a circuit pattern provided on the printed circuit board **800**.

The motion sensor **820** outputs rotating angular speed information according to the motion of the camera module **200**. The motion sensor **820** may be implemented as a 2- or 3-axis gyro sensor or an angular speed sensor.

The controller **830** is mounted or disposed on the printed circuit board **800**.

The printed circuit board **800** may be electrically connected to the lens-moving apparatus **100**. For example, the printed circuit board **800** may be electrically connected to a printed circuit board **250** of the lens-moving apparatus **100**.

For example, a driving signal may be provided to each of a first coil **120** and a second coil **230** of the lens-moving apparatus **100** through the printed circuit board **800**, and a driving signal may be provided to an AF position sensor (or an OIS position sensor). Further, the output of the AF position sensor (or the OIS position sensor) may be transmitted to the printed circuit board **800**.

The connector **840** may be electrically connected to the printed circuit board **800**, and may include a port to be electrically connected to an external device.

The camera module **200** may be any one of an autofocus (AF) camera module and an optical image stabilizer (OIS) camera module. The AF camera module is a camera module configured to perform only an autofocus function, and the OIS camera module is a camera module configured to perform an autofocus function and an optical image stabilizer (OIS) function.

For example, the lens-moving apparatus **100** may be an AF lens-moving apparatus or an OIS lens-moving apparatus, and the meanings of “AF” and “OIS” may be the same as those of the AF camera module and the OIS camera module.

FIG. 2A is a cross-sectional view of an embodiment of the camera module **200** of FIG. 1, and FIG. 2B is a cross-sectional view seen in a direction perpendicular to the cross-sectional view of FIG. 2A. The same reference numerals as those of FIG. 1 denote the same components.

Referring to FIGS. 2A and 2B, the lens-moving apparatus **100** of the camera module **200** may be an OIS lens-moving apparatus.

The lens-moving apparatus **100** may include a housing **140**, a bobbin **110** disposed in the housing **140** to allow the lens or the lens barrel **400** to be mounted thereto, a first coil **120** disposed at the bobbin **110**, a magnet **130** disposed in the housing **140** so as to face the first coil **120**, at least one upper elastic member (not shown) coupled to the upper portion of the bobbin **110** and the upper portion of the housing **140**, at least one lower elastic member (not shown) coupled to the lower portion of the bobbin **110** and the lower portion of the housing **140**, a second coil **230** disposed under the bobbin **110** (and/or the housing **140**), a printed circuit board **250** disposed under the second coil **230**, and a base **210** disposed under the printed circuit board **250**.

In addition, the lens-moving apparatus **100** may further include a cover member **300** coupled to the base **210** to provide a space for accommodating the components of the lens-moving apparatus **100** together with the base **210**.

In addition, the lens-moving apparatus **100** may further include a support member, which electrically connects the printed circuit board **250** to the upper elastic member and supports the housing **140** with respect to the base **210**. Each of the first coil **120** and the second coil **230** may be electrically connected to the printed circuit board **250**, and may receive a driving signal (driving current) from the printed circuit board **250**.

For example, the upper elastic member may include a plurality of upper springs, the support member may include support members connected to the upper springs, and the first coil **120** may be electrically connected to the printed circuit board **250** via the upper springs and the support member. The printed circuit board **250** may include a plurality of terminals, and some of the plurality of terminals may be electrically connected to the first coil **120** and/or the second coil **230**.

The bobbin **110** and the lens or the lens barrel **400** coupled thereto may be moved in the optical-axis direction due to the electromagnetic force generated by interaction between the first coil **120** and the magnet **130**, and accordingly, the displacement of the bobbin **110** in the optical-axis direction may be controlled, whereby an AF operation may be implemented.

In addition, the housing **140** may be moved in a direction perpendicular to the optical axis due to the electromagnetic force generated by interaction between the second coil **230** and the magnet **130**, and accordingly, a hand tremor compensation or OIS operation may be implemented.

In addition, in order to implement an AF feedback operation, the lens-moving apparatus **100** of the camera module **200** may further include a sensing magnet (not shown) disposed at the bobbin **110** and an AF position sensor (e.g. a hall sensor) (not shown) disposed in the housing **140**. In addition, the lens-moving apparatus **100** may further include a printed circuit board (not shown) disposed in the housing and/or on the base to allow the AF position sensor to be disposed or mounted thereon. In another embodiment, the AF position sensor may be disposed at the bobbin, and the sensing magnet may be disposed in the housing. In addition, the lens-moving apparatus **100** may further include a balancing magnet disposed at the bobbin **110** so as to correspond to the sensing magnet.

The AF position sensor may output an output signal according to the result of detection of the magnitude of the magnetic field of the sensing magnet upon movement of the bobbin **100**. The AF position sensor may be electrically connected to the printed circuit board **250** via the upper elastic member (or the lower elastic member) and/or the support member. The printed circuit board **250** may provide a driving signal to the AF position sensor, and the output of the AF position sensor may be transmitted to the printed circuit board **250**.

In another embodiment, the lens-moving apparatus **100** may be an AF lens-moving apparatus, and the AF lens-moving apparatus may include a housing, a bobbin disposed in the housing, a coil disposed at the bobbin, a magnet disposed in the housing, at least one elastic member coupled to the bobbin and the housing, and a base disposed under the bobbin (and/or the housing). For example, the elastic member may include the upper elastic member and the lower elastic member described above.

A driving signal (e.g. driving current) may be provided to the coil, and the bobbin may be moved in the optical-axis direction due to the electromagnetic force generated by interaction between the coil and the magnet. In another embodiment, the coil may be disposed in the housing, and the magnet may be disposed at the bobbin.

In addition, in order to implement an AF feedback operation, the AF lens-moving apparatus may further include a sensing magnet disposed at the bobbin, an AF position sensor (e.g. a hall sensor) disposed in the housing, and a printed circuit board disposed or mounted in the housing and/or on the base to allow the AF position sensor to be mounted thereon. In another embodiment, the AF position sensor may be disposed at the bobbin, and the sensing magnet may be disposed in the housing.

The printed circuit board may be electrically connected to the coil and the AF position sensor, a driving signal may be provided to each of the coil and the AF position sensor through the printed circuit board, and the output of the AF position sensor may be transmitted to the printed circuit board.

FIG. 3 is a perspective view of the holder 600, FIG. 4 is a plan view of the holder 600, the filter 610, and the blocking member 1500, FIG. 5 is an enlarged view of the portion indicated by the dotted line 15 in FIG. 2, FIG. 6 is a partial enlarged view of FIG. 5, and FIG. 7 is a view for explaining the function of the blocking member 1500.

Referring to FIGS. 3 to 7, the holder 600 may be disposed on the printed circuit board 800, and may accommodate the filter 610 therein.

The holder 600 may support the lens-moving apparatus 100 positioned thereon.

The lower surface of the base 210 of the lens-moving apparatus 100 may be disposed on the upper surface 505 of the holder 600. For example, the lower surface of the base 210 of the lens-moving apparatus 100 may be in contact with the upper surface 505 of the holder 600, and may be supported by the upper surface 505 of the holder 600.

The holder 600 may include a seating portion 500 that is recessed from the upper surface 505, and the seating portion 500 may include an inner side surface 511 and a bottom surface 512.

At least a portion of the inner side surface 511 of the seating portion 500 may face the side surface of the filter 610.

The inner side surface 511 of the seating portion 500 may include a first inner side surface 511a and a second inner side surface 511b facing the first inner side surface 511a, and may include a third inner side surface 511c and a fourth inner side surface 511d positioned between the first inner side surface 511a and the second inner side surface 511b and facing each other.

The holder 600 may include a stopper 506 disposed around the seating portion 500 and recessed from the upper surface 505. The stopper 506 may have a groove shape, without being limited thereto. In another embodiment, the stopper 506 may have a protrusion shape protruding from the upper surface 505 in the optical-axis direction.

For example, the stopper 506 may be connected to or contiguous with the inner side surface 511 of the seating portion 500, without being limited thereto. In another embodiment, the stopper 506 may be spaced apart from the inner side surface 511 of the seating portion 500.

The bottom surface 506a of the stopper 506 may be positioned higher than the upper surface 62 of the filter 610,

which is disposed on the seating portion 500, in the optical-axis direction on the basis of the bottom surface 512 of the seating portion 500.

For example, the bottom surface 512 of the seating portion 500 may have a first height difference, and the bottom surface 506a of the stopper 506 may have a second height difference from the upper surface 505 of the holder 600 in the optical-axis direction. The second height difference may be less than the first height difference.

The lower end of the lens or the lens barrel 400, which is moved by the AF operation, may come into contact with the bottom surface 506a of the stopper 506, but may be prevented from moving below the bottom surface 506a by the bottom surface 506a. Accordingly, the stopper 506 may prevent spatial interference between the lower end of the lens or the lens barrel 400 mounted to the lens-moving apparatus 100 and the upper surface 62 of the filter 610. That is, during the AF operation, collisions between the lens or the lens holder 400 of the lens-moving apparatus 100 and the upper surface 62 of the filter 610 may be prevented by the stopper 506.

For example, the stopper 506 may include therein four grooves, which are spaced apart from each other so as to be disposed corresponding to the first to fourth inner side surfaces 511a to 511d of the seating portion 500.

For example, each of the four grooves in the stopper 506 may be contiguous with a corresponding one of the first to fourth inner side surfaces 511a to 511d. For example, each of the grooves in the stopper 506 may be disposed at the center region of a corresponding one of the first to fourth inner side surfaces 511a to 511d.

The overall shape of the four grooves in the stopper 506 may match the shape of the lens or the lens barrel.

The holder 600 may include a foreign-substance-collecting portion 507, which is formed in the shape of a groove recessed from the upper surface 505. The foreign-substance-collecting portion 507 may be disposed adjacent to the stopper 506, without being limited thereto. The foreign-substance-collecting portion 507 may collect foreign substances introduced from the lens-moving apparatus 100. The foreign-substance-collecting portion 507 may be referred to as a dust trapper.

In addition, the holder 600 may include a concave portion 508 disposed at a corner region of the inner side surface 511 of the seating portion 500. The concave portion 508 may have a structure that is recessed in a direction from the center of the opening 501 in the seating portion 500 toward the corner region of the inner side surface 511 of the seating portion 500. The concave portion 508 may prevent an adhesive member, such as UV epoxy, for attaching the filter 610 to the seating portion 500 from overflowing out of the seating portion 500.

Referring to FIGS. 4 to 6, the inner side surface 511 of the seating portion 500 of the holder 600 may include a first surface 601 and a second surface 602 positioned under the first surface 601.

The first surface 601 may be connected to the stopper 506, or may be contiguous with the stopper 506 in a region of the inner side surface 511 of the seating recess 500, with which the stopper 506 is contiguous. Further, the first surface 601 may be connected to the upper surface 505 of the holder 600, or may be contiguous with the upper surface 505 in another region of the inner side surface 511 of the seating recess 500, with which the stopper 506 is not contiguous.

The second surface 602 may be connected to the bottom surface 512 of the seating portion 500 or may be contiguous with the bottom surface 512.

## 11

The second surface **602** may protrude in a direction from the first surface **601** toward the side surface of the filter **610** on the basis of the first surface **601**, and may be disposed so as to surround the side surface of the filter **610**.

The filter **610** may be disposed or seated on the bottom surface **512** of the seating portion **500**. For example, the lower surface of the filter **610** may be in contact with the bottom surface **512** of the seating portion **500**.

The blocking member **1500** may be disposed on the upper surface of the filter **610**. The blocking member **1500** may be referred to as a “masking part”.

The blocking member **1500** may include therein an opening, e.g. a through-hole, at a position corresponding to the image sensor **810** in the optical-axis direction.

For example, the blocking member **1500** may be disposed on the edge portion of the upper surface **62** of the filter **610**, and may serve to block at least a portion of the light traveling toward the edge portion of the filter **610** through the lens or the lens barrel **400** from passing through the filter **610**. For example, the blocking member **1500** may be coupled or attached to the upper surface **62** of the filter **1610**.

For example, the filter **610** may be formed in a rectangular shape when viewed in the optical-axis direction, and the blocking member **1500** may be formed to be symmetrical with respect to the filter **610** along each side of the upper surface of the filter **610**. In this case, the blocking member **1500** may be formed to have a predetermined width on each side of the upper surface of the filter **1610**.

For example, the blocking member **1500** may have a rectangular shape, and may include therein a rectangular-shaped opening, without being limited thereto.

The blocking member **1500** may be formed of an opaque material.

The blocking member **1500** may be an opaque and adhesive material that is applied to the filter **610**, or may be provided in the form of a film that is attached to the filter **610**.

Referring to FIG. 7, the printed circuit board **800** may include a terminal **1830** electrically connected to a terminal **813** provided at the image sensor **810** via a wire **1840**.

The terminal **1830** of the printed circuit board **800** may be disposed adjacent to a region of the printed circuit board **800** that is adjacent to the image sensor **810**. For example, the terminal **1830** of the printed circuit board **800** may include a plurality of terminals disposed in a region of the printed circuit board **800** that is positioned around the image sensor **1810**.

The filter **610** and the image sensor **810** may be disposed so as to face each other in the optical-axis direction, and at least a portion of the blocking member **1500** may overlap the terminal **1830** and/or the wire **1840** disposed on the printed circuit board **800** in the optical-axis direction. The blocking member **1500** may not overlap the photographing area **811** of the image sensor **810** in the optical-axis direction.

The blocking member **1500**, which is disposed on the edge portion of the upper surface **62** of the filter **610**, may serve to block an unnecessary portion of incident light **1010**, incident on the image sensor **810** through the lens or the lens barrel **1400**, from entering the image sensor **810**.

The wire **1840** and the terminal **1830** may be formed of a conductive material such as gold, silver, copper, or a copper alloy, and this conductive material may have a property of reflecting light.

That is, light that has passed through the filter **610** may be reflected by the terminal **1830** of the printed circuit board **800** and the wire **1840**, and an instantaneous flash, i.e. a flare phenomenon, may occur due to this reflected light. Such a

## 12

flare phenomenon may distort the image formed by the image sensor **810** or may deteriorate the quality of the image.

Since the blocking member **1500** is disposed such that at least a portion thereof overlaps the terminal **1830** and/or the wire **1840** in the optical-axis direction, the blocking member **1500** may block light traveling toward the terminal **1830** of the printed circuit board **800** and/or the wire **1840** among the light that has passed through the lens or the lens barrel **400**, thereby preventing the occurrence of the aforementioned flare phenomenon, thus preventing distortion of the image formed by the image sensor **810** and deterioration in the quality of the image.

The side surface **61** of the filter **610** may be spaced apart from each of the first surface **601** and the second surface **602** of the inner side surface **511** of the seating portion **500**.

A region of the bottom portion **512** of the holder **600** corresponding to the space between the side surface **61** of the filter **610** and the second surface **602** of the holder **600** may be a portion corresponding to an alignment guide of the filter **610** when the filter **610** is disposed or seated on the seating portion **500** of the holder **600**.

The spacing distance **D2** from the first surface **601** to the side surface **61** of the filter **610** is greater than the spacing distance **D1** from the second surface **602** to the side surface **61** of the filter **601** ( $D2 > D1$ ).

For example, the ratio of **D1** to **D2** ( $D1:D2$ ) may be 1:2.8 to 1:8.

If the value obtained by dividing **D2** by **D1** ( $D2/D1$ ) is less than 2.8, the spacing distance between the filter **610** and the first surface **601** may be too small, which may cause a collision between the first surface **601** and the filter **610** due to external impacts.

Further, if the value obtained by dividing **D2** by **D1** ( $D2/D1$ ) is greater than 8, the size of the holder **600** may increase, which may cause an increase in the size of the camera module according to the embodiment.

For example, **D1** may be 0.015 [mm] to 0.025 [mm], and **D2** may be 0.07 [mm] to 0.12 [mm].

The upper surface **62** of the filter **610** may be positioned lower than the bottom surface **506a** of the stopper **506** in the optical-axis direction. The reason for this is to avoid spatial interference between the lens or the lens barrel **400** and the filter **610**.

The inner side surface **511** of the seating portion **500** may further include a third surface **603** connecting the first surface **601** and the second surface **602**. For example, the third surface **603** may be a horizontal surface parallel to the bottom surface **512**, without being limited thereto.

The height **H1** from the bottom surface **512** of the seating portion **500** to the third surface **603** may be greater than the height to a center point **CP** of the filter **610** disposed on the bottom surface **512** of the seating portion **500** in the optical-axis direction, and may be less than the height to the upper surface **62** of the filter **610**.

For example, the height **H1** from the bottom surface **512** of the seating portion **500** to the third surface **603** may be greater than 50% of the thickness of the filter **610**, and may be less than 100% of the thickness of the filter **610**.

Alternatively, in another embodiment, **H1** may be the same as the height to the upper surface **62** of the filter **610**. Alternatively, **H1** may be the same as the thickness of the filter **610**.

If the height **H1** is less than the height to the center point **CP** of the side surface of the filter **610**, when the filter **610** is seated or placed on the seating portion **500**, the filter **610**

may be disposed over the protruding portion **65**, which may cause misalignment of the filter **610**.

Further, if the height  $H1$  is greater than the thickness of the filter **610**, the upper surface of the protruding portion **65** may be positioned higher than the upper surface of the filter **610**, which may cause a collision between the protruding portion **65** and the filter **610** due to external impacts and cracking of the filter **610**.

Alternatively, in another embodiment,  $H1$  may be the same as the height from the bottom surface **512** of the seating portion **500** to the center point  $CP$ .

The height  $H1$  from the bottom surface **512** of the seating portion **500** to the third surface **603** may be less than the height to the lower surface of the blocking member **1500**. Alternatively, in another embodiment,  $H1$  may be the same as the height to the lower surface of the blocking member **1500**.

For example, the upper end of the first surface **601** may be positioned higher than the upper surface **62** of the filter **610** disposed on the bottom surface **512** of the seating portion **500**.

In addition, for example, the upper end of the first surface **601** may be positioned higher than the upper surface of the blocking member **1500**.

Here, the upper end of the first surface **601** may be an edge of the first surface **601** that is contiguous with the bottom surface **506a** of the stopper **506**, or may be an edge of the first surface **601** that is contiguous with the upper surface **505** of the holder **600**.

For example, the angle at which each of the first surface **601** and the second surface **602** is inclined with respect to the bottom surface **512** of the seating portion **500** may be a right angle, without being limited thereto.

The height from the bottom surface **512** of the seating portion **500** to the upper surface **1500a** of the blocking member **1500** may be less than the height to the first surface **601**, without being limited thereto.

The spacing distance  $D3$  from the first surface **601** to the side surface of the blocking member **1500** that corresponds to or faces the first surface **601** is greater than the spacing distance  $D1$  from the second surface **602** to the side surface **61** of the filter **601** ( $D3 > D1$ ).

The side surface or the outer side surface of the blocking member **1500** may be coplanar with the side surface **61** of the filter **610**. For example, the side surface or the outer side surface of the blocking member **1500** may be contiguous with the side surface of the filter **610**, without being limited thereto. In another embodiment, the side surface of the blocking member **1500** may not be coplanar with the side surface **61** of the filter **610**, and may be spaced apart from the side surface **61** of the filter **610** or from an edge at which the side surface of the filter **610** is contiguous with the upper surface of the filter **610**.

For example,  $D3$  may be the same as  $D2$ , without being limited thereto. In another embodiment,  $D3$  may be greater than  $D2$  ( $D3 > D2$ ).

At least a portion of the blocking member **1500** may overlap the bottom surface **512** of the seating portion **500** in the optical-axis direction. In addition, the blocking member **1500** may overlap at least a portion of the image sensor **810** in the optical-axis direction.

The thickness  $T1$  of the filter **610** may be greater than the spacing distance  $D1$  from the second surface **602** of the holder **600** to the side surface **61** of the filter **610** ( $T1 > D1$ ). Since  $T1$  is greater than  $D1$ , when the filter **610** is disposed on the bottom surface **512** of the seating portion **500** of the holder **600**, the filter **610** may be effectively aligned.

The thickness  $T1$  of the filter **610** may be greater than or equal to the length  $d11$  obtained by subtracting the spacing distance  $D1$  from the second surface **602** of the holder **6000** to the side surface **61** of the filter **610** from the spacing distance  $D2$  from the first surface **601** of the holder **600** to the side surface **61** of the filter **610** ( $T1 \geq d11$ ).

Further,  $d11$  may correspond to the length of the protruding portion **65** of the holder **600** in a direction from the first surface **601** of the holder **600** toward the side surface **61** of the filter **610**. For example, the length  $d11$  of the protruding portion **65** of the holder **600** may be greater than the spacing distance  $D1$  from the second surface **602** of the holder **600** to the side surface **61** of the filter **610** ( $d11 > D1$ ).

Since  $d11$  is greater than  $D1$  ( $d11 > D1$ ), the embodiment is capable of suppressing collisions between the upper surface **62** of the filter **610** or the upper portion of the side surface **61** thereof and the first surface **601** of the holder **600** due to external impacts and suppressing or preventing shifting of the filter **610** or rotation of the filter **610** when the filter **610** is attached to the seating portion **500**.

The holder **600** may include a protruding portion **65** provided at the lower end of the side surface or the inner side surface **511** of the seating portion **500**. The protruding portion **65** may be contiguous with the lower end of the inner side surface **511** of the seating portion **500** and the bottom surface **512** of the seating portion **500**. In another embodiment, the protruding portion may be disposed on the inner side surface **511** of the seating portion **500**, and may be spaced apart from the bottom surface **512** of the seating portion **500**.

For example, the protruding portion **65** may protrude in a direction from the first surface **6010** toward the filter **610**, and may include the second surface **602**.

The protruding portion **65** may be disposed on the first to fourth inner side surfaces **511a** to **511d** of the seating portion **500**, and may be disposed so as to surround the side surface of the filter **610**.

The filter and the holder may collide with each other due to impacts applied to the camera module, and thus the filter may crack.

The holder **600** may include a first inclined surface **607** and a second inclined surface **609** positioned between the lower surface **505a** and the bottom surface **512** of the seating portion **500**.

The first inclined surface **607** may be contiguous with the bottom surface **512** of the seating portion **500**, and may be an inclined surface that is inclined downwards from the bottom surface **512**. For example, the internal angle formed by the first inclined surface **607** of the holder **600** and the bottom surface **512** may be an obtuse angle. For example, the first inclined surface **607** may be a tapered surface. Due to the first inclined surface **607**, it is possible to suppress cracking in the event of a collision between the lower surface of the filter **610** and the seating portion **500** of the holder **600**.

The second inclined surface **609** may be contiguous with the lower surface **505a** of the holder **600**, and may be an inclined surface that is inclined upwards from the lower surface **505a** of the holder **600**. For example, the internal angle formed by the second inclined surface **609** of the holder **600** and the lower surface **505a** of the holder **600** may be an obtuse angle.

In addition, the holder **600** may further include a third inclined surface **608** connecting the first inclined surface **607** and the second inclined surface **609**. For example, the third inclined surface **608** may be oriented at a right angle relative to the bottom surface **512**, without being limited thereto. In

15

another embodiment, the angle at which the third inclined surface **608** is inclined with respect to the bottom surface **512** may be an obtuse angle or an acute angle.

FIG. **13** shows an X-ray image of a crack formed in the filter of the camera module during a drop test.

Referring to FIG. **13**, in a drop test performed on the camera module, the camera module is warped or bent in the longitudinal direction thereof, which may cause a collision between the holder and the filter and cracking of the filter due to the collision. In particular, the filter may crack in the event of a collision between the upper surface of the filter or the upper portion of the side surface thereof and the side surface of the holder.

In order to prevent cracking of the filter, the filter disposed in the seating portion of the holder is disposed so as to be spaced apart from the inner side surface of the seating portion by a predetermined distance, for example, 0.07 mm to 0.12 mm.

However, if the spacing distance between the filter and the inner side surface of the seating portion of the holder increases, when the filter is disposed in the seating portion of the holder, the filter may shift and rotate. In general, when the filter is attached to the seating portion of the holder, a processing error may be  $-5$  [mm] to  $+5$  [mm]. If the spacing distance between the filter and the inner side surface of the seating portion of the holder increases, a (+) margin for attachment of the filter may become insufficient.

Due to shifting and rotation of the filter, misalignment of the filter may occur in the positional relationship or arrangement relationship with the image sensor, and a defective image may be generated in a specific pixel of the image sensor due to the misalignment of the filter. Here, the defective image may mean the state in which a specific pixel is dark compared to surrounding pixels.

Since the spacing distance D2 between the first surface **601** of the inner side surface **511** of the seating portion **500** of the holder **600** and the side surface **61** of the filter **610** is set to be greater than the spacing distance D1 between the second surface **602** of the inner side surface **511** and the side surface **61** of the filter **610** ( $D2 > D1$ ), the embodiment is capable of suppressing or preventing collisions between the upper surface **62** of the filter **610** or the upper portion of the side surface thereof and the first surface **601** of the holder **600** due to external impacts. In addition, the embodiment is capable of securing D1 ranging from 0.07 mm to 0.12 mm.

In addition, since the spacing distance D3 between the first surface **601** and the side surface of the blocking member **1500** is set to be greater than the spacing distance D1 between the second surface **602** of the inner side surface **511** of the seating portion **500** and the side surface **61** of the filter **610** ( $D3 > D1$ ), the embodiment is capable of suppressing or preventing collisions between the blocking member **1500**, which is disposed on the edge of the upper surface **62** of the filter **610**, and the first surface **601** of the holder **600** due to external impacts, thus preventing damage to the blocking member due to external impacts.

Since the spacing distance D1 between the second surface **602** of the inner side surface **511** of the seating portion **500** of the holder **600** and the side surface **61** of the filter **610** is set to be less than the spacing distance D2 between the first surface **601** of the inner side surface **511** of the seating portion **500** and the side surface **61** of the filter **610** ( $D1 < D2$ ), the embodiment is capable of suppressing or preventing shifting of the filter **610** or rotation of the filter **610** when the filter **610** is attached to the seating portion **500**, thus preventing generation of a defective image in a specific pixel of the image sensor.

16

FIG. **8** shows a holder **600-1** according to another embodiment. The same reference numerals as those in FIG. **6** denote the same components, and a description of the same components will be omitted or made briefly.

Referring to FIG. **8**, the seating portion of the holder **600-1** may include a bottom surface **512** and an inner side surface, which includes a first surface **601** and a second surface **602a** disposed under the first surface **601**.

The first surface **601** and the second surface **602a** of the holder **600-1** of FIG. **8** may be connected to each other, and the angle  $\theta$  between the second surface **602a** and the bottom surface **512** of the holder **600-1** may be an obtuse angle.

For example, the angle  $\theta$  between the second surface **602a** and the bottom surface **512** of the holder **600-1** may be 130 degrees to 170 degrees.

The second surface **602a** may be a flat surface, without being limited thereto.

The portion P1 at which the first surface **601** and the second surface **602a** are contiguous with each other may be positioned higher than the center point CP of the filter **610** in the optical-axis direction and lower than the upper surface **62** of the filter **610**, without being limited thereto. In another embodiment, the portion P1 may be positioned at the same height as the upper surface **62** of the filter **610**.

The height from the bottom surface **512** to the portion P1 may be less than the height to the lower surface of the blocking member **1500**. Alternatively, in another embodiment, the height to the portion P1 may be the same as the height to the lower surface of the blocking member **1500**.

The spacing distance D11 from the second surface **602a** to the side surface **61** of the filter **610** may gradually increase in a direction from the lower surface of the holder **600-1** toward the upper surface of the holder **600-1**.

FIG. **9** shows a holder **600-2** according to still another embodiment. The same reference numerals as those in FIG. **6** denote the same components, and a description of the same components will be omitted or made briefly.

Referring to FIG. **9**, the seating portion of the holder **600-2** may include a bottom surface **512** and an inner side surface, which includes a first surface **601** and a second surface **602b** disposed under the first surface **601**.

The first surface **601** and the second surface **602b** of the holder **600-2** of FIG. **9** may be connected to each other, and the second surface **602b** may include a convexly curved surface.

The portion P2 at which the first surface **601** and the second surface **602b** are contiguous with each other may be positioned higher than the center point CP of the filter **610** in the optical-axis direction and lower than the upper surface **62** of the filter **610**, without being limited thereto. In another embodiment, the portion P2 may be positioned at the same height as the upper surface **62** of the filter **610**.

The height from the bottom surface **512** to the portion P2 may be less than the height to the lower surface of the blocking member **1500**. Alternatively, in another embodiment, the height to the portion P2 may be the same as the height to the lower surface of the blocking member **1500**.

FIG. **10** shows a holder **600-3** according to still another embodiment. The same reference numerals as those in FIG. **6** denote the same components, and a description of the same components will be omitted or made briefly.

Referring to FIG. **10**, the seating portion of the holder **600-3** may include a bottom surface **512** and an inner side surface. The inner side surface of the seating portion of the holder **600-3** may include a first surface **601a**, a second surface **602a** disposed under the first surface **601a**, and a



17

third surface **603a** disposed between the first surface **601a** and the second surface **602a** to connect the first surface **601a** and the second surface **602a**.

Each of the angle at which the first surface **601a** is inclined with respect to the bottom surface **512** and the angle at which the second surface **602a** is inclined with respect to the bottom surface **512** may be an obtuse angle. Further, the third surface **603a** may be a horizontal surface parallel to the bottom surface **512**, without being limited thereto. In another embodiment, the third surface **603a** may be an inclined surface that is inclined with respect to the bottom surface **512**.

The height from the bottom surface **512** to the third surface **603a** may be greater than the height to the center point CP of the filter **610** in the optical-axis direction, and may be less than the height to the upper surface **62** of the filter **610**, without being limited thereto. In another embodiment, the height to the third surface **603a** may be the same as the height to the upper surface **62** of the filter **610**.

The height from the bottom surface **512** to the third surface **603a** may be less than the height to the lower surface of the blocking member **1500**. Alternatively, in another embodiment, the height to the third surface **603a** may be the same as the height to the lower surface of the blocking member **1500**.

D11 may gradually increase in a direction from the lower surface of the holder toward the upper surface of the holder, and the spacing distance D2 from the first surface **601a** to the side surface **61** of the filter **610** may gradually increase in a direction from the lower surface of the holder **600-3** toward the upper surface of the holder **600-3**.

Further, the spacing distance D3 from the first surface **601a** to the side surface **61** of the blocking member **1500** may gradually increase in a direction from the lower surface of the holder **600-3** toward the upper surface of the holder **600-3**.

Since each of D2 and D3 gradually increases in a direction from the lower surface of the holder **600-3** toward the upper surface of the holder **600-3**, it is possible to suppress or prevent collisions between the blocking member **1500**, which is disposed on the edge portion of the upper surface **62** of the filter **610**, and the first surface **601** of the holder **600** due to external impacts, thus preventing damage to the filter **610** and the blocking member **1500** due to external impacts.

FIG. 11 is a perspective view of a camera module **1000** according to another embodiment, and FIG. 12 is a perspective view of a holder **1600** of the camera module of FIG. 11.

Referring to FIG. 11, the camera module **1000** may include a first camera module **100-1** including a first lens-moving apparatus, a second camera module **200-2** including a second lens-moving apparatus, and a holder **1600**.

In addition, the camera module **1000** may further include a printed circuit board **1800** on which a first image sensor of the first camera module **100-1** and a second image sensor of the second camera module **100-2** are mounted.

Although a dual camera module including two lens-moving apparatuses is illustrated in FIG. 11, the embodiment is not limited thereto. In another embodiment, a camera module including three or more lens-moving apparatuses may be used.

Each of the first camera module **200-1** and the second camera module **200-2** may be one of an autofocus (AF) camera module and an optical image stabilizer (OIS) camera module.

For example, the first camera module **200-1** may include the lens-moving apparatus **100** shown in FIG. 2, and the

18

second camera module **200-2** may include the lens-moving apparatus **100** shown in FIG. 2, or may include an AF lens-moving apparatus.

For example, the first camera module **200-1** may include a first lens-moving apparatus, a first lens (or a first lens barrel), a first filter, and a first image sensor. For example, the second camera module **200-2** may include a second lens-moving apparatus, a second lens (or a second lens barrel), a second filter, and a second image sensor.

The holder **1600** may include a first seating portion **500a** having therein a first opening **501a** and a second seating portion **500b** having therein a second opening **501b**.

The first seating portion **500a** is the portion on which the first filter of the first camera module **200-1** is disposed or seated, and the second seating portion **500b** is the portion on which the second filter of the second camera module **200-2** is disposed or seated.

The first camera module **200-1** may include a first blocking member disposed on the first filter, and the second camera module **200-2** may include a second blocking member disposed on the second filter. The above description of the blocking member **1500** may apply to the first blocking member of the first camera module **200-1** and the second blocking member of the second camera module **200-2** of FIGS. 11 and 12.

The description of the arrangement, configuration, and function of the seating portion **500** of FIGS. 1 to 10 may apply to each of the first seating portion **500a** and the second seating portion **500b** shown in FIG. 12.

That is, the holder **1600** shown in FIGS. 11 and 12 may include two seating portions **500a** and **500b** that are the same as or similar to the seating portion **500** described with reference to FIGS. 1 to 10. However, the shape of the first seating portion **500a** and the shape of the second seating portion **500b** may be different from each other, without being limited thereto. In another embodiment, these two components may have the same shape.

For example, each of the first seating portion **500a** and the second seating portion **500b** may include the bottom portion and the inner side surface including the first surface and the second surface, which have been described with reference to FIGS. 1 to 10. In addition, the inner side surface of each of the first seating portion **500a** and the second seating portion **500b** may include the third surface described with reference to FIGS. 1 to 10. In addition, each of the first seating portion **500a** and the second seating portion **500b** may include the protruding portion **65** described with reference to FIGS. 1 to 10.

Although the first camera module **200-1** and the second camera module **200-2** are illustrated in FIG. 12 as being arranged side by side on one holder **1600** to share the holder **1600** with each other, the embodiment is not limited thereto. In another embodiment, the holder **1600** of the camera module **1000** may be divided into a first holder included in the first camera module and a second holder included in the second camera module. In this case, the description of the holder **600** of FIGS. 1 to 10 may equally apply to each of the first holder included in the first camera module and the second holder included in the second camera module.

Although the first image sensor of the first camera module **200-1** and the second image sensor of the second camera module **200-2** are illustrated in FIG. 11 as being arranged side by side on the printed circuit board **1800** to share the printed circuit board **1800** and to include one connector **840a**, the embodiment is not limited thereto. In another embodiment, the printed circuit board **1800** may be divided into a first printed circuit board included in the first camera

module and a second printed circuit board included in the second camera module, and each of the first and second printed circuit boards may include a separate connector.

Since the weight of a dual camera module or a camera module including three or more lens-moving apparatuses increases due to the lens-moving apparatuses, the holder is more likely than that of a single camera module to bend in the longitudinal direction thereof due to external impacts and/or vibration, and collisions between the filter of each camera module and the holder may occur due to the bending of the holder, which may cause cracking of the filter.

Since the camera module 1000 according to the embodiment includes a holder having two or more seating portions, which have a structure that is the same as or similar to that of the seating portion 500 described with reference to FIGS. 1 to 10, it is possible to prevent collisions between the filter and the holder due to external impacts, thus preventing cracking of the filter. In addition, the camera module 1000 according to the embodiment is capable of suppressing or preventing shifting of the filter or rotation of the filter when the filter is attached to the seating portions 500a and 500b, thus preventing the generation of defective images in specific pixels of the first and second image sensors.

FIG. 14 is an exploded perspective view of a camera module 1200 according to an embodiment, FIG. 15A is a first cross-sectional view of the camera module of FIG. 14, FIG. 15B is a second cross-sectional view of the camera module of FIG. 14, and FIG. 16 is a perspective view of the holder 1600 of FIG. 14.

Referring to FIGS. 14 to 16, the camera module 1200 may include a lens or a lens barrel 1400, a lens-moving apparatus 1100, a filter 1610, a holder 1600, a first adhesive member 1310, a second adhesive member 1330, a printed circuit board 1800, and an image sensor 1810.

In addition, the camera module 1200 may further include an adhesive member 1320 disposed between the holder 1600 and the printed circuit board 1800.

In addition, the camera module 1200 may further include a blocking member 11500 disposed on the filter 1610.

In addition, the camera module 1200 may further include an adhesive member 1612 for coupling or attaching the lens-moving apparatus 1100 to the holder 1600.

In addition, the camera module 1200 may further include a motion sensor 1820, a controller 1830, and a connector 1840.

The lens or the lens barrel 1400 may be mounted to a bobbin 1110 of the lens-moving apparatus 1100.

The lens-moving apparatus 1100 may drive the lens or the lens barrel 1400, and may move the lens or the lens barrel 1400 in the optical-axis direction.

The camera module 1200 may be any one of an autofocus (AF) camera module and an optical image stabilizer (OIS) camera module. The AF camera module is a camera module configured to perform only an autofocus function, and the OIS camera module is a camera module configured to perform an autofocus function and an optical image stabilizer (OIS) function.

For example, the lens-moving apparatus 1100 may be an AF lens-moving apparatus or an OIS lens-moving apparatus, and the meanings of "AF" and "OIS" may be the same as those of the AF camera module and the OIS camera module.

For example, the lens-moving apparatus 1100 of the camera module 1200 may be an OIS lens-moving apparatus.

The lens-moving apparatus 1100 may include a housing 1140, a bobbin 1110 disposed in the housing 1140 to allow the lens or the lens barrel 1400 to be mounted thereto, a first coil 1120 disposed at the bobbin 1110, a magnet 1130

disposed in the housing 1140 so as to face the first coil 1120, at least one upper elastic member (not shown) coupled to the upper portion of the bobbin 1110 and the upper portion of the housing 1140, at least one lower elastic member (not shown) coupled to the lower portion of the bobbin 1110 and the lower portion of the housing 1140, a second coil 1230 disposed under the bobbin 1110 (and/or the housing 1140), a printed circuit board 1250 disposed under the second coil 1230, and a base 1210 disposed under the printed circuit board 1250.

In addition, the lens-moving apparatus 1100 may further include a cover member 1300 coupled to the base 1210 to provide space for accommodating the components of the lens-moving apparatus 1100 together with the base 1210.

In addition, the lens-moving apparatus 1100 may further include a support member (not shown) electrically connecting the printed circuit board 1250 to the upper elastic member and supporting the housing 1140 with respect to the base 1210. Each of the first coil 1120 and the second coil 1230 may be electrically connected to the printed circuit board 1250, and may receive a driving signal (driving current) from the printed circuit board 1250.

For example, the upper elastic member may include a plurality of upper springs, the support member may include support members connected to the upper springs, and the first coil 1120 may be electrically connected to the printed circuit board 1250 via the upper springs and the support member. The printed circuit board 1250 may include a plurality of terminals, and some of the plurality of terminals may be electrically connected to the first coil 1120 and/or the second coil 1230.

The bobbin 1110 and the lens or the lens barrel 1400 coupled thereto may be moved in the optical-axis direction due to the electromagnetic force generated by interaction between the first coil 1120 and the magnet 1130, and accordingly, the displacement of the bobbin 1110 in the optical-axis direction may be controlled, whereby an AF operation may be implemented.

In addition, the housing 1140 may be moved in a direction perpendicular to the optical axis due to the electromagnetic force generated by interaction between the second coil 1230 and the magnet 1130, and accordingly, a hand tremor compensation or OIS operation may be implemented.

In addition, in order to implement an AF feedback operation, the lens-moving apparatus 1100 of the camera module 1200 may further include a sensing magnet (not shown) disposed at the bobbin 1110 and an AF position sensor (e.g. a hall sensor) (not shown) disposed in the housing 1140. In addition, the lens-moving apparatus 1100 may further include a printed circuit board (not shown) disposed in the housing and/or on the base to allow the AF position sensor to be disposed or mounted thereon. In another embodiment, the AF position sensor may be disposed at the bobbin, and the sensing magnet may be disposed in the housing. In addition, the lens-moving apparatus 1100 may further include a balancing magnet disposed at the bobbin 1110 so as to correspond to the sensing magnet.

The AF position sensor may output an output signal according to the result of detection of the magnitude of the magnetic field of the sensing magnet upon movement of the bobbin 1110. The AF position sensor may be electrically connected to the printed circuit board 1250 via the upper elastic member (or the lower elastic member) and/or the support member. The printed circuit board 1250 may provide a driving signal to the AF position sensor, the output of the AF position sensor may be transmitted to the printed

circuit board **1250**, and the controller **1830** may sense or detect the displacement of the bobbin **1110** using the output of the AF position sensor.

In another embodiment, the lens-moving apparatus **1100** may be an AF lens-moving apparatus, and the AF lens-moving apparatus may include a housing, a bobbin disposed in the housing, a coil disposed at the bobbin, a magnet disposed in the housing, at least one elastic member coupled to the bobbin and the housing, and a base disposed under the bobbin (and/or the housing). For example, the elastic member may include the upper elastic member and the lower elastic member described above.

A driving signal (e.g. driving current) may be provided to the coil, and the bobbin may be moved in the optical-axis direction due to the electromagnetic force generated by interaction between the coil and the magnet. In another embodiment, the coil may be disposed in the housing, and the magnet may be disposed at the bobbin.

In addition, in order to implement an AF feedback operation, the AF lens-moving apparatus may further include a sensing magnet disposed at the bobbin, an AF position sensor (e.g. a hall sensor) disposed in the housing, and a printed circuit board disposed or mounted in the housing and/or on the base to allow the AF position sensor to be mounted thereon. In another embodiment, the AF position sensor may be disposed at the bobbin, and the sensing magnet may be disposed in the housing.

The printed circuit board may be electrically connected to the coil and the AF position sensor, a driving signal may be provided to each of the coil and the AF position sensor through the printed circuit board, and the output of the AF position sensor may be transmitted to the printed circuit board.

The camera module according to another embodiment may include, instead of the lens-moving apparatus **1100** of FIG. **14**, a housing coupled to the lens or the lens barrel **1400** to fix the lens or the lens barrel **1400**, and the housing may be coupled or attached to the upper surface of the holder **1600**. The housing attached or fixed to the holder **1600** may not be moved, and the position of the housing may be fixed in the state in which the housing is attached to the holder **1600**.

The holder **1600** may be disposed under the base **1210** of the lens-moving apparatus **1100**.

For example, the holder **1600** may be disposed under the lens or the lens barrel **1400**.

The holder **1600** may include a seating portion **1500**, which is recessed from the upper surface thereof and on which the filter **1610** is seated. The filter **1610** may be disposed in the seating portion **1500**.

The adhesive member **1612** may couple or attach the base **1210** of the lens-moving apparatus **1100** to the holder **1600**. For example, the adhesive member **1612** may be disposed between the lower surface of the base **1210** and the upper surface of the holder **1600**, and may bond these two components to each other.

The adhesive member **1612** may serve not only to bond components, as described above, but also to prevent foreign substances from entering the lens-moving apparatus **1100**. For example, the adhesive member **1612** may be an epoxy, a thermosetting adhesive, or an ultraviolet curable adhesive.

The holder **1600** may have an opening **1501** formed in the region thereof in which the filter **1610** is mounted or disposed so that light passing through the filter **1610** enters the image sensor **1810**.

For example, the opening **1501** may penetrate the holder **1600** in the optical-axis direction, and may be referred to as a "through-hole".

For example, the opening **1501** may penetrate the center of the holder **1600**, and may be disposed so as to correspond to or face the image sensor **1810** (e.g. an active area of the image sensor **1810**).

The holder **1600** may be disposed on the printed circuit board **1800**, and may support the lens-moving apparatus **1100** positioned thereon. For example, the lower surface of the base **1210** of the lens-moving apparatus **1100** may be disposed on the upper surface of the holder **1600**.

For example, the lower surface of the base **1210** of the lens-moving apparatus **1100** may be in contact with the upper surface of the holder **1600**, and may be supported by the upper surface of the holder **1600**.

The filter **1610** may serve to block light in a specific frequency band, among the light passing through the lens barrel **1400**, from entering the image sensor **1810**.

For example, the filter **1610** may be an infrared cut-off filter, without being limited thereto. In another embodiment, the filter may be an infrared pass filter. For example, the filter **1610** may be disposed parallel to the x-y plane, which is perpendicular to the optical axis OA.

The filter **1610** may be attached to the bottom surface **1512** of the seating portion **1500** of the holder **1600** using adhesive members **1310** and **1330**. Here, the adhesive members **1310** and **1330** may be an epoxy, a thermosetting adhesive, or an ultraviolet curable adhesive.

The printed circuit board **1800** may be disposed under the holder **1600**, and the image sensor **1810** may be disposed on the upper surface of the printed circuit board **1800**.

The holder **1600** may be attached or fixed to the upper surface of the printed circuit board **1800** using an adhesive member **1320** such as an epoxy, a thermosetting adhesive, or an ultraviolet curable adhesive. In this case, the adhesive member **1320** may be disposed between the lower surface of the holder **1600** and the upper surface of the printed circuit board **1800**.

The image sensor **1810** may be a part on which the light that has passed through the filter **1610** is incident and in which an image included in the light is formed.

The printed circuit board **1800** may be provided with various circuits, elements, and controllers in order to convert an image formed by the image sensor **1810** into an electrical signal and to transmit the electrical signal to an external device.

A circuit pattern, which is electrically connected to the image sensor and various elements, may be formed on the printed circuit board **1800**.

The filter **1610** and the image sensor **1810** (e.g. the active area of the image sensor **1810**) may be disposed so as to be spaced apart from each other and to face each other in the optical-axis (OA) direction or the first direction.

The motion sensor **1820** may be mounted or disposed on the printed circuit board **1800**, and may be electrically connected to the controller **1830** via a circuit pattern provided on the printed circuit board **1800**.

The motion sensor **1820** outputs rotating angular speed information according to the motion of the camera module **1200**.

The motion sensor **1820** may be implemented as a 2- or 3-axis gyro sensor or an angular speed sensor.

The controller **1830** is mounted or disposed on the printed circuit board **1800**.

The printed circuit board **1800** may be electrically connected to the lens-moving apparatus **1100**. For example, the

23

printed circuit board **1800** may be electrically connected to the printed circuit board **1250** of the lens-moving apparatus **1100**.

For example, a driving signal may be provided to each of the first coil **1120** and the second coil **1230** of the lens-moving apparatus **1100** through the printed circuit board **1800**, and a driving signal may be provided to the AF position sensor (or the OIS position sensor). Further, the output of the AF position sensor (and/or the OIS position sensor) may be transmitted to the printed circuit board **1800**.

The connector **1840** may be electrically connected to the printed circuit board **1800**, and may include a port to be electrically connected to an external device. For example, the connector **1840** may be electrically connected to the printed circuit board **1800** via a connection substrate.

Although not shown in FIG. **14**, the embodiment may further include a stiffener disposed under the printed circuit board **1800**. The stiffener is a plate-type member having a predetermined thickness and hardness, and may stably support the printed circuit board **1800** and prevent damage to the printed circuit board due to an external impact or contact. In addition, the stiffener may improve a heat dissipation effect of dissipating the heat generated from the image sensor to the outside.

For example, the stiffener may be formed of a metal material having high thermal conductivity, such as SUS or aluminum, without being limited thereto. In another embodiment, the stiffener may be formed of glass epoxy, plastic, or synthetic resin.

In the embodiment including the stiffener, the printed circuit board **1800** may include therein an opening for exposing the image sensor **1810**, and the image sensor **1810** may be disposed on the upper surface of the stiffener.

In addition, the stiffener may be electrically connected to a ground terminal of the printed circuit board **1800**, and thus may serve as a ground for protecting the camera module from electrostatic discharge (ESD).

The blocking member **11500** may be disposed on the upper surface of the filter **1610**. The blocking member **11500** may be referred to as a "masking part".

For example, the blocking member **11500** may be disposed on the edge portion of the upper surface of the filter **1610**, and may serve to block at least a portion of the light traveling toward the edge portion of the filter **1610** through the lens or the lens barrel **1400** from passing through the filter **1610**. For example, the blocking member **11500** may be coupled or attached to the upper surface of the filter **1610** using an adhesive member.

For example, the filter **1610** may be formed in a rectangular shape when viewed in the optical-axis direction, and the blocking member **11500** may be formed to be symmetrical with respect to the filter **1610** along each side of the upper surface of the filter **1610**.

In this case, the blocking member **11500** may be formed to have a predetermined width on each side of the upper surface of the filter **1610**.

The blocking member **11500** may be formed of an opaque material. For example, the blocking member **11500** may be an opaque and adhesive material that is applied to the filter **1610**, or may be provided in the form of a film that is attached to the filter **1610**.

The filter **1610** and the active area of the image sensor **1810** may be disposed so as to face or overlap each other in the optical-axis direction, and the blocking member **11500** may not overlap the active area or the sensing pixel area of the image sensor **1810** in the optical-axis direction. Further, at least a portion of the blocking member **11500** may overlap

24

the terminal **1830** and/or the wire disposed on the printed circuit board **1800** in the optical-axis direction.

The image sensor **1810** may be electrically connected to the terminal of the printed circuit board **1800** via a wire. The wire and the terminal may be formed of a conductive material such as gold, silver, copper, or a copper alloy, and this conductive material may have a property of reflecting light. The light that has passed through the filter **1610** may be reflected by the terminal **1830** of the printed circuit board **1800** and the wire, and an instantaneous flash, i.e. a flare phenomenon, may occur due to this reflected light. Such a flare phenomenon may distort the image formed by the image sensor **1810** or may deteriorate the quality of the image.

Since the blocking member **11500** is disposed such that at least a portion thereof overlaps the terminal of the printed circuit board **1800** and/or the wire in the optical-axis direction, the blocking member **11500** may block the light traveling toward the terminal of the printed circuit board **1800** and/or the wire, among the light that has passed through the lens or the lens barrel **1400**, thereby preventing the occurrence of the aforementioned flare phenomenon, thus preventing distortion of the image formed by the image sensor **1810** and deterioration in the quality of the image.

Referring to FIG. **16**, the seating portion **1500** may be formed in the shape of a recess, a cavity, or a hole, which is concavely formed in the upper surface **1051a** of the holder **1600**, without being limited thereto.

The seating portion **1500** of the holder **1600** may include an inner side surface **1511** and a bottom surface **1512**, and the filter **1610** may be disposed on the bottom surface **1512** of the seating portion **1500** of the holder **1600**.

For example, the opening **1501** may be formed in the bottom surface **1512** of the seating portion **1500**, and may be spaced apart from the inner side surface **1511** of the seating portion **1500**.

The area of the opening **1501** may be smaller than the area of the filter **1610** defined by the horizontal length and the vertical length thereof so that the filter **1610** may be disposed on the bottom surface **1512** of the seating portion **1500** of the holder **1600**.

The inner side surface **1511** of the seating part **1500** of the holder **1600** may correspond to or face the side surface of the filter **1610**.

The inner side surface **1511** of the seating portion **1500** may include a first inner side surface **1511a**, a second inner side surface **1511b**, a third inner side surface **1511c**, and a fourth inner side surface **1511d**.

The first inner side surface **1511a** and the second inner side surface **1511b** may face each other, and the third inner side surface **1511c** and the fourth inner side surface **1511d** may face each other.

The third inner side surface **1511c** may connect one end of the first inner side surface **1511a** and one end of the second inner side surface **1511b** to each other, and the fourth inner side surface **1511d** may connect the opposite end of the first inner side surface **1511a** and the opposite end of the second inner side surface **1511b** to each other.

The holder **1600** may include a protruding portion **1503** disposed around the seating portion **1500** and protruding from the upper surface **1051a** of the holder **1600**.

For example, the protruding portion **1503** may have a structure protruding along the inner side surface **1511** of the seating portion **1500** in the optical-axis direction. The shape of the protruding portion **1503** may be the same as or similar to the shape of the seating portion **1500** (e.g. a rectangular shape), without being limited thereto.

25

Further, the upper surface of the protruding portion **1503** may be positioned higher than the upper surface of the filter **1610** in the optical-axis direction, without being limited thereto. In another embodiment, the upper surface of the protruding portion **1503** may be positioned lower than the upper surface of the filter **1610**.

The holder **1600** may further include a stopper **1506** disposed adjacent to the seating portion **1500** and protruding from the upper surface of the protruding portion **1503** in the optical-axis direction. The stopper **1506** may have a protrusion shape, without being limited thereto. In another embodiment, the stopper **1506** may be formed in the shape of a groove recessed from the upper surface of the protruding portion **1503**.

For example, the stopper **1506** may be connected to or contiguous with the inner side surface **1511** of the seating portion **1500**, without being limited thereto. In another embodiment, the stopper **1506** may be spaced apart from the inner side surface **1511** of the seating portion **1500**.

The upper surface of the stopper **1506** may be positioned higher than the upper surface of the filter **1610**, which is disposed on the seating portion **1500**, in the optical-axis direction on the basis of the bottom surface **1512** of the seating portion **1500**. In the case in which the stopper **1506** is formed in a groove shape, the bottom surface of the stopper **1506** may be positioned higher than the upper surface of the filter **1610**, which is disposed on the seating portion **1500**, in the optical-axis direction on the basis of the bottom surface **1512** of the seating portion **1500**.

The lower end of the lens or the lens barrel **1400**, which is moved in the optical-axis direction by the AF operation, may come into contact with the upper surface of the stopper **1506**, but may be prevented from moving below the stopper **1506** by the stopper **1506**.

The stopper **1506** may prevent spatial interference between the lower end of the lens or the lens barrel **1400** mounted to the lens-moving apparatus **1100** and the upper surface of the filter **1610**. That is, during the AF operation, collisions between the lens or the lens holder **400** of the lens-moving apparatus **1100** and the upper surface of the filter **1610** may be prevented by the stopper **1506**.

Referring to FIG. **16**, the holder **1600** may include four stoppers corresponding to the first to fourth inner side surfaces, without being limited thereto. In another embodiment, two or more stoppers or one stopper may be provided.

For example, the stopper **1506** may be disposed adjacent to a corresponding one of the first to fourth inner side surfaces **1511a** to **1511d** of the seating portion **1500**, without being limited thereto. In another embodiment, the stopper may be disposed corresponding to at least one of the first to fourth inner side surfaces **1511a** to **1511d** of the seating portion **1500**.

For example, the stopper **1506** may be contiguous with a corresponding one of the first to fourth inner side surfaces **1511a** to **1511d** of the seating portion **1500**. For example, the stopper **1506** may be disposed in the center area of a corresponding inner side surface.

For example, the overall shape of the stopper **1506** may match the shape of the lens or the lens barrel.

The holder **1600** may include a foreign-substance-collecting portion **1507**, which is formed in the shape of a groove recessed from the upper surface **1051a**. The foreign-substance-collecting portion **1507** may be disposed adjacent to the stopper **1506**, without being limited thereto. For example, the foreign-substance-collecting portion **1507** may be positioned outside the stopper **1506** on the basis of the seating portion **1500**, without being limited thereto.

26

The foreign-substance-collecting portion **1507** may collect foreign substances introduced from the lens-moving apparatus **1100**. The foreign-substance-collecting portion **1507** may be referred to as a dust trapper. Referring to FIG. **16**, the holder **1600** may include two foreign-substance-collecting portions **1507**, without being limited thereto. In another embodiment, one or three or more foreign-substance-collecting portions may be provided.

In addition, the holder **1600** may include a concave portion **1508** disposed at a corner region of the inner side surface **1511** of the seating portion **1500**. The concave portion **1508** may have a structure that is recessed in a direction from the center of the opening **1501** in the seating portion **1500** toward the corner region of the inner side surface **1511** of the seating portion **1500**. The concave portion **1508** may prevent an adhesive member, such as UV epoxy, for attaching the filter **1610** to the seating portion **1500** from overflowing out of the seating portion **1500**.

The holder **1600** may include a groove portion **1504**, which is formed in the inner side surface **1511** of the seating portion **1500**. The groove portion **1504** may be formed in an inner side surface (e.g. **1511a**) positioned between two adjacent corners of the seating portion **1500**. Here, the groove portion **1504** may be referred to as a "concave portion" or a "groove".

The groove portion **1504** may be positioned at the center of one (e.g. **511a**) of the first to fourth inner side surfaces **1511a** to **1511d** of the seating portion **1500**.

For example, the inner side surface **1511** of the seating portion **1500** may include a first inner side surface **1511a** facing the first side surface of the filter **1610**, and the groove portion **1504** in the seating portion **1500** may be formed in the first inner side surface **1511a**, and may be recessed from the first inner side surface **1511a** in a direction from the first side surface of the filter **1610** toward the first inner side surface **1511a**.

For example, the groove portion **1504** in the seating portion **1500** may be concavely formed in the first inner side surface **1511a** in a direction from the first side surface of the filter **1610** toward the first inner side surface **1511a**.

For example, the groove portion **1504** in the seating portion **1500** may be open to the upper surface of the holder **1600**, and may be connected to the bottom surface **1512** of the seating portion **1500**. Further, for example, the groove portion **1504** in the seating portion **1500** may have therein an opening that opens toward the filter **1610**.

Further, for example, the bottom surface of the groove portion **1504** may be coplanar with the bottom surface **1512** of the seating portion **1500**. The reason of this is to allow the second adhesive member **1330** to smoothly enter the space between the lower surface of the filter **1610** and the bottom surface **1512** of the seating portion **1500**. However, in another embodiment, the bottom surface of the groove portion **1504** may not be coplanar with the bottom surface **1512** of the seating portion **1500**.

The groove portion **1504** may not overlap the filter **1610**, disposed in the seating portion **1500**, in the optical-axis direction.

For example, the groove portion **1504** may be formed in a region of the stopper **504** of the holder **1600**. Referring to FIG. **3**, the groove portion **1504** may be formed in the stopper **1506** adjacent to the first inner side surface **1511a** of the seating portion **1500**, without being limited thereto.

In another embodiment, the groove portion **1504** may be formed in the inner side surface of the seating portion **1500** in which a stopper is not provided.

The ratio (DL1:DL2) of the length DL1 of the groove portion **1504** in the longitudinal direction of the inner side surface **1511a** (or the transverse direction of the inner side surface **1511a**) of the seating portion **1500** to the length DL2 of the inner side surface **1511a** of the seating portion **1500** may be 1:3 to 1:4.

For example, if the value obtained by dividing DL2 by DL1 (DL2/DL1) is less than 3, the length DL1 of the groove portion **1504** may be excessive, and thus the amount of the second adhesive member **1330** charged into the groove portion **1504** may increase. In the case in which the groove portion **1504** is formed in the stopper **1506**, when the length of the groove portion **1504** increases, the contact area of the stopper **1506** with the lens barrel **1400** may decrease, and thus the stopper may not stably stop the movement of the lens or the lens barrel, and may exhibit reduced strength or durability.

If the value obtained by dividing DL2 by DL1 (DL2/DL1) is greater than 4, the length DL1 of the groove portion **1504** is so small that the second adhesive member **1330** may not smoothly fill the gap between the filter **1610** and the bottom surface **1512** of the seating portion **1500** of the holder **1600**, whereby the opening **1504** in the first adhesive member **1310** may not be sealed.

Further, for example, the length DL1 of the groove portion **1504** may be constant, without being limited thereto. In another embodiment, the length DL1 of the groove portion **1504** may gradually increase in a direction from the groove portion **1504** toward the side surface of the filter **1610** facing the groove portion **1504**. The reason for this is to allow the second adhesive member **1330** to smoothly fill the gap between the filter **1610** and the bottom surface **1512** of the seating portion **1500** of the holder **1600**.

FIGS. 17 to 20 show an order in which the holder **1600**, the filter **1610**, and the printed circuit board **1800** according to the embodiment are coupled, FIG. 21 is a partial enlarged view of the cross-section taken in the direction AB in FIG. 20, and FIG. 22 is a partial enlarged view of the cross-sectional view of FIG. 20 before the second adhesive member **1320** is formed after the attachment of the holder **1600** and the printed circuit board **1800**.

The first adhesive member **1310** may be disposed between the bottom surface **1512** of the seating portion **1500** and the lower surface of the filter **1610**, and may include therein an opening **1054**, at least a portion of which corresponds to the groove portion **1504**.

Referring to FIG. 17, the first adhesive member **1310** may be formed on the bottom surface **1512** of the seating portion **1500**. The first adhesive member **1310** may be disposed so as to have a predetermined width DW1 within a predetermined region from the inner side surface **1511** of the seating portion **1500**.

For example, the first adhesive member **1310** may be formed by applying an adhesive (e.g. UV epoxy) to the bottom surface **1512** of the seating portion **1500**.

The first adhesive member **1310** may have therein an opening **1054** or an open region at a position corresponding to the groove portion **1504** in the holder **1600**. Here, the opening **1054** may serve as an air vent for discharging fumes generated when the second adhesive member **1330** is cured, which will be described later.

The opening **1054** in the first adhesive member **1310** may be the region corresponding to the groove portion **1504** in the bottom surface **1512** of the seating portion **1500**, and may be the region to which an adhesive for forming the first adhesive member **1310** is not applied.

For example, the first adhesive member **1310** may have therein an opening **1054**, which is a cut portion corresponding to the groove portion **1504**. For example, the portion of the first adhesive member **1310**, other than the opening **1054**, may be disposed on the bottom surface **1512** so as to surround the opening **1501** in the holder **1600**.

The length DL3 of the opening **1054** in the longitudinal direction of the inner side surface **1511a**, in which the groove portion **1504** is positioned, may be the same as the length DL1 of the groove portion **1504** in the longitudinal direction of the inner side surface **1511a** shown in FIG. 16 (DL3=DL1), without being limited thereto.

In another embodiment, the length DL3 of the opening **1054** may be less than the length DL1 of the groove portion **1504** (DL3<DL1). Since DL3 is less than DL1 (DL3<DL1), when the second adhesive member **1330** is placed in the opening **1054**, the second adhesive member **1330** completely fills the opening **1054**, with the result that the space between the bottom of the filter **1610** and the bottom surface **1512** of the seating portion **1500** of the holder **1600** is sealed.

Subsequently, referring to FIG. 18, the filter **1610** is attached to the seating portion **1500**, on which the first adhesive member **1310** has been formed, and the first adhesive member **1310** is cured. For example, the first adhesive member **1310** may be a UV curable adhesive member, e.g. UV epoxy.

Subsequently, referring to FIG. 19, an adhesive member **1320** corresponding to the lower portion of the holder **1600** (e.g. the second lower surface **1604**) is formed on the upper surface of the printed circuit board **1800**, the holder **1600** is attached to the printed circuit board **1800**, on which the adhesive member **1320** has been formed, and the adhesive member **1320** is cured.

For example, the adhesive member **1320** may be a thermosetting adhesive member, e.g. thermosetting epoxy.

FIG. 19 is a bottom view of the holder **1600**. As shown in FIG. 19, the lower surface of the holder **1600** may include a first lower surface **1602** corresponding to the bottom portion **1512** of the seating portion **1500** and a second lower surface **1604** protruding from the first lower surface **1602** in the optical-axis direction and disposed around the first lower surface **1602**.

The holder **1600** may include a lower protruding portion **1604a** protruding from the first lower surface **1602**.

For example, the first lower surface **1602** of the holder **1600** may be the surface that is positioned opposite the bottom surface **1512** of the seating portion **1500**.

For example, the second lower surface **1604** of the holder **1600** may be the lower surface of the lower protruding portion **1604a**.

The lower protruding portion **1604a** of the holder **1600** may be positioned so as to be connected to or contiguous with the edge of the first lower surface **1602** of the holder **1600**, and may be contiguous with the outer side surface of the holder **1600**.

The lower surface of the lower protruding portion **1604a** of the holder **1600**, i.e. the second lower surface **1604**, may have a height difference from the first lower surface **1602** in the optical-axis direction.

The shape of the lower protruding portion **1604a** viewed from below may be a rectangular shape, and the lower protruding portion **1604a** may include a protrusion **1604b** protruding from the outer side surface of the edge of the lower protruding portion **1604a** in a direction perpendicular to the optical axis or in the horizontal direction. Here, the adhesive member **1320** may include a portion corresponding to the lower surface of the protrusion **1604b**. Since the

protrusion **1604b** is also attached to the printed circuit board **1800** using the adhesive member **1320**, the protrusion **1604b** increases the contact area with the printed circuit board **1800**, thereby increasing the bonding force between the holder **1600** and the printed circuit board **1800**.

For example, the shape of the adhesive member **1320** formed on the printed circuit board **1800** may match the shape of the lower protruding portion **1604a** of the holder **1600**.

After the adhesive member **1320** is formed on the printed circuit board **1800**, the second lower surface **1604** of the holder **1600** may be attached to the adhesive member **1320**, without being limited thereto. In another embodiment, after the adhesive member **1320** is formed on the second lower surface **1604** of the holder **1600**, the adhesive member **1320** may be attached to the upper surface of the printed circuit board **1800**.

For example, the adhesive member **1320** may not overlap the first adhesive member **1310** in the optical-axis direction. The adhesive member **1320** may have a closed-loop shape corresponding to the second lower surface **1604** of the holder **1600**.

When the holder **1600** is attached to the adhesive member **1320** formed on the upper surface of the printed circuit board **1800** and the adhesive member **1320** is thermally cured, fumes may be generated through, for example, evaporation of a volatile material contained in the adhesive member **1320** during the thermal curing process. These fumes may contaminate or damage circuits and various elements of the printed circuit board **1800**.

The fumes generated during the process of thermally curing the adhesive member **1320** may be discharged to the outside of the holder **1600** through the space between the printed circuit board **1800** and the first lower surface **1602** of the holder **1600**, the opening **1054** in the first adhesive member **1310** formed on the bottom surface **1512** of the holder **1600**, and the groove portion **1504** in the holder **1600**. For example, the fumes generated during the process of thermally curing the adhesive member **1320** may be discharged to the outside along the path **85** shown in FIG. 9.

After the adhesive for forming the adhesive member **1320** is completely cured and the fumes are completely discharged to the outside, an adhesive for forming the second adhesive member **1330** is applied to the groove portion **1504**.

The second adhesive member **1330** may be disposed in the groove portion **1504** in the holder **1600**, and may be coupled to the filter **1610**. The second adhesive member **1330** may include a region or a shape corresponding to the groove portion **1504** in the holder **1600**.

The second adhesive member **1330** may be disposed in the groove portion **1504**, and may be disposed between the lower surface of the filter **1610** and the opening in the first adhesive member **1310** so as to fill the gap between the lower surface of the filter **1610** and the opening **1054** in the first adhesive member **1310**.

The second adhesive member **1330** may be in contact with both ends of the first adhesive member **1310**, which are positioned on both sides of the opening **1054** in the first adhesive member **1310**.

The second adhesive member **1330** may be in contact with the side surface of the filter **1610** that corresponds to or faces the groove portion **1504**.

Referring to FIG. 21, the second adhesive member **1330** may include a first portion **1330a** disposed in the groove portion **1504** in the holder **1600** and a second portion **1330b**

disposed between the opening **1054** in the first adhesive member **1310** and the lower surface of the filter **1610**.

The second adhesive member **1330** may be disposed in at least a portion of the opening **1054** in the first adhesive member **1310**.

For example, the second adhesive member **1330** may connect both open ends of the first adhesive member **1310** to each other to form a closed loop together with the first adhesive member **1310**.

The height DH1 to the first portion **1330a** of the second adhesive member **1330** may be less than the depth DH3 of the groove portion **1504** (DH1<DH3). The reason for this is to prevent the second adhesive member **1330** from overflowing out of the groove portion **1504**.

The height DH1 to the first portion **1330a** may be the height from the bottom surface of the groove portion **1504** (or the bottom surface **1512** of the seating groove **1500**).

For example, the height DH1 to the first portion **1330a** of the second adhesive member **1330** may be less than the height DH2 to the upper surface of the filter **1610** (DH1<DH2). The reason for this is to prevent deterioration in the performance of the filter **1610** or damage to the filter **1610** due to overflow of the second adhesive member **1330** to the upper surface of the filter **1610**. Here, the height to the upper surface of the filter **1610** may be the height from the bottom surface **1512** of the seating groove **1500**.

The second adhesive member **1330** may be a UV curable adhesive, for example, UV epoxy.

The space between the lower surface of the holder **1600** and the upper surface of the printed circuit board **1800** may be sealed by the second adhesive member **1330**.

FIG. 23A shows a second adhesive member **1330-1** according to an embodiment.

Referring to FIG. 23A, the second adhesive member **1330-1** may include a first portion **1330a** disposed in the groove portion **1504** and a second portion **1330b** disposed in the opening **1054** in the first adhesive member **1310**.

For example, the length of the first portion **1330a** of the second adhesive member **1330-1** and the length DL11 of the second portion **1330b** of the second adhesive member **1330** may be the same as each other. Further, the length DL11 of the second portion **1330b** of the second adhesive member **1330** may be the same as the length DL3 of the opening **1054** in the first adhesive member **1310** (DL11=DL3).

Here, the length DL11 of each of the first portion **1330a** and the second portion **1330b** may be the length of each of the first portion **1330a** and the second portion **1330b** in the transverse direction. Alternatively, for example, DL11 may be the length in a direction parallel to the longitudinal direction (or the transverse direction) of the first inner side surface **1511a** of the seating portion **1500**.

The second portion **1330b** of the second adhesive member **1330-1** may be positioned between opposite ends of the first adhesive member **1310**, which are positioned on both sides of the opening **1054** in the first adhesive member **1310**, and may be connected to opposite ends of the first adhesive member **1310**.

For example, the first portion **1330a** of the second adhesive member **1330-1** may protrude from the first adhesive member **1310** in a direction from the first adhesive member **1310** toward the groove portion **1504**.

The width DW2 of the second adhesive member **1330-1** may be greater than the width DW1 of the first adhesive member **1310** (DW2>DW1). For example, the width DW2 of the second adhesive member **1330-1** may be the length of the second adhesive member **1330-1** in the vertical direction or the length of the second adhesive member **1330-1** in a

31

direction perpendicular to the longitudinal direction of the first inner side surface **1511a**.

For example, the width **DW11** of the first portion **1330a** of the second adhesive member **1330-1** may be greater than the width **DW21** of the second portion **1330b** of the second adhesive member **1330-1** (**DW11>DW21**).

For example, the width **DW21** of the second portion **1330b** of the second adhesive member **1330-1** may be less than or equal to the width **DW1** of the first adhesive member **1310** (**DW21≤DW1**).

The second adhesive member **1330-1** may protrude from the first adhesive member **1310** in a direction from the second inner side surface **1511b** of the seating portion **1500** toward the first inner side surface **1511a**.

FIG. **23B** shows a second adhesive member **1330-2** according to another embodiment.

Referring to FIG. **23B**, the second adhesive member **1330-2** may include a first portion, which is disposed in the groove portion **1504** in the seating portion **1500** and is in contact with the outer side surfaces of opposite ends of the first adhesive member **1310**, which are disposed on both sides of the opening **1054**. For example, the second adhesive member **1330-2** may not include a portion that is disposed in the opening **1054** in the first adhesive member **1310**.

The length **DL12** of the second adhesive member **1330-2** may be greater than the length **DL3** of the opening **1054** in the first adhesive member **1310** (**DL12>DL3**).

Further, the width **DW11** of the second adhesive member **1330-2** may be less than or equal to the width **DW1** of the first adhesive member **1310** (**DW11≤DW1**).

FIG. **23C** shows a second adhesive member **1330-3** according to still another embodiment.

Referring to FIG. **23C**, the second adhesive member **1330-3** may include a first portion **1330a1** disposed in the groove portion **1504** and a second portion **1330b1** disposed in the opening **1054** in the first adhesive member **1310**.

The length **DL12** of the first portion **1330a1** may be greater than the length **DL21** of the second portion **1330b1** (**DL12>DL21**). Further, the width **DW11** of the first portion **1330a1** may be greater than the width **DW21** of the second portion **1330b1** (**DW11>DW21**).

The first portion **1330a1** may be in contact with the outer side surfaces of opposite ends of the first adhesive member **1310**, which are disposed on both sides of the opening **1054**. The second portion **1330b1** may be positioned between opposite ends of the first adhesive member **1310**, and may be connected to opposite ends of the first adhesive member **1310**.

The length (**DL22+DL23**) of the first portion **1330a1**, which does not overlap the second portion **1330b1** in a direction from the opening **1054** toward the groove portion **1504** or a direction from the inner side surface **1511b** of the seating portion **1500** toward the inner side surface **1511a** thereof, may be less than the length **DL21** of the second portion **1330b1** (**DL22+DL23<DL21**).

Although the first adhesive member **1310** and the second adhesive member **1330** have been described above as being provided separately from each other, the embodiment is not limited thereto. The first adhesive member **1310** and the second adhesive member **1330** may be made of the same material, and may be implemented as an integrated adhesive member. In this case, the first adhesive member **1310** described above may correspond to a first portion (or a first region) of the integrated adhesive member, and the second adhesive member **1330** described above may correspond to a second portion (or a second region) of the integrated adhesive member.

32

In general, in the case of an active-alignment-type camera module, after an image sensor, a printed circuit board, and a holder are assembled, an adhesive is applied to the upper surface of the holder, and the assembly of a lens-moving apparatus and a lens is mounted to the holder, to which the adhesive has been applied.

In this case, in order to attach the holder to the printed circuit board, a thermosetting adhesive, e.g. thermosetting epoxy, is primarily applied to the printed circuit board. At this time, an air vent is formed in the thermosetting adhesive applied to the printed circuit board in order to discharge fumes generated during the process of curing the thermosetting adhesive. In addition, after the holder is attached to the printed circuit board, a process of secondarily applying a thermosetting adhesive to the air vent region is performed.

Since the curing time of a thermosetting adhesive is much longer than that of a UV curable adhesive, when the process of curing the thermosetting adhesive is performed twice, as described above, it takes a very long time.

Further, since a secondary thermosetting adhesive is injected into the gap between the printed circuit board and the holder, bubbles may be easily generated and may burst during thermal curing, and voids may be formed. Dark spots may be generated in the image sensor due to introduction of foreign substances through the voids formed in the secondary thermosetting adhesive, and the printed circuit board and the image sensor may be contaminated due to permeation of a cleaning liquid during wet cleaning.

In the embodiment, the opening **1054** for sealing a gap is formed in the first adhesive member **1310** for attaching the filter **1610** and the holder **1600** to each other, whereby it is possible to discharge fumes generated during the process of thermally curing the adhesive member **1320** to couple the printed circuit board **1800** and the holder **1600** to each other.

In addition, since the groove portion **1504** corresponding to the opening **1054** in the first adhesive member **1310** is formed in the holder **1600**, it is possible to smoothly discharge fumes generated during the process of thermally curing the adhesive member **1320** to couple the printed circuit board **1800** and the holder **1600** to each other, to enable the second adhesive member **1330** to easily and smoothly enter the space between the filter **1610** and the bottom surface **1512** of the seating portion **1500** of the holder **1600**, and to prevent the formation of voids during a curing process.

Further, since the second adhesive member **1330**, which is a UV curable adhesive, is transparent, it is possible to easily determine with the naked eye whether the opening in the first adhesive member **1310** and the groove portion **1504** in the holder **1600** are not filled with the second adhesive member **1330**, to prevent insufficient charging of the second adhesive member **1330**, and to prevent introduction of a cleaning liquid (e.g. DI water) and foreign substances during wet cleaning, thus preventing damage to the printed circuit board and the image sensor.

In addition, since a UV curable adhesive is used as the second adhesive member **1330**, it is possible to prevent bursting or cracking of a thermosetting adhesive due to voids formed during the process of curing the thermosetting adhesive.

In addition, since the thermal curing process for attaching the printed circuit board **1800** and the holder **1600** to each other is performed once, it is possible to reduce the curing process time. Although the UV curing process is performed twice, the thermal curing process time is about 20 times the UV curing process time.



33

The first adhesive member **1320** and the second adhesive member **1330** of the camera module of FIGS. **14** to **21** may be formed of different materials from each other, without being limited thereto. In another embodiment, the first adhesive member **1320** and the second adhesive member **1330** may be formed of the same material as each other.

The description of the inner side surface **511** and the bottom **512** of the seating portion **500** of the holder **600** of FIG. **3**, the first surface **601** and the second surface **602** of the inner side surface **511**, the spacing distance from the first surface **601** to the side surface of the filter **610**, the spacing distance from the second surface **602** to the side surface of the filter **610**, the relationship between the spacing distances and the thickness of the filter **610**, the relationship with the adhesive member, and the relationship with the blocking member may be equally or similarly applied to the embodiment including the holder **1600** of FIG. **16**.

In addition, the description of the seating portion **1500** of the holder **1600** of FIG. **16**, the groove portion **504** in the holder **1600**, the first adhesive member **310**, and the second adhesive members **330**, **330-1**, **330-2** and **330-3** may be equally or similarly applied to the embodiment including the holder **600** of FIG. **3**. That is, the embodiment of FIG. **1** and the embodiment of FIG. **14** may be equally or similarly applied to each other.

The camera module according to the embodiment may be included in an optical instrument for the purpose of forming an image of an object present in a space using reflection, refraction, absorption, interference, and diffraction, which are characteristics of light, for the purpose of increasing visibility, for the purpose of recording and reproduction of an image by a lens, or for the purpose of optical measurement or image propagation or transmission. For example, the optical instrument according to the embodiment may include a smartphone and a portable terminal equipped with a camera.

FIG. **24** is a perspective view of a portable terminal **200A** according to an embodiment, and FIG. **25** is a configuration diagram of the portable terminal **200A** shown in FIG. **24**.

Referring to FIGS. **24** and **25**, the portable terminal **200A** (hereinafter referred to as a "terminal") may include a body **850**, a wireless communication unit **710**, an A/V input unit **720**, a sensor **740**, an input/output unit **750**, a memory **760**, an interface **770**, a controller **780**, and a power supply **790**.

The body **850** shown in FIG. **24** has a bar shape, without being limited thereto, and may be any of various types such as, for example, a slide type, a folder type, a swing type, or a swivel type, in which two or more sub-bodies are coupled so as to be movable relative to each other.

The body **850** may include a case (e.g. casing, housing, or cover) defining the external appearance thereof. For example, the body **850** may be divided into a front case **851** and a rear case **852**. A variety of electronic components of the terminal may be mounted in the space formed between the front case **851** and the rear case **852**.

The wireless communication unit **710** may include one or more modules, which enable wireless communication between the terminal **200A** and a wireless communication system or between the terminal **200A** and a network in which the terminal **200A** is located. For example, the wireless communication unit **710** may include a broadcast reception module **711**, a mobile communication module **712**, a wireless Internet module **713**, a nearfield communication module **714**, and a location information module **715**.

The audio/video (A/V) input unit **720** serves to input audio signals or video signals, and may include a camera **721** and a microphone **722**.

34

The camera **721** may include the camera module **200**, **1000** or **1200** according to the embodiment.

The sensor **740** may sense the current state of the terminal **200A**, such as the open or closed state of the terminal **200A**, the location of the terminal **200A**, the presence or absence of a user's touch, the orientation of the terminal **200A**, or the acceleration/deceleration of the terminal **200A**, and may generate a sensing signal to control the operation of the terminal **200A**. For example, when the terminal **200A** is a slide-type phone, whether the slide-type phone is open or closed may be detected. In addition, the sensor **740** serves to sense whether power is supplied from the power supply **790** or whether the interface **770** is coupled to an external device.

The input/output unit **750** serves to generate visual, audible, or tactile input or output. The input/output unit **750** may generate input data to control the operation of the terminal **200A**, and may display information processed in the terminal **200A**.

The input/output unit **750** may include a keypad unit **730**, a display module **751**, a sound output module **752**, and a touchscreen panel **753**. The keypad unit **730** may generate input data in response to input to a keypad.

The display module **751** may include a plurality of pixels, the color of which varies in response to electrical signals. For example, the display module **751** may include at least one of a liquid crystal display, a thin-film transistor liquid crystal display, an organic light-emitting diode, a flexible display, or a 3D display.

The sound output module **752** may output audio data received from the wireless communication unit **710** in a call-signal reception mode, a call mode, a recording mode, a voice recognition mode, or a broadcast reception mode, or may output audio data stored in the memory **760**.

The touchscreen panel **753** may convert variation in capacitance, caused by a user's touch on a specific region of a touchscreen, into electrical input signals.

The memory **760** may store programs for the processing and control of the controller **780**, and may temporarily store input/output data (e.g. a phone book, messages, audio, still images, pictures, and moving images). For example, the memory **760** may store images captured by the camera **721**, for example, pictures or moving images.

The interface **770** serves as a passage for connection between the terminal **200A** and an external device. The interface **770** may receive data or power from the external device, and may transmit the same to respective components inside the terminal **200A**, or may transmit data inside the terminal **200A** to the external device. For example, the interface **770** may include a wired/wireless headset port, an external charger port, a wired/wireless data port, a memory card port, a port for connection of a device having an identification module, an audio input/output (I/O) port, a video input/output (I/O) port, and an earphone port.

The controller **780** may control the general operation of the terminal **200A**. For example, the controller **780** may perform control and processing related to voice calls, data communication, and video calls.

The controller **780** may include a multimedia module **781** for multimedia playback. The multimedia module **781** may be provided inside the controller **180**, or may be provided separately from the controller **780**.

The controller **780** may perform pattern recognition processing, by which writing or drawing input to the touchscreen is perceived as characters or images.

35

The power supply 790 may supply power required to operate the respective components upon receiving external power or internal power under the control of the controller 780.

The features, structures, effects and the like described above in the embodiments are included in at least one embodiment of the present disclosure, but are not necessarily limited to only one embodiment. Furthermore, the features, structures, effects and the like exemplified in the respective embodiments may be combined with other embodiments or modified by those skilled in the art. Therefore, content related to such combinations and modifications should be construed as falling within the scope of the present disclosure.

#### INDUSTRIAL APPLICABILITY

The embodiments may be used in a camera module and an optical device capable of suppressing or preventing collision of a filter and a blocking member with a holder due to external impacts and suppressing shifting or rotation of the filter when the filter is attached to a seating portion of the holder.

The invention claimed is:

1. A camera module, comprising:
  - a lens barrel configured to be movable in an optical-axis direction;
  - a holder disposed under the lens barrel and comprising a seating portion recessed from an upper surface thereof, a first opening formed in a bottom surface of the seating portion, and a groove portion formed in an inner side surface of the seating portion;
  - a filter disposed on the bottom surface of the seating portion;
  - a first adhesive member disposed between the bottom surface of the seating portion and a lower surface of the filter and comprising a second opening;
  - a second adhesive member disposed in the groove portion to be coupled to the filter, the second adhesive member comprising a first portion disposed in the groove portion of the holder and a second portion disposed between the second opening of the first adhesive member and the lower surface of the filter; and
  - an image sensor disposed under the filter.
2. The camera module according to claim 1, wherein the groove portion is positioned in a first inner side surface, which is positioned between two adjacent corners of the seating portion.
3. The camera module according to claim 1, wherein the inner side surface of the seating portion comprises a first inner side surface facing a first side surface of the filter, and wherein the groove portion in the seating portion is formed in the first inner side surface, and is recessed from the first inner side surface in a direction from the first side surface of the filter toward the first inner side surface.
4. The camera module according to claim 3, wherein a length of the second opening in the first adhesive member in a longitudinal direction of the first inner side surface is less than a length of the groove portion in the longitudinal direction of the first inner side surface.
5. The camera module according to claim 3, wherein a width of the second adhesive member is greater than a width of the first adhesive member.
6. The camera module according to claim 1, wherein the groove portion is open to the upper surface of the holder and connected to the bottom surface of the seating portion.

36

7. The camera module according to claim 1, wherein the groove portion does not overlap the filter in the optical-axis direction.

8. The camera module according to claim 1, wherein the second portion of the second adhesive member protrudes from the first adhesive member.

9. The camera module according to claim 1, wherein the second adhesive member connects both open ends of the first adhesive member to each other to form a closed loop together with the first adhesive member.

10. The camera module according to claim 1, further comprising:

- a printed circuit board disposed under the holder; and
- a third adhesive member disposed between the printed circuit board and a lower surface of the holder.

11. The camera module according to claim 10, wherein each of the first and second adhesive members is a UV curable adhesive member.

12. The camera module according to claim 11, wherein the third adhesive member is a thermosetting adhesive member.

13. The camera module according to claim 1, wherein the first adhesive member and the second adhesive member is formed of a same material as each other.

14. The camera module according to claim 1, wherein the second portion of the second adhesive member overlaps the filter in the optical-axis direction.

15. The camera module according to claim 1, wherein the first adhesive member is disposed so as to have a predetermined width within a predetermined region from the inner side surface of the seating portion.

16. The camera module according to claim 1, wherein the second opening of the first adhesive member serves as an air vent for discharging fumes generated when the second adhesive member is cured.

17. The camera module according to claim 1, wherein a height to the first portion of the second adhesive member is less than a depth of the groove portion.

18. An optical instrument comprising the camera module according to claim 1.

19. A camera module, comprising:

- a holder comprising a seating portion recessed from an upper surface thereof and a groove portion formed in an inner side surface of the seating portion;
- a filter disposed on a bottom surface of the seating portion;
- a first adhesive member disposed between the bottom surface of the seating portion and a lower surface of the filter and comprising an opening;
- a second adhesive member disposed in the groove portion to be coupled to the filter;
- a lens barrel disposed on the filter and spaced apart from the filter; and
- an image sensor disposed under the filter, wherein the second adhesive member is configured to close the opening of the first adhesive member.

20. A camera module, comprising:

- a lens barrel configured to be movable in an optical-axis direction;
- a holder disposed under the lens barrel and comprising a seating portion recessed from an upper surface thereof, a first opening formed in a bottom surface of the seating portion, and a groove portion formed in an inner side surface of the seating portion;
- a filter disposed on the bottom surface of the seating portion;

**37**

a first adhesive member disposed between the bottom surface of the seating portion and a lower surface of the filter and comprising a second opening;

a second adhesive member disposed in the groove portion to be coupled to the filter; and

an image sensor disposed under the filter,

wherein the second opening of the first adhesive member serves as an air vent for discharging fumes generated when the second adhesive member is cured.

\* \* \* \* \*

10

**38**