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(54) **LENS ELEMENT FACILITATING OPTICAL INSPECTION**

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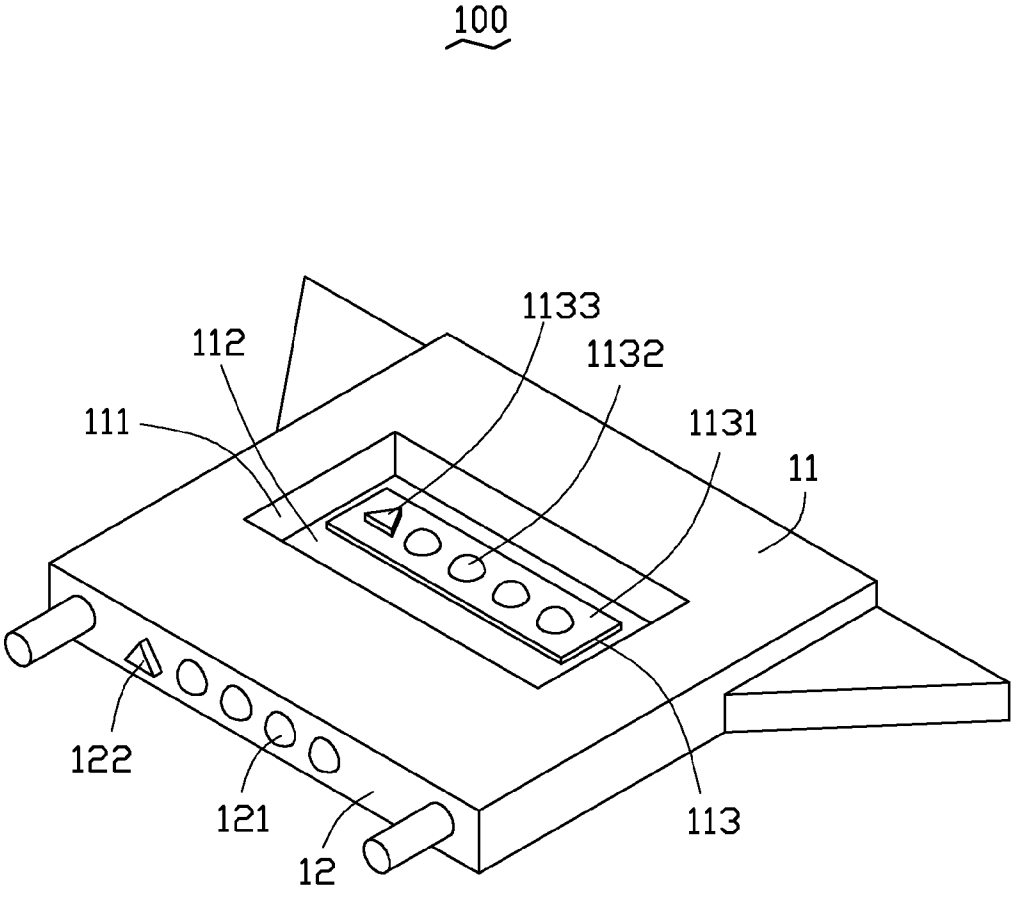
(57) **ABSTRACT**

A lens element includes a number of lenses and a mark. The lenses are substantially identical with each other in shape and size. The mark is different from the lenses in shape and size. The lenses and the mark are linearly arranged, with the mark located at an end of the lenses.



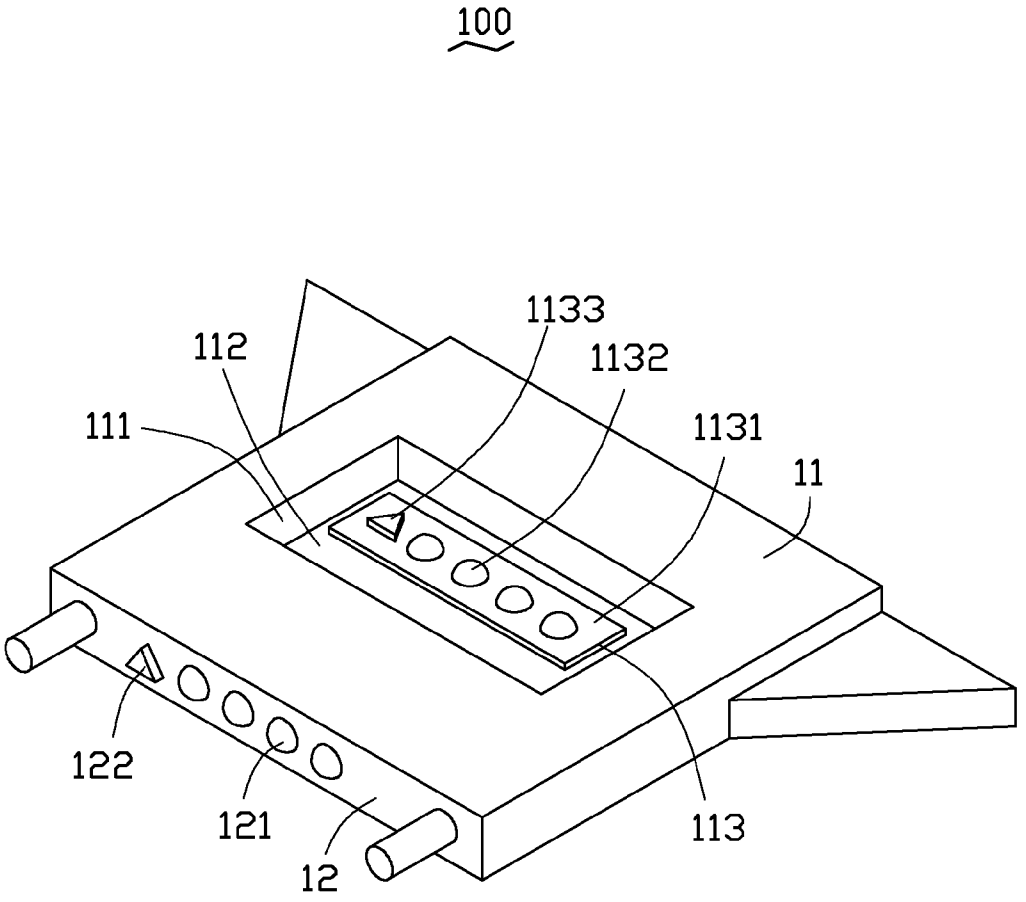


FIG. 1

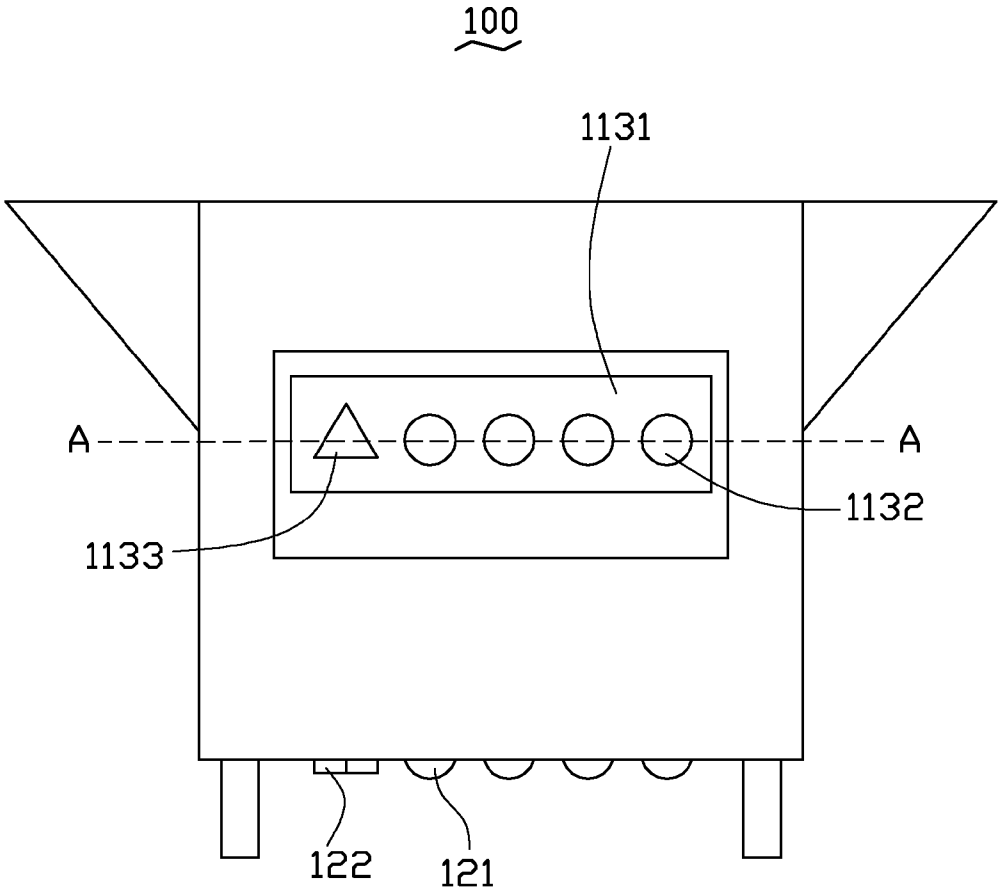


FIG. 2

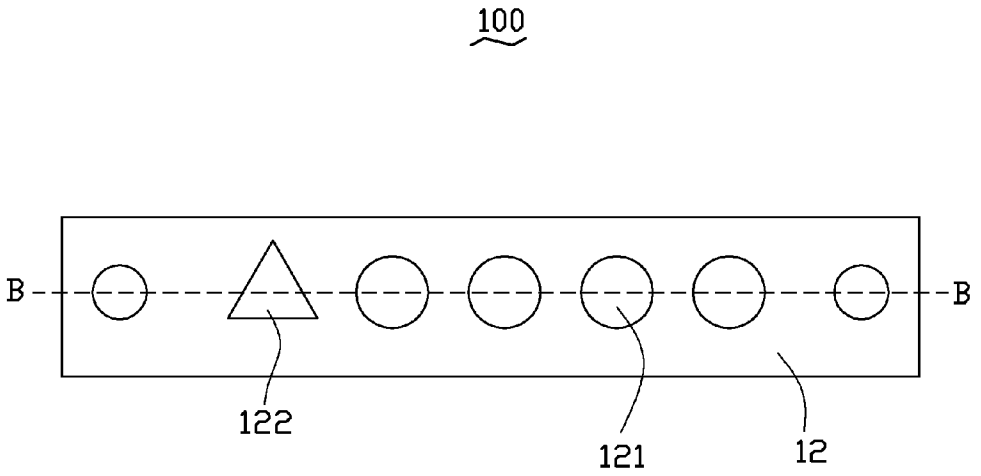


FIG. 3

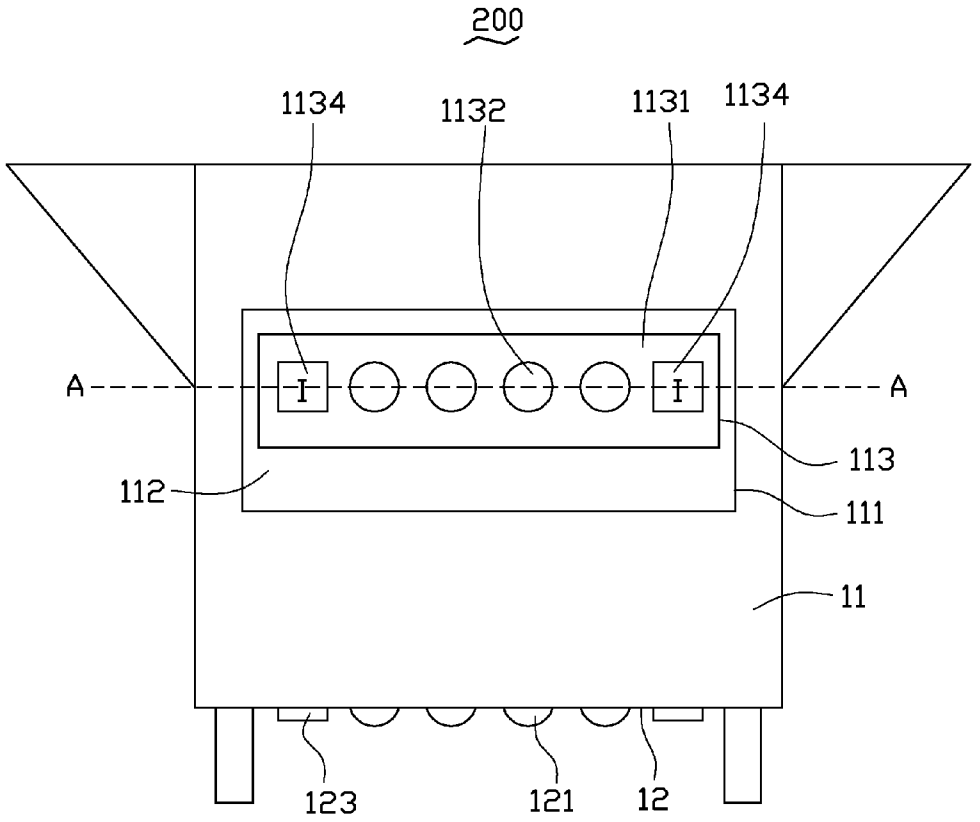


FIG. 4

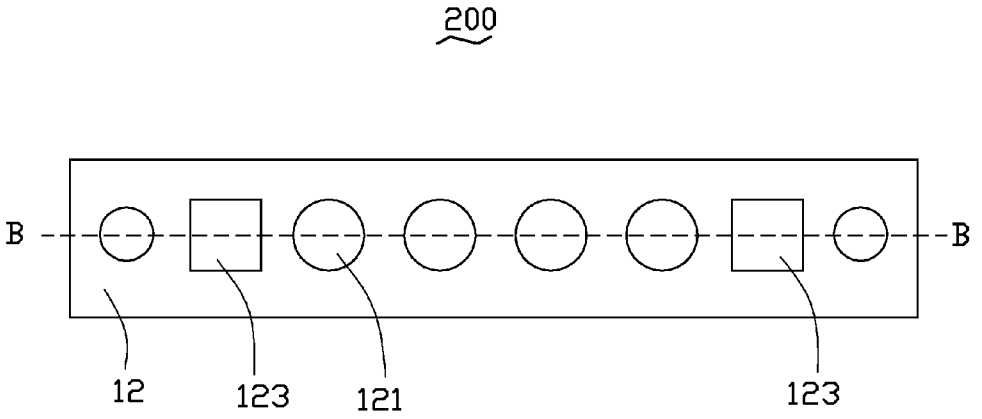


FIG. 5

LENS ELEMENT FACILITATING OPTICAL INSPECTION

BACKGROUND

[0001] 1. Technical Field

[0002] The present disclosure relates to optical connectors, and particularly to a lens element for use in an optical connector to facilitate optical inspection.

[0003] 2. Description of Related Art

[0004] Optical connectors include a number of photoelectric elements, a lens element, and a number of optical fibers. The lens element packages the photoelectric elements and forms a number of lenses to optically couple the photoelectric elements with the optical fibers that are arranged at a side of the lens element. To ensure high quality, the lenses are optically inspected to detect defects or contaminations. However, as the lenses are substantially identical in shape and size and are linearly arranged, it is difficult to recognize which lenses have been detected and which haven't.

[0005] Therefore, it is desirable to provide a lens element that can overcome the above-mentioned problems.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Many aspects of the present disclosure 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.

[0007] FIG. **1** is an isometric schematic view of a lens element, according to an embodiment.

[0008] FIG. **2** is a bottom view of the lens element of FIG. **1**.

[0009] FIG. **3** is a side view of the lens element of FIG. **1**.

[0010] FIG. **4** is a bottom view of a lens element, according to another embodiment.

[0011] FIG. **5** is a side view of the lens element of FIG. **4**.

DETAILED DESCRIPTION

[0012] Embodiments of the present disclosure will be described with reference to the drawings.

[0013] FIGS. **1-3** show a lens element **100**, according to an embodiment.

[0014] The lens element **100** can be made of transparent plastic by injection molding.

[0015] The lens element **100** is substantially rectangular and includes a first surface **11** and a second surface **12** substantially perpendicularly connected to the first surface **11**. The lens element **100** defines a substantially rectangular recess **111** in a central part of the first surface **11**. The lens element **100** also includes a substantially rectangular platform **113** extending up from a bottom surface **112** of the recess **111**.

[0016] The platform **113** includes a third surface **1131**. The first surface **11**, the bottom surface **112**, and the third surface **1131** are substantially parallel to each other, and long sides of the lens element **100**, the recess **112**, and the platform **1131** are substantially parallel to each other.

[0017] The lens element **100** also includes a number of internal lenses **1132** extending up from the third surface **1131** and a first mark **1133** formed on the third surface **1131**. The internal lenses **1132** are substantially identical to each other but are different from the first mark in shape and size. The internal lenses **1132** and the first mark **1133** are linearly arranged along a first line AA, with the first mark **1133** located at an end of the internal lenses **1132**.

[0018] The lens element **100** also includes a number of external lenses **121** extending out from the second surface **12** and a second mark **122** formed on the second surface **12**. The external lenses **121** are substantially identical to each other but are different from the second mark **122** in shape and size. The external lenses **121** and the second mark **122** are linearly arranged along a second line BB, with the second mark **122** located at an end of the external lenses **121**.

[0019] The internal lenses **1132** and the external lenses **121** are convex lenses. In this embodiment, a number of the internal lenses **1131** and the external lenses **121** is four, but the number is not limited to four. The external lenses **121** are optically coupled with the internal lenses **1132**.

[0020] The first mark **1133** and the second mark **122** are raised blocks shaped as equilateral triangles. In this embodiment, the first line AA and the second line BB pass through centers of the first mark **1133** and the second mark **122**, respectively. However, configurations, such as shapes and positions of the first mark **1133** and the second mark **122**, are not limited to this embodiment. In alternative embodiments, the first mark **1133** and the second mark **122** can be formed in a recess or take the form of other suitable shapes, such as a cross, for example.

[0021] The first mark **1133** and the second mark **122** serve as reference points for inspectors when inspecting the internal lenses **1132** and **121**.

[0022] In alternative embodiments, only the internal lenses **1132** with the first mark **1133** or the external lenses **121** with the second mark **122** are employed.

[0023] Referring to FIGS. **4-5**, a lens element **200**, according to another embodiment, is substantially similar to the lens element **100**, except that instead of the first mark **1133** and the second mark **122**, the lens element **200** includes a pair of third marks **1134** and a pair of fourth marks **123**. The third marks **1134** are square blocks and are located at two outermost sides of the internal lenses **1132**, and the fourth marks **123** are square blocks and are located at two outermost sides of the external lenses **121**. Each of the third marks **1134** and the fourth marks **123** forms a character, such as "1," on an upper surface of it. The characters on the third marks **1134** are identical in orientation, and the characters on the fourth marks **123** are identical in orientation. As such, the third marks and the fourth marks serve as reference points to assist inspectors in recognizing the internal lenses **1132** and the external lenses **121**, respectively.

[0024] It will be understood that the above particular embodiments are shown and described by way of illustration only. The principles and the features of the present disclosure may be employed in various and numerous embodiments thereof without departing from the scope of the disclosure. The above-described embodiments illustrate the possible scope of the disclosure but do not restrict the scope of the disclosure.

What is claimed is:

1. A lens element comprising:

a plurality of lenses substantially identical with each other in shape and size; and

a mark different from the lenses in shape and size;

wherein the lenses and the mark are linearly arranged and the mark is located at an outermost side of the lenses.

2. The lens element of claim **1**, wherein the lens element is substantially rectangular and comprises a first surface and a

second surface perpendicular to the first surface, the lens element defines a recess in the first surface and comprises a platform extending up from a bottom surface of the recess, the platform comprises a third surface, and the lenses and the marks are positioned on the second surface or the third surface.

3. The lens element of claim **1**, comprising another mark, the marks being located at two opposite outermost sides of the lenses, each mark forming a character on an upper surface thereof, orientations of the characters being identical with each other.

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