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(54) **LENS MODULE**

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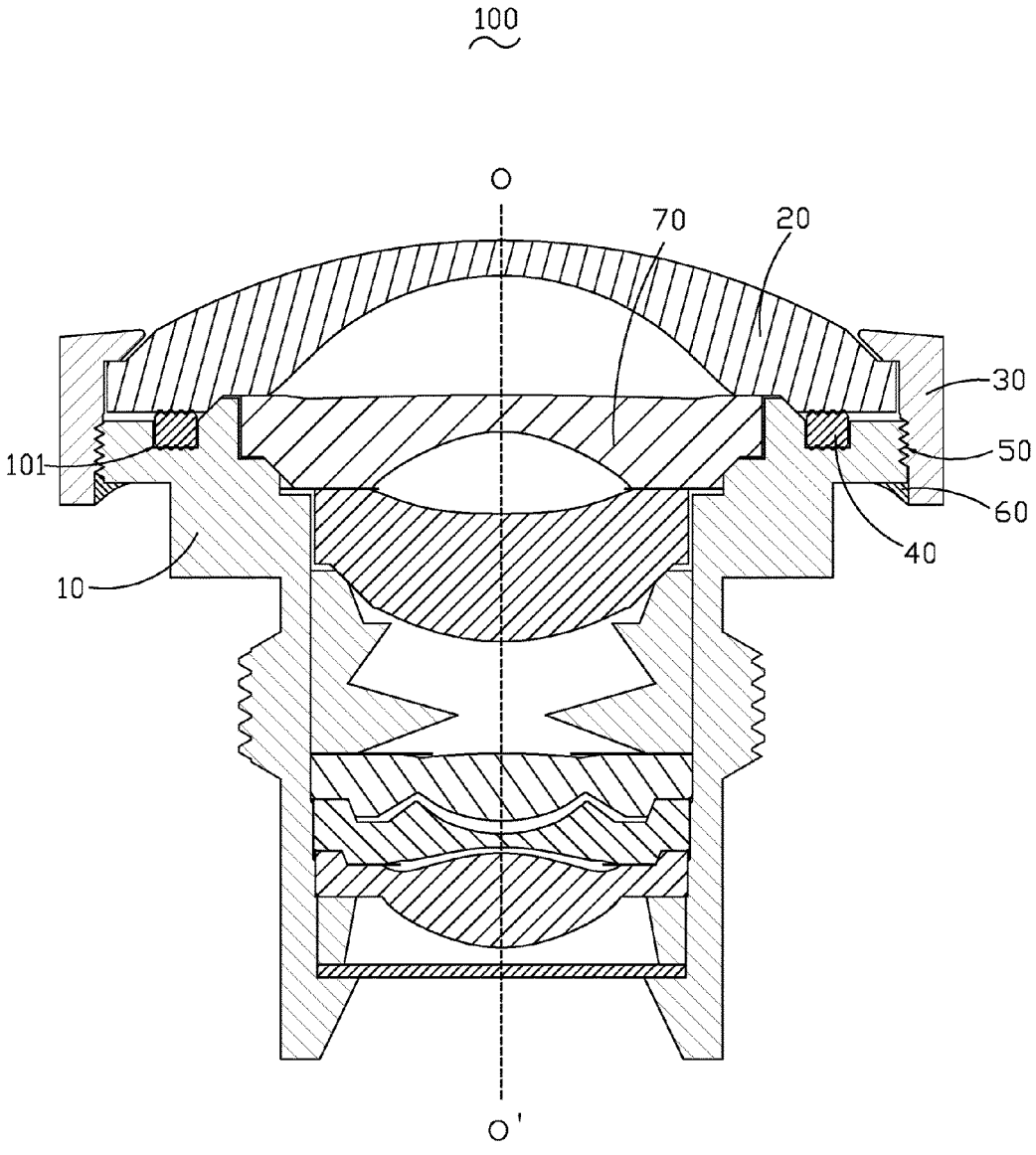
(57) **ABSTRACT**

The present disclosure relates to the technical field of optical lenses, and provides a lens module. The lens module includes a lens barrel, a first lens arranged at an object side of the lens barrel, a fixing part for pressing the first lens against the lens barrel from an object side of the first lens, and a sealing ring arranged between the lens barrel and the first lens. The sealing ring includes a top surface directly facing the first lens and a bottom surface directly facing the lens barrel. The top surface is provided with at least two first contacting portions around an optical axis of the first lens, and the at least two first contacting portions abut against the first lens. The lens module provided by the present disclosure has a higher reliability and a good sealing property.



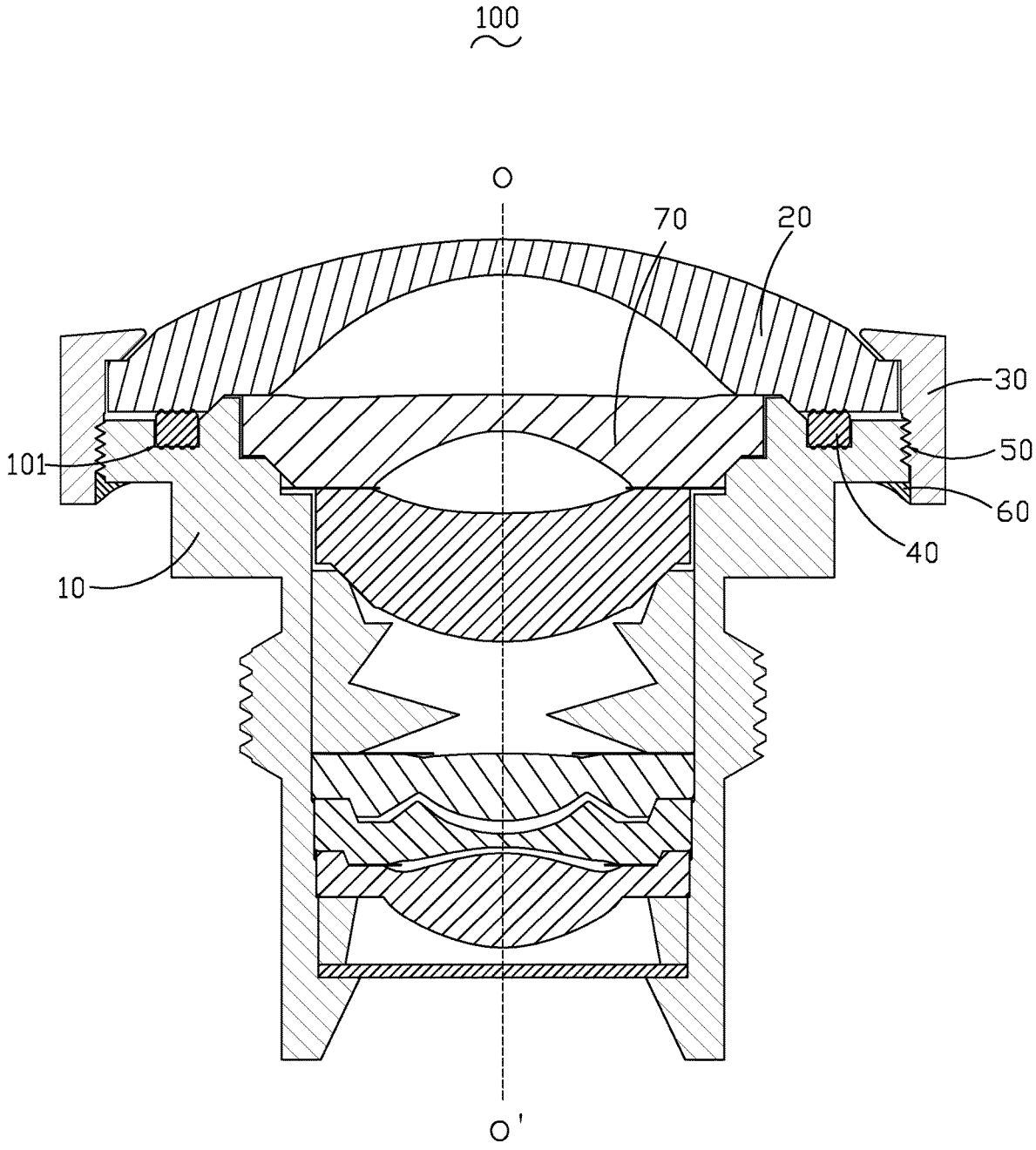


FIG. 1

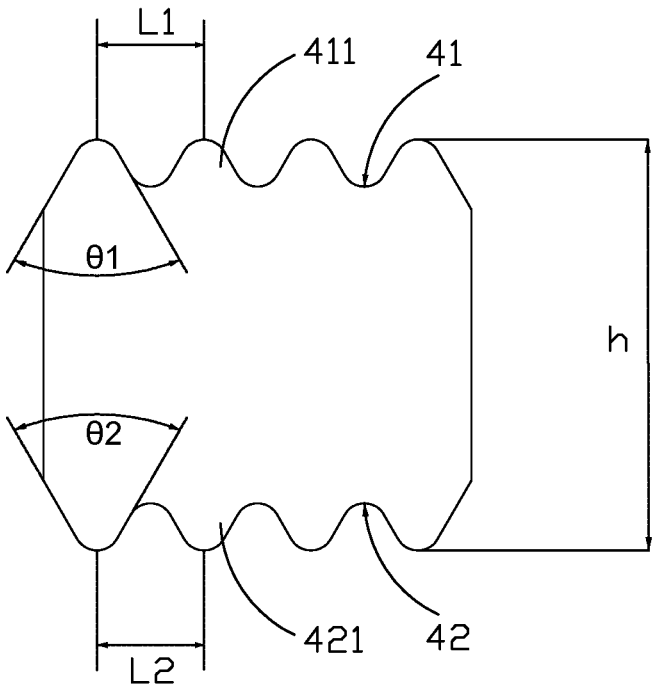


FIG. 2

LENS MODULE

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of optical lenses, and in particular, to a lens module.

BACKGROUND

[0002] With development of technologies, various devices are equipped with lens modules. For example, with respect to safety hazard of driving a vehicle, the vehicle is equipped with a vehicle-mounted lens module. In the related art, the vehicle-mounted lens module usually includes a lens barrel and a plurality of lenses received in the lens barrel.

[0003] The inventors have found that a problem existing in the prior art: the vehicle-mounted lens modules are subjected to external forces caused by, for example, vibration, friction, and collision during the use of the vehicle-mounted lens module, such that the vehicle-mounted lens module has a poor stability and is unsuitable for bad operating environment. Moreover, the vehicle-mounted lens module has such a poor sealing performance that external debris can easily enter the lens barrel and affect the optical performance of the lens. Therefore, it is urgent to provide a new lens module to solve the above problem.

BRIEF DESCRIPTION OF DRAWINGS

[0004] Many aspects of the exemplary embodiment can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

[0005] FIG. **1** is a structural schematic cross-sectional view of a lens module according to an embodiment of the present disclosure; and

[0006] FIG. **2** is a structural schematic cross-sectional view of a sealing ring according to an embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0007] The present disclosure will be further illustrated with reference to the accompanying drawings and the embodiments.

[0008] An embodiment of the present disclosure provides a lens module **100**. As shown in FIG. **1**, the lens module **100** includes a lens barrel **10**, a first lens **20** arranged at an object side of the lens barrel **10**, a fixing part **30** for pressing the first lens **20** against the lens barrel **10** from an object side of the first lens **20**, and a sealing ring **40** arranged between the lens barrel **10** and the first lens **20**. With further reference to FIG. **2**, the sealing ring **40** includes a top surface **41** directly facing the first lens **20** and a bottom surface **42** directly facing the lens barrel **10**. The top surface **41** is provided with at least two first contacting portions **411** around an optical axis OO' of the first lens **20**. The first contacting portions **411** abut against the first lens **20**.

[0009] Compared with the related art, in this embodiment of the present disclosure, the fixing part **30** presses the first lens **20** against the lens barrel **10** to fix of the first lens **20** to the lens barrel **10**. The sealing ring **40** arranged between the first lens **20** and the lens barrel **10** ensures that the first lens **20** is tightly attached to the lens barrel **10**, thereby preventing looseness of the first lens **20** and thus improving reliability of the lens module **100**. The top surface **41** of the sealing ring **40** is provided with at least two first contacting portions **411** around the optical axis OO' of the first lens **20**, and the first contacting portions **411** abut against the first lens **20**. In this way, a path via which external debris enters the lens barrel **10** through an abutting position between the lens barrel **10** and the first lens **20** is lengthened, thereby improving the sealing performance of the lens module **100**.

[0010] Preferably, the lens barrel **10** is provided with a groove **101** for receiving the sealing ring **40**, and thus the effective space occupied by the sealing ring **40** in the lens module **100** is reduced, which is conducive to the miniaturization of the lens module **100**. In this embodiment, the groove **101** has an annular shape around the optical axis of the lens module.

[0011] It should be understood that, in this embodiment, the sealing ring **40** is a serrated sealing rubber gasket, and a thickness h of the sealing rubber gasket has in a direction parallel to the optical axis OO' is adjusted depending upon the actual situation. During the assembling, the sealing ring **40** is placed in the groove **101**, the first lens **20** is positively engaged with the lens barrel from the object side and presses the sealing ring **40** with its surface close to an image side, and thus the sealing ring **40** is deformed to achieve a sealing effect. It should be noted that the features of the sealing ring **40** described in this embodiment are those of the sealing ring before the deformation.

[0012] Specifically, each first contacting portion **411** at the top surface **41** includes two oblique surfaces that extend from the top surface **41** towards the first lens **20** and intersect at an end facing away from the top surface **41**, where an angle θ_1 formed by the two oblique surfaces is an acute angle.

[0013] Preferably, the intersection position of the two oblique surfaces is formed as a rounded angle, which can increase a contact area between each first contacting portion **411** and the first lens **20**, thereby further preventing external debris from entering the lens barrel **10** via a connecting position between the lens barrel **10** and the first lens **20**. It should be noted that a curvature radius of the rounded angle is not greater than 0.5 mm, so that a width of the first contacting portion **411** is not excessively increased, thereby increasing a number of the first contacting portions **411** arranged on the top surface **41**.

[0014] It should be noted that an intersection line is formed by two oblique surfaces of each first contacting portion **411**, and a distance L_1 between any two adjacent intersection lines is not smaller than 0.05 mm but not larger than 0.8 mm. In this way, while avoiding an excessively dense distribution of the first contacting portions **411** on the top surface **41**, the path via which external debris enters the lens barrel **10** can be ensured to be as long as possible.

[0015] More preferably, the bottom surface **42** is provided with at least two second contacting portions **421** around the optical axis OO' of the first lens **20**. The second contacting portions **421** abut against the lens barrel **10**. In this way, the sealing between the sealing ring **40** and the lens barrel **10** can be increased, and the path via which external debris enters the lens barrel **10** from an image side of the sealing ring **40** can be lengthened.

[0016] Specifically, each second contacting portion **421** includes two oblique surfaces that extend from the bottom surface **42** towards the lens barrel **10** and intersect at an end

facing away from the bottom surface **42**, where an angle θ_2 formed by two oblique surfaces is an acute angle.

[0017] Preferably, an intersection position of the two oblique surfaces is formed as a rounded angle, which increases a contact area between each second contacting portion **421** and the lens barrel **10**, thereby further preventing external debris from entering the lens barrel **10** via the connecting position between the lens barrel **10** and the first lens **20**. Moreover, a curvature radius of the rounded angle is not larger than 0.5 mm.

[0018] More preferably, an intersection line is formed by two oblique surfaces of each second contacting portion **421**, and a distance L_2 between any two adjacent intersection lines is not smaller than 0.05 mm but not larger than 0.8 mm. In this way, while avoiding an excessively dense distribution of the second contacting portions **421** on the bottom surface **42**, the path via which external debris enters the lens barrel **10** can be ensured to be as long as possible.

[0019] It should be noted that, the lens module **100** is provided with threads **50** for fixedly connecting the barrel wall **11** with the fixing part **30**. In this embodiment, the fixing part **30** is a screw cap. During the assembling, the fixing part **30** is arranged at the object side of the lens barrel **10**, and an end of the lens barrel **10** close to the object side is screwed into the fixing part **30**, so as to tightly connect the fixing part **30** to the lens barrel **10**. In this way, it can prevent the first lens **20** arranged between the lens barrel **10** and the fixing part **30** from departing from the lens barrel **10**, and ensure a more stable fixation structure of the first lens **20**, the fixing part **30** and the lens barrel **10**, thereby further improving the reliability of the lens module **100**.

[0020] Preferably, the lens module **100** is further provided with a thermosetting glue **60** for fixedly connecting the barrel wall **11** with the fixing part **30**. The thermosetting glue **60** is provided at the connecting position between the lens barrel **10** and the fixing part **30** to reduce a probability of the failure of the threads **50**, thereby further improving the reliability of the lens module **100**. Meanwhile, the thermosetting glue **60** can prevent external debris from entering the lens module **100** via the connecting position between lens barrel **10** and the fixing part **30**, thereby further optimizing the sealing property of the lens module **100**.

[0021] It should be understood by those skilled in the art that the lens module **100** may further include at least one second lens **70** received in the lens barrel **10** and located at the image side of the first lens **20**.

[0022] It should be understood by those skilled in the art that the above embodiments are merely some specific embodiments of the present disclosure, and various changes in form and details may be made without departing from the scope of the present disclosure.

What is claimed is:

1. A lens module, comprising:

a lens barrel;

a first lens arranged at an object side of the lens barrel;

a fixing part for pressing the first lens against the lens barrel from an object side of the first lens; and

a sealing ring arranged between the lens barrel and the first lens,

wherein the sealing ring comprises a top surface directly facing the first lens and a bottom surface directly facing the lens barrel, the top surface is provided with at least two first contacting portions around an optical axis of the first lens, and the at least two first contacting portions abut against the first lens.

2. The lens module as described in claim **1**, wherein each of the at least two first contacting portions comprises two oblique surfaces that extend from the top surface towards the first lens and intersect at an end facing away from the top surface, an angle formed between the two oblique surfaces being an acute angle.

3. The lens module as described in claim **2**, wherein a rounded angle is formed at an intersection end of the two oblique surfaces.

4. The lens module as described in claim **3**, wherein a curvature radius of the rounded angle is smaller than or equal to 0.5 mm.

5. The lens module as described in claim **2**, wherein an intersection line is formed by the two oblique surfaces of each of the at least two first contacting portions, and a distance between any two adjacent intersection lines is greater than or equal to 0.05 mm, and smaller than or equal to 0.8 mm.

6. The lens module as described in claim **1**, wherein the bottom surface is provided with at least two second contacting portions around the optical axis of the first lens, and the at least two second contacting portions abut against the lens barrel.

7. The lens module as described in claim **6**, wherein each of the at least two second contacting portions comprises two oblique surfaces that extend from the bottom surface towards the lens barrel and intersect at an end facing away from the bottom surface, an angle formed between the two oblique surfaces is an acute angle.

8. The lens module as described in claim **7**, wherein a rounded angle is formed at an intersection end of the two oblique surfaces.

9. The lens module as described in claim **8**, wherein a curvature radius of the rounded angle is smaller than or equal to 0.5 mm.

10. The lens module as described in claim **7**, wherein an intersection line is formed by the two oblique surfaces of each of the at least two second contacting portions, and a distance between any two adjacent intersection line is greater than or equal to 0.05 mm, and smaller than or equal to 0.8 mm.

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