

A LIGHT DETECTION ARRANGEMENT AND A METHOD FOR DETECTING LIGHT IN A LIGHT DETECTION ARRANGEMENT

Technical Field

[0001] Embodiments relate to a light detection arrangement and a method for detecting light in a light detection arrangement.

Background

[0002] Semiconductor devices, such as integrated circuit chips, may be electronically connected to leads on a lead frame by a process known as wire bonding. The wire bonding process involves adopting a wire to connect pads residing on a chip or die to a lead in a lead frame. Once the chip and lead frame have been wire bonded, the chip and lead frame may be further packaged in ceramic or plastic to form an integrated circuit device.

[0003] In many cases, an inspection of the quality of the wire bond may be performed manually by a human operator using a microscope. However, this manual method may be time consuming and costly. Having said that, it may be desired to perform an automatic wire bond inspection. However, a number of challenges may need to be addressed for the automatic wire bond inspection. For example, due to a relatively high specularity of the wires on the lead frame, illumination may need to be designed so as to minimize the specularity on the respective surfaces of the wires and the lead frame to ensure a relatively accurate measurement. At the same time, good contrasts on other

respective surfaces such as die surface and bond surface shall also be desired so as to be able to carry out two-dimensional (2D) measurements.

[0004] While there may not be any standard illumination systems available in the market for stereo vision system, some examples of the state of the art illumination systems adopted may include a co-axial light, a dome light, a ring light, a combination of the dome light and the co-axial light or other combinations thereof.

[0005] Having said that, there may be some issues faced when adopting the state of the art illumination systems. These issues may include a relatively low contrast between the chip and the wire bond, a difficulty in extracting an object information for a three-dimensional (3D) calculation and a limited intensity tuning range of some of the illumination systems.

[0006] Therefore, there is a need for an alternative illumination system which may be able to provide a uniform illumination for the object surface to be inspected while at the same time enhance the contrast between the die surface and the wire bond.

Summary

[0007] In various embodiments, a light detection arrangement may be provided. The light detection arrangement may include a body structure configured to provide light, the body structure including a first light-transmissive portion and a second light-transmissive portion disposed at a distance from the first light-transmissive portion; an object receiving region arranged such that light provided by the body structure may be illuminating at least a portion of the object receiving region; a first camera having a first main optical axis; a second camera having a second main optical axis; wherein the body

structure may be arranged between the first camera and the second camera on its one side and the object receiving region on its other side; wherein the first camera may be arranged such that its first main optical axis may be directed to the object receiving region via the first light-transmissive portion; wherein the second camera may be arranged such that its second main optical axis may be directed to the object receiving region via the second light-transmissive portion; an arrangement configured to provide light reflected from the object receiving region such that a first reflected light portion may be provided as a first co-axial light portion aligned to the first main optical axis, and such that a second reflected light portion may be provided as a second co-axial light portion aligned to the second main optical axis.

[0008] In various embodiments, a method for detecting light in a light detection arrangement may be provided. The light detection arrangement may include a body structure configured to provide light, the body structure including a first light-transmissive portion and a second light-transmissive portion disposed at a distance from the first light-transmissive portion; an object receiving region arranged such that light provided by the body structure may be illuminating at least a portion of the object receiving region; a first camera having a first main optical axis; a second camera having a second main optical axis; wherein the body structure may be arranged between the first camera and the second camera on its one side and the object receiving region on its other side; wherein the first camera may be arranged such that its first main optical axis may be directed to the object receiving region via the first light-transmissive portion; wherein the second camera may be arranged such that its second main optical axis may be directed to the object receiving region via the second light-transmissive portion; the method may

include providing light reflected from the object receiving region such that a first reflected light portion may be provided as a first co-axial light portion aligned to the first main optical axis, and such that a second reflected light portion may be provided as a second co-axial light portion aligned to the second main optical axis.

Brief Description of the Drawings

[0009] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of various embodiments. In the following description, various embodiments of the invention are described with reference to the following drawings, in which:

FIG. 1A shows a front view of a light detection arrangement, the light detection arrangement including a first light source, a second light source, a first beam splitter and a second beam splitter according to an embodiment;

FIG. 1B shows a front view of a light detection system, the light detection system including the light detection arrangement of FIG. 1A according to an embodiment;

FIG. 2A shows a front view of a light detection arrangement, the light detection arrangement including a body structure with a cutout portion according to an embodiment;

FIG. 2B shows a top view of the body structure with the cutout portion of FIG. 2A according to an embodiment

FIG. 3 shows a perspective view of a prototype of the light detection arrangement of FIG. 2A according to an embodiment;

FIG. 4A shows a left image obtained with the prototype of the light detection arrangement of FIG. 3 according to an embodiment;

FIG. 4B shows a right image obtained with the prototype of the light detection arrangement of FIG. 3 according to an embodiment;

FIG. 5A shows a front view of a light detection arrangement, the light detection arrangement including a beam splitter arrangement arranged on the same side of a body structure as an object receiving region according to an embodiment;

FIG. 5B shows a side view of the light detection arrangement of FIG. 5A according to an embodiment;

FIG. 6 shows a perspective view of a prototype of a light detection arrangement of FIG. 5A according to an embodiment;

FIG. 7A shows a left image obtained with the prototype of the light detection arrangement of FIG. 5A according to an embodiment;

FIG. 7B shows a right image obtained with the prototype of the light detection arrangement of FIG. 5A according to an embodiment;

FIG. 8A shows a front view of a light detection arrangement, the light detection arrangement including a bar shaped light source according to an embodiment;

FIG. 8B shows a side view of the light detection arrangement of FIG. 8A according to an embodiment;

FIG. 9A shows a front view of a light detection arrangement, the light detection arrangement including an arc shaped light source according to an embodiment;

FIG. 9B shows a top view of the arc shape light source of FIG. 9A according to an embodiment;

FIG. 10A shows a front view of a light detection arrangement, the light detection arrangement including a blue color dichroic mirror and a red color dichroic mirror according to an embodiment;

FIG. 10B shows a top view of the light detection arrangement of FIG. 10A according to an embodiment; and

FIG. 11 shows a flow-chart of a method for detecting light in a light detection arrangement according to an embodiment.

Description

[0010] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details and embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention. Other embodiments may be utilized and structural, logical, and electrical changes may be made without departing from the scope of the invention. The various embodiments are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments.

[0011] The word "exemplary" is used herein to mean "serving as an example, instance, or illustration". Any embodiment or design described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments or designs.

[0012] An embodiment may provide a light detection arrangement. The light detection arrangement may include a body structure configured to provide light, the body structure including a first light-transmissive portion and a second light-transmissive portion disposed at a distance from the first light-transmissive portion; an object receiving region arranged such that light provided by the body structure may be illuminating at least a portion of the object receiving region; a first camera having a first main optical axis; a second camera having a second main optical axis; wherein the body structure may be arranged between the first camera and the second camera on its one side and the object receiving region on its other side; wherein the first camera may be arranged such that its first main optical axis may be directed to the object receiving region via the first light-transmissive portion; wherein the second camera may be arranged such that its second main optical axis may be directed to the object receiving region via the second light-transmissive portion; an arrangement configured to provide light reflected from the object receiving region such that a first reflected light portion may be provided as a first co-axial light portion aligned to the first main optical axis, and such that a second reflected light portion may be provided as a second co-axial light portion aligned to the second main optical axis. The distance between the first light-transmissive portion and the second light-transmissive portion may vary according to design and user requirements.

[0013] In an embodiment, each of the first light-transmissive portion and the second light-transmissive portion may be configured to at least allow some light to pass through. For example, each of the first light-transmissive portion and the second light-transmissive

portion may be translucent. Alternatively, each of the first light-transmissive portion and the second light-transmissive portion may be configured to be transparent. For example, the first light-transmissive portion and the second light-transmissive portion may be formed as two separate openings or as a single opening.

[0014] In an embodiment, the body structure may have a dome shape. The dome shape may include a radius of between about 40 mm to about 45 mm, for example. The dome shape may be sized so as to accommodate the object to be arranged in the object receiving region and at least one body structure illuminating light source. The body structure may include a dome light, for example. The body structure may also include any other light source as long as the light source may provide uniform illumination on the object receiving region.

[0015] In an embodiment, the light detection arrangement may further include a structure having the first light-transmissive portion and the second light-transmissive portion, wherein the body structure has a cutout portion and the structure is arranged in the cutout portion. The structure may be made of a material which may not allow the through passage of light. For example, the structure may include a rectangular plate or a diffused white plastic sheet.

[0016] In an embodiment, at least a portion of an inner surface of the body structure facing the object receiving region may have a reflective surface.

[0017] In an embodiment, at least a portion of an inner surface of the body structure facing the object receiving region may be configured to generate light.

[0018] In an embodiment, the at least a portion of an inner surface of the body structure facing the object receiving region may include a light generating coating and/or a plurality of organic light emitting diodes.

[0019] In an embodiment, the light detection arrangement may further include at least one body structure illuminating light source arranged to illuminate at least a portion of an inner surface of the body structure. The at least one body structure illuminating light source may be positioned within the body structure or positioned outside of the body structure.

[0020] In an embodiment, the at least one body structure illuminating light source may include a plurality of lamps.

[0021] In an embodiment, the plurality of lamps may include a light emitting diode array.

[0022] In an embodiment, the plurality of lamps may include a diffuser or a diffuse light source.

[0023] In an embodiment, the arrangement may include a light arrangement.

[0024] In an embodiment, the light arrangement may include a first light source and a second light source. The first light source may be arranged to direct light through the first light-transmissive portion to the object receiving region and/or the second light source may be arranged to direct light through the second light-transmissive portion to the object receiving region.

[0025] In an embodiment, the first light source and the second light source may be arranged such that a light axis of the light emitted by the first light source may be substantially parallel with the first main optical axis and that a light axis of the light

emitted by the second light source may be substantially parallel with the second main optical axis.

[0026] In an embodiment, the first light source and/or the second light source may include a plurality of lamps.

[0027] In an embodiment, the plurality of lamps may include a light emitting diode array.

[0028] In an embodiment, the first light source and/or the second light source may be a disperse light beam or a focused light beam.

[0029] In an embodiment, the light arrangement may include a light source being selected from a group of light sources consisting of an arc shaped light source, a bar shaped light source, and a diffuser.

[0030] In an embodiment, the arrangement may include a beam splitter arrangement.

[0031] In an embodiment, the beam splitter arrangement may be arranged on the same side of the body structure as the first camera and the second camera.

[0032] In an embodiment, the beam splitter arrangement may include a first beam splitter and a second beam splitter.

[0033] In an embodiment, the arrangement may include a light arrangement, the light arrangement including a first light source and a second light source; wherein the first beam splitter may be arranged relative to the first light source and the first camera such that the first beam splitter may be configured to receive the light provided by the first light source and to re-direct the light to the object receiving region via the first light-transmissive portion, thereby generating the second reflected light portion; and wherein the second beam splitter may be arranged relative to the second light source and the

second camera such that the second beam splitter may be configured to receive the light provided by the second light source and to re-direct the light to the object receiving region via the second light-transmissive portion, thereby generating the first reflected light portion.

[0034] In an embodiment, the arrangement may include a light arrangement; and wherein the beam splitter arrangement may be arranged relative to the light arrangement and both the first camera and the second camera such that the beam splitter arrangement may be configured to receive the light provided by the light arrangement and to re-direct the light to the object receiving region via the respective first light-transmissive portion and the second light-transmissive portion to generate the second reflected light portion and the first reflected light portion from the received light.

[0035] In an embodiment, the beam splitter arrangement may be arranged on the same side of the body structure as the object receiving region.

[0036] In an embodiment, the beam splitter arrangement may be configured to receive the light provided by the inner surface of the body structure, and to generate the first reflected light portion and the second reflected light portion from the received light.

[0037] In an embodiment, the beam splitter arrangement may include a single beam splitter configured such that the first reflected light portion may be provided as the first co-axial light portion aligned to the first main optical axis and such that the second reflected light portion may be provided as the second co-axial light portion aligned to the second main optical axis.

[0038] In an embodiment, the first camera and the second camera may be arranged along a common camera plane.

[0039] In an embodiment, the single beam splitter may be arranged at a substantially 45 degree angle with respect to the common camera plane.

[0040] In an embodiment, the arrangement may include a first dichroic mirror of a first wavelength arranged in a light path along the first main optical axis and a second dichroic mirror of a second wavelength arranged in a light path along the second main optical axis.

[0041] In an embodiment, the first dichroic mirror may be arranged in the first light-transmissive portion or on the one side of the body structure overlapping the first light-transmissive portion and wherein the second dichroic mirror may be arranged in the second light-transmissive portion or on the one side of the body structure overlapping the second light-transmissive portion.

[0042] In an embodiment, the first dichroic mirror may be a blue color dichroic mirror and the second dichroic mirror may be a red color dichroic mirror; or wherein the second dichroic mirror may be a blue color dichroic mirror and the first dichroic mirror may be a red color dichroic mirror.

[0043] In an embodiment, the light detection arrangement may further include a light separating structure. The light separating structure may include a opaque material for example a black paper so as to prevent the light from the first light source from interfering with the light from the second light source.

[0044] In an embodiment, the light separating structure may be arranged between the first light source and the second light source, or between the beam splitter arrangement and the at least one body structure illuminating light source.

[0045] In an embodiment, the light detection arrangement may further include an object arranged in the object receiving region.

[0046] In an embodiment, the object may be a die or a chip.

[0047] In an embodiment, the die may include a plurality of bonding structures. The plurality of bonding structures may include a plurality of bond pads and a plurality of wire bonds. Each of the plurality of bond wire may be configured to connect each of the plurality of bond pads to the die.

[0048] In an embodiment, the first camera and the second camera may be arranged in a manner such that the first main optical axis and the second main optical axis may be axial symmetric with respect to a symmetry axis being perpendicular to a plane defined by the object receiving region.

[0049] In an embodiment, each of the first camera and the second camera may be arranged at a same camera angle (α) with respect to the symmetry axis. Further, each of the first beam splitter and the second beam splitter may be arranged at a same beam splitter angle (β) with respect to the symmetry axis. The difference between the beam splitter angle and the camera angle is about 45° . Correspondingly, the first beam splitter and the second beam splitter may be arranged at a combined beam splitter angle of $90^\circ + 2\alpha$.

[0050] In an embodiment, the arrangement configured to provide light reflected from the object receiving region may compensate for the light provided by the body structure and escaping through the first light-transmissive portion and the second light-transmissive portion.

[0051] An embodiment may provide a method for detecting light in a light detection arrangement, the light detection arrangement may include a body structure configured to provide light, the body structure including a first light-transmissive portion and a second light-transmissive portion disposed at a distance from the first light-transmissive portion; an object receiving region arranged such that light provided by the body structure may be illuminating at least a portion of the object receiving region; a first camera having a first main optical axis; a second camera having a second main optical axis; wherein the body structure may be arranged between the first camera and the second camera on its one side and the object receiving region on its other side; wherein the first camera may be arranged such that its first main optical axis may be directed to the object receiving region; wherein the second camera may be arranged such that its second main optical axis may be directed to the object receiving region; the method may include providing light reflected from the object receiving region such that a first reflected light portion may be provided as a first co-axial light portion aligned to the first main optical axis, and such that a second reflected light portion may be provided as a second co-axial light portion aligned to the second main optical axis.

[0052] In an embodiment, when light from the first light source may be incident on the first beam splitter, light may be re-directed in two directions. The light separating structure may serve to absorb light in one direction and the light in the other direction may be reflected off the object arranged in the object receiving region. The second camera may be positioned to receive this reflected light. Similarly, for light from the second light source, the arrangement may be such that the light originating from the second light source may be either essentially absorbed by the light separating structure

and/or be reflected off the object arranged in the object receiving region and thereafter being sensed by the first camera.

[0053] FIG. 1A shows a front view of a light detection arrangement 102, the light detection arrangement 102 including a first light source 104, a second light source 106, a first beam splitter 108 and a second beam splitter 110 according to an embodiment.

[0054] The light detection arrangement 102 may include a body structure 112 configured to provide light, the body structure 112 including a first light-transmissive portion 114 and a second light-transmissive portion 116 disposed at a distance from the first light-transmissive portion 114. The distance between the first light-transmissive portion 114 and the second light-transmissive portion 116 may vary according to design and user requirements. The light detection arrangement 102 may further include an object receiving region 118 arranged such that light provided by the body structure 112 may be illuminating at least a portion of the object receiving region 118.

[0055] The light detection arrangement 102 may further include a first camera 120 having a first main optical axis 122 and a second camera 124 having a second main optical axis 126. The body structure 112 may be arranged between the first camera 120 and the second camera 124 on its one side and the object receiving region 118 on its other side.

[0056] The first camera 120 may be arranged such that its first main optical axis 122 may be directed to the object receiving region 118 via the first light-transmissive portion 114 and the second camera 124 may be arranged such that its second main optical axis 126 may be directed to the object receiving region 118 via the second light-transmissive portion 116.

[0057] The light detection arrangement 102 may further include an arrangement 128 configured to provide light reflected from the object receiving region 118 such that a first reflected light portion 130 may be provided as a first co-axial light portion 132 aligned to the first main optical axis 122, and such that a second reflected light portion 134 may be provided as a second co-axial light portion 136 aligned to the second main optical axis 126. The arrangement 128 may help to generate a good illumination contrast between the die and the bond wire on an image captured by the second camera 124.

[0058] Each of the first light-transmissive portion 114 and the second light-transmissive portion 116 may be configured to at least allow some light to pass through or be translucent. Alternatively, each of the first light-transmissive portion 114 and the second light-transmissive portion 116 may be configured to be transparent. For example, the first light-transmissive portion 114 and the second light-transmissive portion 116 may be formed as two separate openings or as a single opening.

[0059] In FIG. 1A, the body structure 112 may have a dome shape. The dome shape may include a radius of between about 40 mm to about 45 mm, for example. The body structure 112 may include a dome light, for example.

[0060] In an embodiment, at least a portion of an inner surface 138 of the body structure 112 facing the object receiving region 118 may have a reflective surface. At least a portion of an inner surface 138 of the body structure 112 facing the object receiving region 118 may also be configured to generate light. The at least a portion of an inner surface 138 of the body structure 112 facing the object receiving region 118 may include a light generating coating and/or a plurality of organic light emitting diodes.

[0061] In FIG. 1A, the light detection arrangement 102 may further include a plurality of body structure illuminating light sources 140 arranged to illuminate at least a portion of an inner surface 138 of the body structure 112. The plurality of body structure illuminating light sources 140 may be positioned within the body structure 112.

[0062] The plurality of body structure illuminating light sources 140 may include a plurality of lamps. The plurality of lamps may include a light emitting diode array; in alternative embodiments, the plurality of lamps may include any other suitable light generating devices such as e.g. organic light emitting diodes. The plurality of lamps may include a diffuser.

[0063] In FIG. 1A, the arrangement 128 may include a light arrangement 142. The light arrangement 142 may include the first light source 104 and the second light source 106. The first light source 104 may be arranged to direct light through the first light-transmissive portion 114 to the object receiving region 118 and/or the second light source 106 may be arranged to direct light through the second light-transmissive portion 116 to the object receiving region 118.

[0064] The first light source 104 and/or the second light source 106 may include co-axial light sources. The first light source 104 and/or the second light source 106 may include a focused light beam or a disperse light source, for example a plurality of lamps. The plurality of lamps may include a light emitting diode array; in alternative embodiments, the plurality of lamps may include any other suitable light generating devices such as e.g. organic light emitting diodes.

[0065] In FIG. 1A, the arrangement 128 may further include a beam splitter arrangement 148. The beam splitter arrangement 148 may be arranged on the same side

of the body structure 112 as the first camera 120 and the second camera 124. The beam splitter arrangement 148 may include the first beam splitter 108 and the second beam splitter 110. It is to be noted that the arrangement 128 may include any other suitable device configured to re-direct light such that light may be directed to the object receiving region 118 or to the first camera 120 or to the second camera 124, as desired.

[0066] The first beam splitter 108 may be arranged relative to the first light source 104 and the first camera 120 such that the first beam splitter 108 may be configured to receive the light provided by the first light source 104 and to re-direct the light to the object receiving region 118 via the first light-transmissive portion 114, thereby generating the second reflected light portion 134. The second reflected light portion 134 may be substantially aligned with the second major optical axis 126 such that the second camera 124 detects more of the second reflected light portion 134 than the first camera 120. In addition, the second beam splitter 110 may be arranged relative to the second light source 106 and the second camera 124 such that the second beam splitter 110 may be configured to receive the light provided by the second light source 106 and to re-direct the light to the object receiving region 118 via the second light-transmissive portion 116, thereby generating the first reflected light portion 130. The first reflected light portion 130 may be substantially aligned with the first major optical axis 122 such that the first camera 120 detects more of the first reflected light portion 130 than the second camera 124.

[0067] In FIG. 1A, the light detection arrangement 102 may further include a light separating structure 154. The light separating structure 154 may be arranged between the first light source 104 and the second light source 106. The light separating structure 154

may include a opaque material for example a black paper so as to prevent the light from the first light source 104 from interfering with the light from the second light source 106.

[0068] In FIG. 1A, an object 156 may be arranged in the object receiving region 118. The object 156 may be a die (e.g. a semiconductor die); in alternative embodiments, the object 156 may e.g. be any kind of substrate or carrier, e.g. a wafer including a plurality of dies. The die may include a plurality of bonding structures.

[0069] In FIG. 1A, the first camera 120 and the second camera 124 may be arranged in a manner such that the first main optical axis 122 and the second main optical axis 126 may be axial symmetric with respect to a symmetry axis 190 being perpendicular to a plane 158 defined by the object receiving region 118.

[0070] Each of the first camera 120 and the second camera 124 may be arranged at a same camera angle (α) with respect to the symmetry axis 190. Further, each of the first beam splitter 108 and the second beam splitter 110 may be arranged at a same beam splitter angle (β) with respect to the symmetry axis 190. The difference between the beam splitter angle and the camera angle may be about 45° . Correspondingly, the first beam splitter 108 and the second beam splitter 110 may be arranged at a combined beam splitter angle of $90^\circ + 2\alpha$.

[0071] FIG. 1B shows a front view of a light detection system 192, the light detection system 192 including the light detection arrangement 102 of FIG. 1A according to an embodiment.

[0072] The light detection system 192 may include an input 160, an output 162, a controlling or processing device 164 and the light detection arrangement 102 of FIG. 1A. The input 160 may include a keyboard and the output 162 may include a display. The

controlling or processing device 164 may serve to control the light detection arrangement 102 and may include a processor 166 (e.g. a (e.g. programmable) microprocessor or any kind of programmable or hard-wired logic) and a memory 168.

[0073] When in use, the user may provide the input 160 to the controlling or processing device 164 so as to control the light detection arrangement 102. Data may be received from the light detection arrangement 102 and then stored in the memory 168. The processor 166 may then process the data stored in the memory 168 so as achieve a desired image data to be displayed on the output 162.

[0074] FIG. 2A shows a front view of a light detection arrangement 102, the light detection arrangement 102 including a body structure 112 with a cutout portion 170 according to an embodiment and FIG. 2B shows a top view of the body structure 112 with the cutout portion 170 of FIG. 2A according to an embodiment

[0075] In FIGs. 2A and 2B, the light detection arrangement 102 may include the body structure 112 configured to provide light, the body structure 112 including a first light-transmissive portion 114 and a second light-transmissive portion 116 disposed at a distance from the first light-transmissive portion 114. The distance between the first light-transmissive portion 114 and the second light-transmissive portion 116 may vary according to design and user requirements.

[0076] The light detection arrangement 102 may further include an object receiving region 118 arranged such that light provided by the body structure 112 may be illuminating at least a portion of the object receiving region 118.

[0077] The light detection arrangement 102 may further include a first camera 120 having a first main optical axis 122 and a second camera 124 having a second main

optical axis 126 and the body structure 112 may be arranged between the first camera 120 and the second camera 124 on its one side and the object receiving region 118 on its other side.

[0078] The first camera 120 may be arranged such that its first main optical axis 122 may be directed to the object receiving region 118 via the first light-transmissive portion 114 and the second camera 124 may be arranged such that its second main optical axis 126 may be directed to the object receiving region 118 via the second light-transmissive portion 116.

[0079] The light detection arrangement 102 may further include an arrangement 128 configured to provide light reflected from the object receiving region 118 such that a first reflected light portion 130 may be provided as a first co-axial light portion 132 aligned to the first main optical axis 122, and such that a second reflected light portion 134 may be provided as a second co-axial light portion 136 aligned to the second main optical axis 126.

[0080] Unlike the light detection arrangement 102 as shown in FIG. 1A, the light detection arrangement 102 as shown in FIGs. 2A and 2B may further include a structure 172 having a first light-transmissive portion 114 and a second light-transmissive portion 116. The body structure 112 may include the cutout portion 170 and the structure 172 may be arranged in the cutout portion 170. As an example, the structure 172 having the first light-transmissive portion 114 and the second light-transmissive portion 116 may include a rectangular plate or a plate with any suitable shape matching the shape of the cutout portion 170. Alternatively, the structure 172 may include a diffused white plastic sheet.

[0081] In addition, to eliminate multiple reflections between the first beam splitter 108 and the second beam splitter 110 which may reach the first camera 120 and the second camera 124, and thereby causing possible artifacts (i.e. errors in the image presented by the camera caused by reflections, for example), the light detection arrangement 102 may include a light separating structure 154. The light separating structure 154 may be positioned between the first beam splitter 108 or the second beam splitter 110, or indirectly between the first light source 104 and the second light source 106.

[0082] Compared with the embodiment according to FIG. 1A, the embodiment according to FIG. 2A may have a more compact or integrated design. Such a design is of particular advantage if commercially available co-axial light sources may be used. As an example, it may not be allowable to use two commercially available co-axial light sources in the embodiment according to FIG. 1A due to a limited working distance of lens of the two co-axial light sources. Further, there may not be sufficient space to include the two co-axial light sources above the dome light. An integrated design of the lighting according to FIGs. 2A and 2B may solve this.

[0083] To accommodate the integrated design of the lighting, the dome light may be cut a rectangular window which may be wider than the combined width of separate first beam splitter 108 and second beam splitter 110 so that an integrated first beam splitter 108 and second beam splitter 110 may be located lower than the ceiling of the dome light.

[0084] To serve both as a support to the integrated first beam splitter 108 and the second beam splitter 110 and to reduce the loss of the dome light due to the cutting of the

dome light, the structure 172 or the rectangular plate may be adopted which may include the first light-transmissive portion 114 and the second light-transmissive portion 116 in the form of two circular openings matching the viewing angle of the first camera 120 and the second camera 124.

[0085] FIG. 3 shows a perspective view of a prototype of the light detection arrangement 102 of FIG. 2A according to an embodiment.

[0086] The light detection arrangement 102 may include a body structure 112 configured to provide light. The body structure 112 may include a dome light.

[0087] The light detection arrangement 102 may further include a structure 172 having the first light-transmissive portion (not shown) and the second light-transmissive portion (not shown). The body structure 112 has a cutout portion 170 and the structure 172 is arranged in the cutout portion 170.

[0088] The light detection arrangement 102 may further include an arrangement 128 configured to provide light reflected from an object receiving region (not shown).

[0089] FIG. 4A shows a left image 400 obtained with the prototype of the light detection arrangement 102 of FIG. 3 according to an embodiment; FIG. 4B shows a right image 402 obtained with the prototype of the light detection arrangement 102 of FIG. 3 according to an embodiment.

[0090] In FIGs. 4A and 4B, the left image 400 may be taken by the left camera or the first camera 120 and the right image 402 may be taken by the right camera or the second camera 124. From the respective left image 400 and right image 402, it may be seen that the object 156, e.g. the die 194 includes a plurality of bonding structures 174. Each of the plurality of bonding structures 174 may include a plurality of bond pads 176 and a

plurality of wire bonds 178. Each of the plurality of bond wire may be configured to connect each of the plurality of bond pads 176 to the object 156, e.g. the die 194. In addition, the contrast of the die 194 and the wire bonds 178 in the left image 400 in FIG. 4A and the right image 402 in FIG. 4B seems comparable.

[0091] FIG. 5A shows a front view of a light detection arrangement 102, the light detection arrangement 102 including a beam splitter arrangement 148 arranged on the same side of a body structure 112 as an object receiving region 118 according to an embodiment; FIG. 5B shows a side view of the light detection arrangement 102 of FIG. 5A according to an embodiment.

[0092] The light detection arrangement 102 may include the body structure 112 configured to provide light, the body structure 112 including a first light-transmissive portion 114 and a second light-transmissive portion 116 disposed at a distance from the first light-transmissive portion 114; the object receiving region 118 arranged such that light provided by the body structure 112 may be illuminating at least a portion of the object receiving region 118; a first camera 120 having a first main optical axis 122; a second camera 124 having a second main optical axis 126; wherein the body structure 112 may be arranged between the first camera 120 and the second camera 124 on its one side and the object receiving region 118 on its other side; wherein the first camera 120 may be arranged such that its first main optical axis 122 may be directed to the object receiving region 118 via the first light-transmissive portion 114; wherein the second camera 124 may be arranged such that its second main optical axis 126 may be directed to the object receiving region 118 via the second light-transmissive portion 116; an arrangement 128 configured to provide light reflected from the object receiving

region 118 such that a first reflected light portion 130 may be provided as a first co-axial light portion 132 aligned to the first main optical axis 122, and such that a second reflected light portion 134 may be provided as a second co-axial light portion 136 aligned to the second main optical axis 126. The distance between the first light-transmissive portion 114 and the second light-transmissive portion 116 may vary according to design and user requirements.

[0093] In FIGs. 5A and 5B, the body structure 112 may have a dome shape. The dome shape may include a radius of between about 40 mm to about 45 mm, for example. The body structure 112 may include a dome light for example.

[0094] The light detection arrangement 102 may further include a plurality of body structure illuminating light sources 140 arranged to illuminate at least a portion of an inner surface 138 of the body structure 112. The plurality of body structure illuminating light sources 140 may be positioned within the body structure 112.

[0095] In FIGs. 5A and 5B, the arrangement 128 may include the beam splitter arrangement 148. The beam splitter arrangement 148 may be arranged on the same side of the body structure 112 as the object receiving region 118. The beam splitter arrangement 148 may be configured to receive the light provided by the inner surface 138 of the body structure 112, and to generate the first reflected light portion 130 and the second reflected light portion 134 from the received light. This may be to compensate for the light which may escape through the first light-transmissive portion 114 and the second light-transmissive portion 116.

[0096] The beam splitter arrangement 148 may include a single beam splitter 180 configured such that the first reflected light portion 130 may be provided as the first co-

axial light portion 132 aligned to the first main optical axis 122 and such that the second reflected light portion 134 may be provided as the second co-axial light portion 136 aligned to the second main optical axis 126.

[0097] In FIGs. 5A and 5B, the diffused light provided by the inner surface 138 of the body structure 112 may be reflected onto the object 156 through the beam splitter arrangement 148 so as to generate a co-axial lighting effect. Because of the curvature of the dome light, a requirement for different lighting directions may be met. An advantage of this design may be that the alignment becomes relatively simple and easy.

[0098] The first camera 120 and the second camera 124 may be arranged along a common camera plane 196. The single beam splitter 180 may be arranged at an approximately 45 degree angle with respect to the common camera plane 196. The single beam splitter 180 may be positioned so as correspond to the position of the respective first light-transmissive portion 114 and the second light-transmissive portion 116. This may be to compensate for the light escaping through the first light-transmissive portion 114 and the second light-transmissive portion 116.

[0099] In FIGs. 5A and 5B, the light detection arrangement 102 may further include a light separating structure 154. The light separating structure 154 may be arranged between the beam splitter arrangement 148 and the plurality of body structure illuminating light sources 140 or the body structure 112. The light separating structure 154 may be arranged substantially perpendicular to a plane 158 defined by the object receiving region 118.

[00100] In FIGs. 5A and 5B, the first camera 120 and the second camera 124 may be arranged in a manner such that the first main optical axis 122 and the second main optical

axis 126 may be axial symmetric with respect to a symmetry axis 190 being perpendicular to a plane 158 defined by the object receiving region 118. Each of the first camera 120 and the second camera 124 may be arranged at a same camera angle (α) with respect to the symmetry axis 190.

[00101] FIG. 6 shows a perspective view of a prototype of a light detection arrangement 102 of FIG. 5A according to an embodiment.

[00102] The light detection arrangement 102 may include a body structure 112 configured to provide light. The body structure 112 may include a dome light.

[00103] The light detection arrangement 102 may further include a first camera 120 and a second camera 124 disposed above the body structure 112.

[00104] Unlike the light detection arrangement 102 as shown in FIG. 3 where the arrangement 128 may be seen, the arrangement 128 may not be shown in FIG. 6 as the arrangement may be arranged within the body structure 112.

[00105] FIG. 7A shows a left image 700 obtained with the prototype of the light detection arrangement 102 of FIG. 5A according to an embodiment; FIG. 7B shows a right image 702 obtained with the prototype of the light detection arrangement 102 of FIG. 5A according to an embodiment.

[00106] The respective left image 700 and right image 702 as shown in FIGs. 7A and 7B may be similar to the respective left image 400 and right image 402 as shown in FIGs. 4A and 4B. Similar to FIGs. 4A and 4B, the left image 700 may be taken by the left camera or the first camera 120 and the right image 702 may be taken by the right camera or the second camera 124 in FIGs. 7A and 7B. From the respective left image and right image in FIGs. 7A and 7B, it may be seen that the object 156, e.g. the die 194

includes a plurality of bonding structures 174. Each of the plurality of bonding structures 174 may include a plurality of bond pads 176 and a plurality of wire bonds 178. Each of the plurality of bond wires 178 may be configured to connect each of the plurality of bond pads 176 to the object 156, e.g. the die 194. In addition, the contrast of the die 194 and the wire bonds 178 in the left image 700 in FIG. 7A and the right image 702 in FIG. 7B seems comparable.

[00107] FIG. 8A shows a front view of a light detection arrangement 102, the light detection arrangement 102 including a bar shaped light source 182 according to an embodiment; FIG. 8B shows a side view of the light detection arrangement 102 of FIG. 8A according to an embodiment.

[00108] The light detection arrangement 102 may include a body structure 112 configured to provide light, the body structure 112 including a first light-transmissive portion 114 and a second light-transmissive portion 116 disposed at a distance from the first light-transmissive portion 114; an object receiving region 118 arranged such that light provided by the body structure 112 may be illuminating at least a portion of the object receiving region 118; a first camera 120 having a first main optical axis 122; a second camera 124 having a second main optical axis 126; wherein the body structure 112 may be arranged between the first camera 120 and the second camera 124 on its one side and the object receiving region 118 on its other side; wherein the first camera 120 may be arranged such that its first main optical axis 122 may be directed to the object receiving region 118 via the first light-transmissive portion 114; wherein the second camera 124 may be arranged such that its second main optical axis 126 may be directed to the object receiving region 118 via the second light-transmissive portion 116;

an arrangement 128 configured to provide light reflected from the object receiving region 118 such that a first reflected light portion 130 may be provided as a first co-axial light portion 132 aligned to the first main optical axis 122, and such that a second reflected light portion 134 may be provided as a second co-axial light portion 136 aligned to the second main optical axis 126. The distance between the first light-transmissive portion 114 and the second light-transmissive portion 116 may vary according to design and user requirements.

[00109] In FIGs. 8A and 8B, the body structure 112 may have a dome shape with a flat portion at the top. The body structure 112 may include a dome light for example. Further in FIGs. 8A and 8B, the dome light may include a housing which may have a flat top for the purpose of easy positioning of a beam splitter arrangement 148 on top of the dome light.

[00110] The light detection arrangement 102 may further include a plurality of body structure illuminating light sources 140 arranged to illuminate at least a portion of an inner surface 138 of the body structure 112. The plurality of body structure illuminating light sources 140 may be positioned within the body structure 112.

[00111] In FIGs. 8A and 8B, the arrangement 128 may include a light arrangement 142. The light arrangement 142 may include one or more diffused light sources positioned above or outside of the body structure 112. Each of the diffused light sources may include the bar shaped light source 182 which may include a length at least longer than the width of the first light-transmissive portion 114 and the second light-transmissive portion 116 so that the required directions of light for co-axial lighting effect may be met.

[00112] In FIGs. 8A and 8B, the arrangement 128 may include a beam splitter arrangement 148. The beam splitter arrangement 148 may be arranged on the same side of the body structure 112 as the first camera 120 and the second camera 124. The beam splitter arrangement 148 may include a single beam splitter 180 configured such that the first reflected light portion 130 may be provided as the first co-axial light portion 132 aligned to the first main optical axis 122 and such that the second reflected light portion 134 may be provided as the second co-axial light portion 136 aligned to the second main optical axis 126.

[00113] The first camera 120 and the second camera 124 may be arranged along a common camera plane 196. The single beam splitter 180 may be arranged at a substantially 45 degree angle with respect to the common camera plane 196.

[00114] FIG. 9A shows a front view of a light detection arrangement 102, the light detection arrangement 102 including an arc shaped light source 184 according to an embodiment; FIG. 9B shows a top view of the arc shape light source of FIG. 9A according to an embodiment.

[00115] The light detection arrangement 102 as shown in FIGs. 9A and 9B may be similar to the light detection arrangement 102 as shown in FIGs. 8A and 8B with a difference such that the light arrangement 142 may include the arc shape light source instead of the bar shaped light source 182. One effect of using the arc shape light source may be to simplify alignment effort when compared to the bar shaped light source 182.

[00116] FIG. 10A shows a front view of a light detection arrangement 102, the light detection arrangement 102 including a blue color dichroic mirror 186 and a red color

dichroic mirror 188 according to an embodiment; FIG. 10B shows a top view of the light detection arrangement 102 of FIG. 10A according to an embodiment.

[00117] The light detection arrangement 102 may include a body structure 112 configured to provide light, the body structure 112 including an opening 198; an object receiving region 118 arranged such that light provided by the body structure 112 may be illuminating at least a portion of the object receiving region 118; a first camera 120 having a first main optical axis 122; a second camera 124 having a second main optical axis 126; wherein the body structure 112 may be arranged between the first camera 120 and the second camera 124 on its one side and the object receiving region 118 on its other side; wherein the first camera 120 may be arranged such that its first main optical axis 122 may be directed to the object receiving region 118 via the opening 198; wherein the second camera 124 may be arranged such that its second main optical axis 126 may be directed to the object receiving region 118 via the opening 198; an arrangement 128 configured to provide light reflected from the object receiving region 118 such that a first reflected light portion 130 may be provided as a first co-axial light portion 132 aligned to the first main optical axis 122, and such that a second reflected light portion 134 may be provided as a second co-axial light portion 136 aligned to the second main optical axis 126.

[00118] In FIGs. 10A and 10B, the body structure 112 may have a dome shape. The body structure 112 may include a dome light. The dome light may include a white LED dome light with all red (R), green (G) and blue (B) spectrums.

[00119] The light detection arrangement 102 may further include a plurality of body structure illuminating light sources 140 arranged to illuminate at least a portion of an

inner surface 138 of the body structure 112. The plurality of body structure illuminating light sources 140 may be positioned within the body structure 112.

[00120] The arrangement 128 may include a first dichroic mirror 186 of a first wavelength arranged in a light path along the first main optical axis 122 and a second dichroic mirror 188 of a second wavelength arranged in a light path along the second main optical axis 126. The first wavelength may be different from the second wavelength. The first wavelength may include a range between about 400 nm to about 500 nm and the second wavelength may include a range between about 500 nm to about 650 nm.

[00121] The first dichroic mirror 186 may be arranged over a portion of the opening 198 or on the one side of the body structure 112 overlapping the portion of the opening 198 and the second dichroic mirror 188 may be arranged in the another portion of the opening 198 or on the one side of the body structure 112 overlapping the another portion of the opening 198. The first dichroic mirror 186 may be arranged so as in contact with the second dichroic mirror 188 at the respective edges. The first dichroic mirror 186 and the second dichroic mirror 188 may also be arranged so as to substantially overlap the opening 198.

[00122] The first dichroic mirror 186 may be a blue color dichroic mirror and the second dichroic mirror 188 may be a red color dichroic mirror. Alternatively, the second dichroic mirror 188 may be a blue color dichroic mirror and the first dichroic mirror 186 may be a red color dichroic mirror.

[00123] In FIGs. 10A and 10B, the first dichroic mirror 186 may be a blue color dichroic mirror and the second dichroic mirror 188 may be a red color dichroic mirror.

The red color dichroic mirror may reflect red light and let other wavelengths pass and the blue color dichroic mirror may reflect blue light and let other wavelengths pass. The diffused red dome light reflected from the red color dichroic mirror illuminates the die surface and the reflected light will pass through the blue color dichroic mirror before reaching the first camera 120. Likewise, the diffused blue dome light reflected from the blue color dichroic mirror illuminates the die surface and the reflected light will pass through the red color dichroic mirror before reaching the second camera 124. Alternatively, a dome light 112 with mixed blue and red LEDs may be built to control the blue and red illumination intensity separately.

[00124] The first camera 120 and the second camera 124 may be arranged in a manner such that the first main optical axis 122 and the second main optical axis 126 may be axial symmetric with respect to a symmetry axis 190 being perpendicular to a plane 158 defined by the object receiving region 118.

[00125] FIG. 11 shows a flow-chart 1100 of a method for detecting light in a light detection arrangement 102 according to an embodiment.

[00126] The light detection arrangement 102 may include a body structure 112 configured to provide light, the body structure 112 including a first light-transmissive portion 114 and a second light-transmissive portion 116 disposed at a distance from the first light-transmissive portion 114. The light detection arrangement 102 may further include an object receiving region 118 arranged such that light provided by the body structure 112 may be illuminating at least a portion of the object receiving region 118. The light detection arrangement 102 may further include a first camera 120 having a first main optical axis 122 and a second camera 124 having a second main optical axis 126.

[00127] The body structure 112 may be arranged between the first camera 120 and the second camera 124 on its one side and the object receiving region 118 on its other side.

[00128] The first camera 120 may be arranged such that its first main optical axis 122 may be directed to the object receiving region 118 via the first light-transmissive portion 114 and the second camera 124 may be arranged such that its second main optical axis 126 may be directed to the object receiving region 118 via the second light-transmissive portion 116.

[00129] The method may include providing light reflected from the object receiving region 118 such that a first reflected light portion 130 may be provided as a first co-axial light portion 132 aligned to the first main optical axis 122, and such that a second reflected light portion 134 may be provided as a second co-axial light portion 136 aligned to the second main optical axis 126.

[00130] While the invention has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

Claims

What is claimed is:

1. A light detection arrangement, comprising:
 - a body structure configured to provide light, the body structure comprising a first light-transmissive portion and a second light-transmissive portion disposed at a distance from the first light-transmissive portion;
 - an object receiving region arranged such that light provided by the body structure is illuminating at least a portion of the object receiving region;
 - a first camera having a first main optical axis;
 - a second camera having a second main optical axis;
 - wherein the body structure is arranged between the first camera and the second camera on its one side and the object receiving region on its other side;
 - wherein the first camera is arranged such that its first main optical axis is directed to the object receiving region via the first light-transmissive portion;
 - wherein the second camera is arranged such that its second main optical axis is directed to the object receiving region via the second light-transmissive portion;
 - an arrangement configured to provide light reflected from the object receiving region such that a first reflected light portion is provided as a first co-axial light portion aligned to the first main optical axis, and such that a second reflected light portion is provided as a second co-axial light portion aligned to the second main optical axis.

2. The light detection arrangement of claim 1,
wherein the body structure has a dome shape.
3. The light detection arrangement of claim 1 or 2, further comprising;
a structure having the first light-transmissive portion and the second light-transmissive portion,
wherein the body structure has a cutout portion and the structure is arranged in the cutout portion.
4. The light detection arrangement of any one of claims 1 to 3,
wherein at least a portion of an inner surface of the body structure facing the object receiving region has a reflective surface.
5. The light detection arrangement of any one of claims 1 to 4,
wherein at least a portion of an inner surface of the body structure facing the object receiving region is configured to generate light.
6. The light detection arrangement of claim 5,
wherein the at least a portion of an inner surface of the body structure facing the object receiving region comprises a light generating coating and/or a plurality of organic light emitting diodes.
7. The light detection arrangement of any one of claims 1 to 6, further comprising:

at least one body structure illuminating light source arranged to illuminate at least a portion of an inner surface of the body structure.

8. The light detection arrangement of claim 7,
wherein the at least one body structure illuminating light source comprises a plurality of lamps.
9. The light detection arrangement of claim 8,
wherein the plurality of lamps comprises a light emitting diode array.
10. The light detection arrangement of claim 8 or 9,
wherein the plurality of lamps comprises a diffuser.
11. The light detection arrangement of any one of claims 1 to 10,
wherein the arrangement comprises a light arrangement.
12. The light detection arrangement of claim 11,
wherein the light arrangement comprises a first light source and a second light source.
13. The light detection arrangement of claim 12,
wherein the first light source and/or the second light source comprises a plurality of lamps.

14. The light detection arrangement of claim 13,
wherein the plurality of lamps comprises a light emitting diode array.
15. The light detection arrangement of claim 11,
wherein the light arrangement comprises a light source being selected from a group of light sources consisting of an arc shaped light source, a bar shaped light source, and a diffuser.
16. The light detection arrangement of any one of claims 1 to 15,
wherein the arrangement comprises a beam splitter arrangement.
17. The light detection arrangement of claim 16,
wherein the beam splitter arrangement is arranged on the same side of the body structure as the first camera and the second camera.
18. The light detection arrangement of claim 16 or 17,
wherein the beam splitter arrangement comprises a first beam splitter and a second beam splitter.
19. The light detection arrangement of claim 18,
wherein the arrangement comprises a light arrangement, the light arrangement comprising a first light source and a second light source;

wherein the first beam splitter is arranged relative to the first light source and the first camera such that the first beam splitter is configured to receive the light provided by the first light source and to re-direct the light to the object receiving region via the first light-transmissive portion, thereby generating the second reflected light portion; and

wherein the second beam splitter is arranged relative to the second light source and the second camera such that the second beam splitter is configured to receive the light provided by the second light source and to re-direct the light to the object receiving region via the second light-transmissive portion, thereby generating the first reflected light portion.

20. The light detection arrangement of claim 16 or 17,

wherein the arrangement comprises a light arrangement; and

wherein the beam splitter arrangement is arranged relative to the light arrangement and both the first camera and the second camera such that the beam splitter arrangement is configured to receive the light provided by the light arrangement and to re-direct the light to the object receiving region via the respective first light-transmissive portion and the second light-transmissive portion to generate the second reflected light portion and the first reflected light portion from the received light.

21. The light detection arrangement of claim 16,

wherein the beam splitter arrangement is arranged on the same side of the body structure as the object receiving region.

22. The light detection arrangement of claim 21,
wherein the beam splitter arrangement is configured to receive the light provided by the inner surface of the body structure, and to generate the first reflected light portion and the second reflected light portion from the received light.
23. The light detection arrangement of any one of claims 20 to 22,
wherein the beam splitter arrangement consists of a single beam splitter configured such that the first reflected light portion is provided as the first co-axial light portion aligned to the first main optical axis and such that the second reflected light portion is provided as the second co-axial light portion aligned to the second main optical axis.
24. The light detection arrangement of any one of claims 1 to 23,
wherein the first camera and the second camera are arranged along a common camera plane.
25. The light detection arrangement of claim 24,
wherein the single beam splitter is arranged at a 45 degree angle with respect to the common camera plane.

26. The light detection arrangement of any one of claims 1 to 10,
wherein the arrangement comprises a first dichroic mirror of a first wavelength arranged in a light path along the first main optical axis and a second dichroic mirror of a second wavelength arranged in a light path along the second main optical axis.
27. The light detection arrangement of claim 26,
wherein the first dichroic mirror is arranged in the first light-transmissive portion or on the one side of the body structure overlapping the first light-transmissive portion and wherein the second dichroic mirror is arranged in the second light-transmissive portion or on the one side of the body structure overlapping the second light-transmissive portion.
28. The light detection arrangement of claim 26 or 27,
wherein the first dichroic mirror is a blue color dichroic mirror and the second dichroic mirror is a red color dichroic mirror; or wherein the second dichroic mirror is a blue color dichroic mirror and the first dichroic mirror is a red color dichroic mirror.
29. The light detection arrangement of any one of claims 1 to 28,
further comprising: a light separating structure.
30. The light detection arrangement of claim 29,

wherein the light separating structure is arranged between the first light source and the second light source, or between the beam splitter arrangement and the at least one body structure illuminating light source.

31. The light detection arrangement of any one of claims 1 to 30,
further comprising: an object arranged in the object receiving region.
32. The light detection arrangement of claim 31,
wherein the object is a die.
33. The light detection arrangement of claim 32,
wherein the die comprises a plurality of bonding structures.
34. The light detection arrangement of any one of claims 1 to 33,
wherein the first camera and the second camera are arranged in a manner such that the first main optical axis and the second main optical axis are axial symmetric with respect to a symmetry axis being perpendicular to a plane defined by the object receiving region.
35. A method for detecting light in a light detection arrangement,
the light detection arrangement comprising:

a body structure configured to provide light, the body structure comprising a first light-transmissive portion and a second light-transmissive portion disposed at a distance from the first light-transmissive portion;

an object receiving region arranged such that light provided by the body structure is illuminating at least a portion of the object receiving region;

a first camera having a first main optical axis;

a second camera having a second main optical axis;

wherein the body structure is arranged between the first camera and the second camera on its one side and the object receiving region on its other side;

wherein the first camera is arranged such that its first main optical axis is directed to the object receiving region via the first light-transmissive portion;

wherein the second camera is arranged such that its second main optical axis is directed to the object receiving region via the second light-transmissive portion;

the method comprising:

providing light reflected from the object receiving region such that a first reflected light portion is provided as a first co-axial light portion aligned to the first main optical axis, and such that a second reflected light portion is provided as a second co-axial light portion aligned to the second main optical axis.