as the focus plane of the lens module would lie far-off the image sensor plane. However, for an economical production of such optical devices it is essential that as few rejects occur as possible. To reduce the mentioned fabrication tolerances the production process can only be improved to a limited degree. Hence, other ways have to be found to reduce the amount of rejected components.

It is known from the state of the art that lenses are assembled into a barrel and mount and are then focused after assembly on the image sensor. This approach has the drawback of additionally assembly costs, which are caused by the focusing step. A further disadvantage is the large camera footprint since the barrel/mount solution is usually bigger. Further, this method has the risk of so-called "foreign material" on the image sensor. This, because particles of the barrel/mount could fall onto the sensor during the focusing operation.

It is also known from the state of the art to assemble a lens at a fixed focus distance, e.g. by means of a bottom spacer or a mount with a fixed height for all lenses. This method overcomes the disadvantages of the above mentioned approach but has the risk that if the lenses in a production batch have a certain distribution in their FFL's (caused by regular fabrication tolerances), many of the assembled lenses would not be in focus and hence the yield could be quite low.

DESCRIPTION OF THE INVENTION

Embodiments~~It is an object~~ of the present invention seek to provide an economical method for manufacturing a plurality of optical devices for cameras with as little rejects as possible. Embodiments~~It is further an object~~ of the invention also seek to provide a plurality of optical devices for such cameras which are produced with the manufacturing method according to embodiments of the invention.

According to a first aspect of the invention, there is provided a method of manufacturing a plurality of optical devices for cameras, each optical device having a fix focus lens module and a mount element for assembling with an image sensor comprising an image sensor plane, wherein the lens modules are designed for cameras with identical design, each fix focus lens module comprising one or more lenses or lens parts, the method comprises the steps of:

- manufacturing a plurality of lens modules, wherein the lens modules are replicated on wafer scale, and wherein the replication process comprises molding or embossing;
- determining a lens module focusing parameter value (FP) for each lens module;
- providing and allocating mount elements to the lens modules, whereas the mount elements are to be arranged within the optical devices to define a fixed separation distance between the lens modules and the image sensor plane, the mount elements having variable mount section lengths by means of which the geometrical distance between the lens module and the image sensor plane is adjusted for each lens module individually or in groups dependent on the optical properties of the lens modules, to compensate the variation of the lens module focusing parameter values between the plurality of lens modules, so that the focal plane of the lens modules falls into the image plane, particularly the image sensor plane, or lies within the depth of focus of the camera containing the optical device;
- assembling the lens modules and the mount elements in order to form optical devices.

According to a second aspect of the invention, there is provided a plurality of optical devices, in particular for cameras, preferably manufactured with the method according to the first aspect, wherein the optical devices each comprise a lens module and a mount element, wherein the lens modules are designed for cameras with identical design, and the lens modules are replicated on wafer scale, wherein the replication process comprises molding or embossing, and the lens modules of at least two optical devices have different lens module focusing parameter values, particularly flange focal lengths (FFL), and wherein the mount elements of the optical devices have variable mount section lengths, and the mount section length of the corresponding mount element is adapted to the focusing parameter value, particularly flange focal length (FFL) of the corresponding optical device, so that the focal plane of the lens module falls into an image plane, particularly the image sensor plane of an optoelectronic unit to be brought in operative connection with the optical device or lies within the depth of focus of a camera containing the optical device.

~~These objects are achieved by a method according to claim 1 and optical devices according to claim 10.~~ Further, preferred embodiments are evident from the dependent patent claims. Features of the method claims may be combined with features of the device claims and vice versa.

As already mentioned above, each optical device comprises a fix focus lens module with one or more lenses or lens parts. The fix focus lens module is for assembling with an optoelectronic unit having an image sensor with an image sensor plane.

The optoelectronic unit can be part oft the optical device according to the definition in this patent application. Sensor elements are arranged on the image sensor plane of the image sensor. The light is directed through the lens module to the image sensor plane and impinges on the sensor elements. It is therefore important that the light is correctly directed to the sensor plane. The image sensor may comprise arrays of pixel, i.e. arrays of sensing elements. The image sensor can e.g. be an Active Pixel Sensor (APS), also called CMOS-Sensor, or a CCD Sensor.

A method of manufacturing a plurality of optical devices for cameras according to an embodiment of the invention may ~~The method~~ comprises ~~now~~ the following steps:

- manufacturing a plurality of lens modules;
- determining a lens module focusing parameter value for each lens module;
- providing and allocating mount elements to the lens modules, whereas the mount elements are to be arranged within the optical devices to define a fixed separation distance between the lens modules and the image sensor plane, the mount elements having variable mount section lengths by means of which the geometrical distance between the lens module and the image sensor plane is adjusted for each lens module individually or in groups dependent on the optical properties of the lens modules, to compensate the variation of the lens module focusing parameter values between the plurality of lens modules, so that the focal planes of the lens modules falls into an image plane, particularly the image sensor plane or lie within the depth of focus of the camera containing the optical device;