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(54) **SEMICONDUCTOR LIGHTING DEVICE AND METHOD FOR INSTALLING A COVER ON A MOUNTING OF A SEMICONDUCTOR LIGHTING DEVICE**

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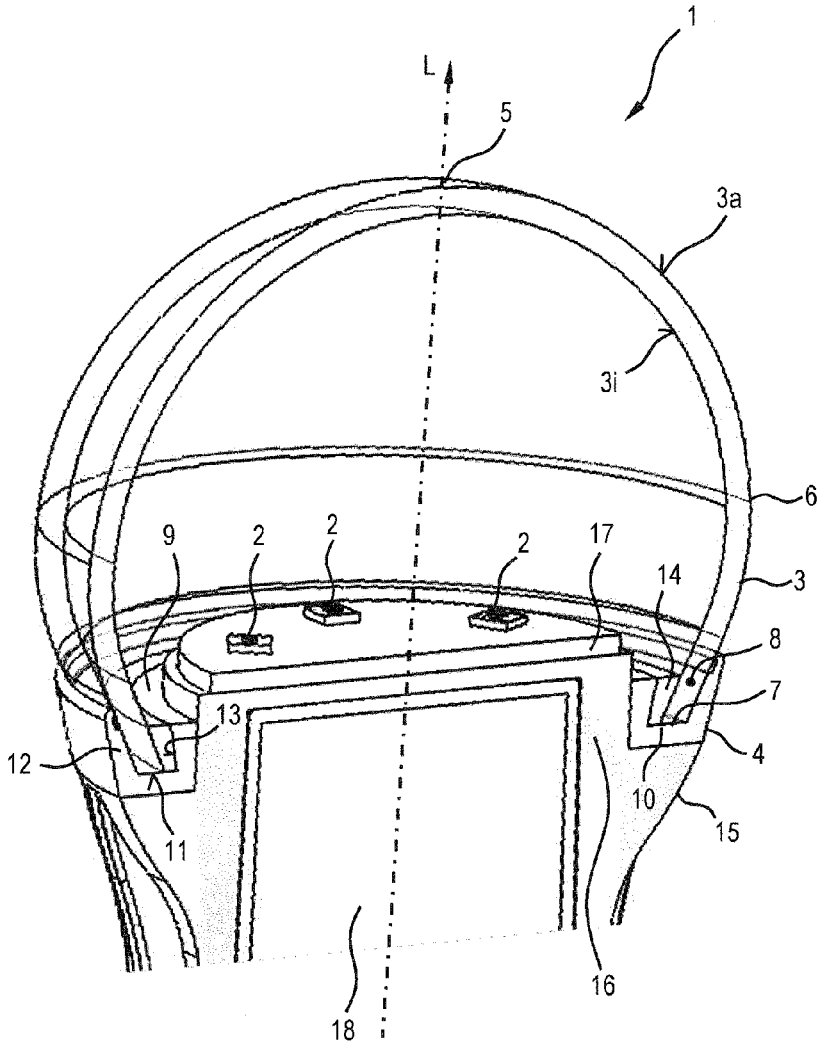
(57) **ABSTRACT**

A semiconductor lighting device includes a translucent cover and a mounting for the cover, wherein the mounting has an annular groove, the cover is inserted into the annular groove and the cover is held in the annular groove, at least on a first side, by means of an adhesive.



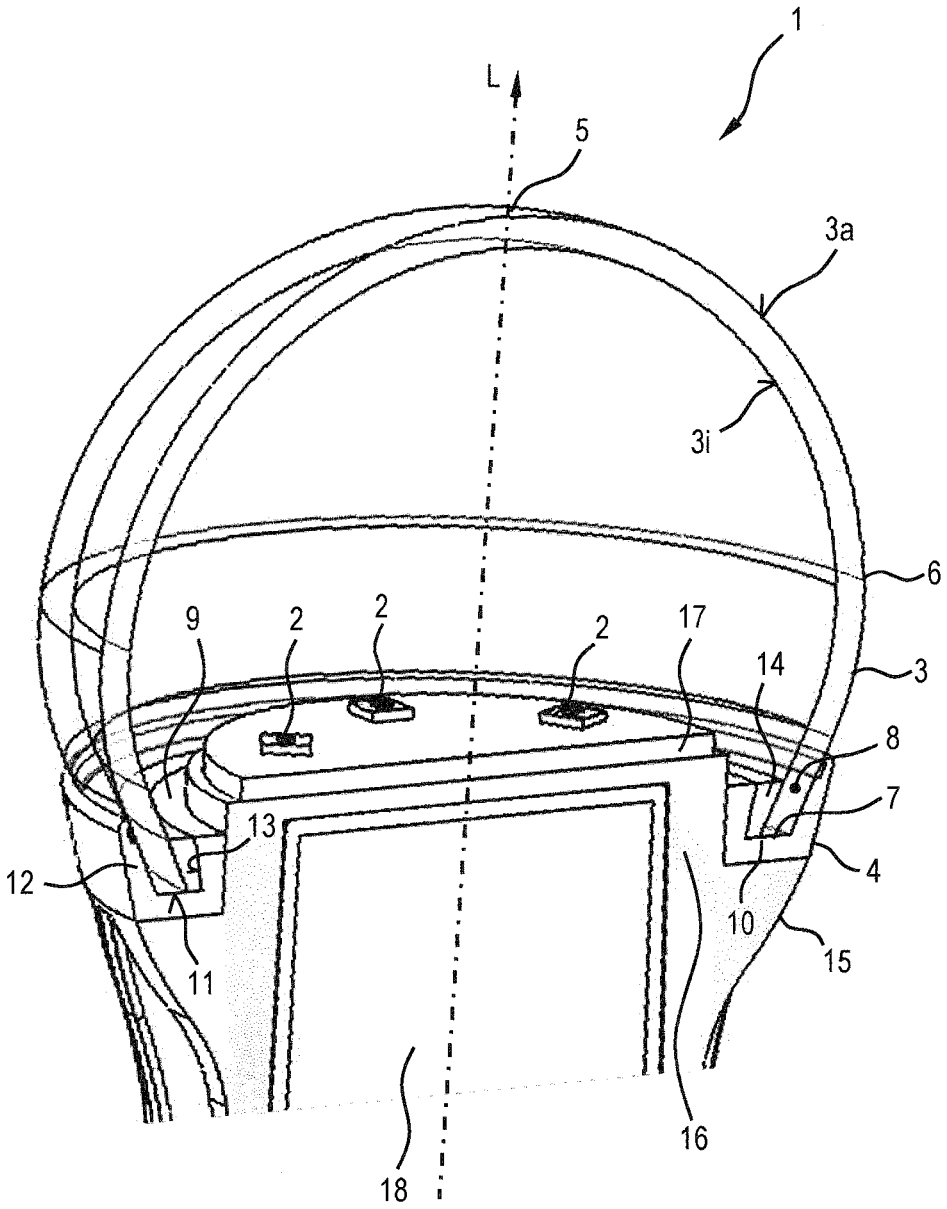


Fig.1

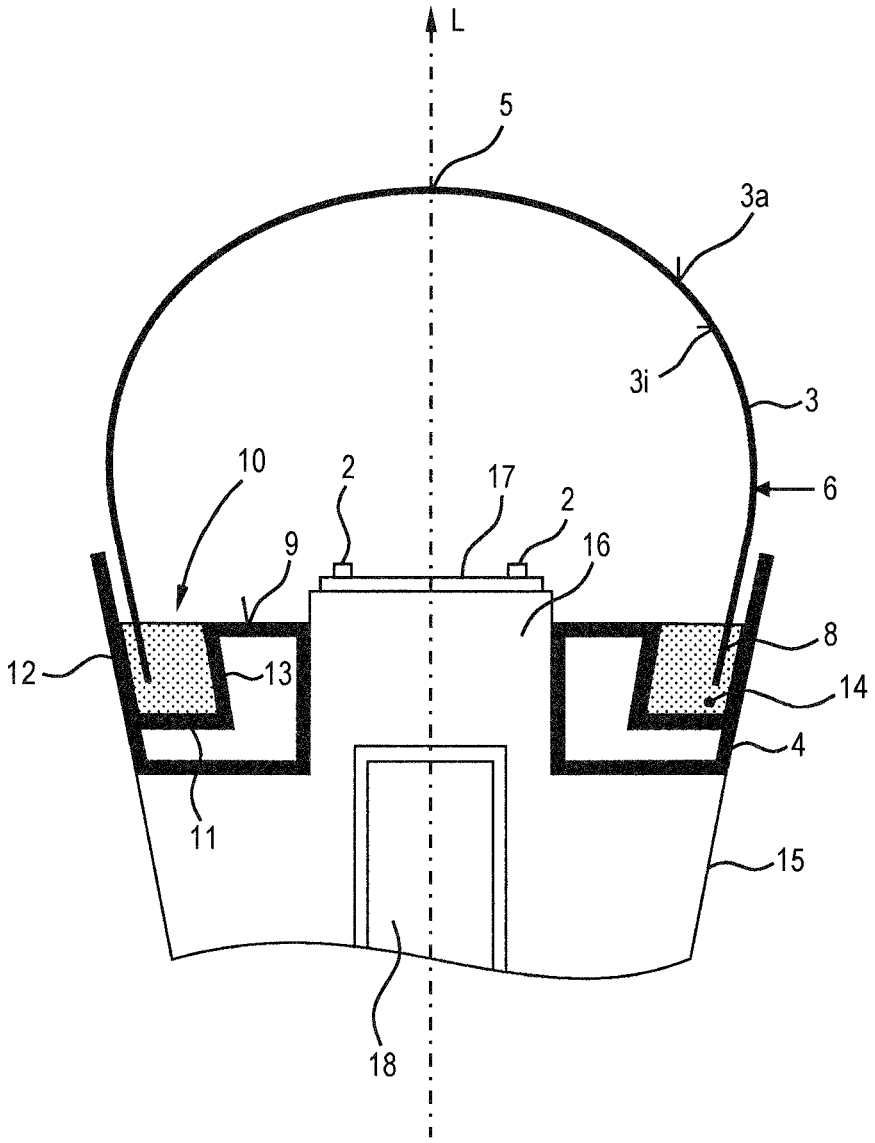


Fig.2

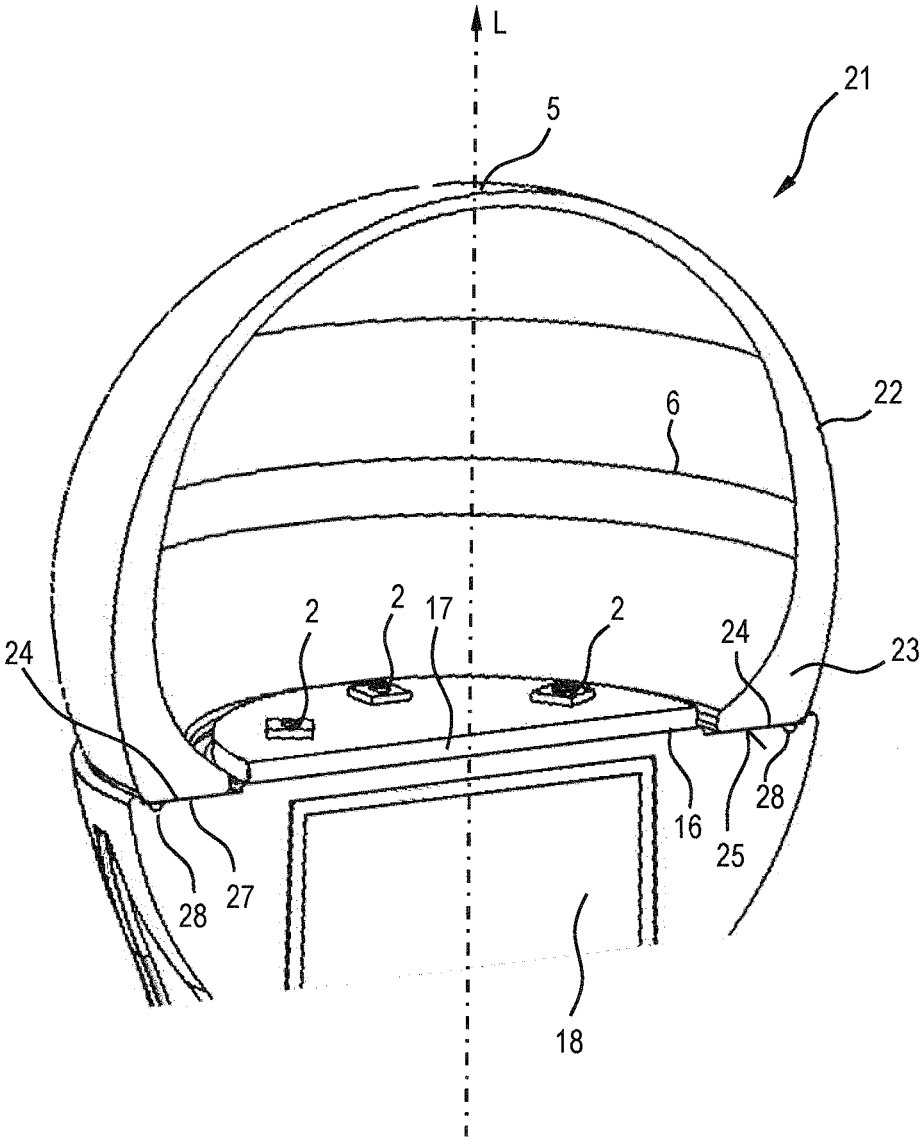


Fig.3

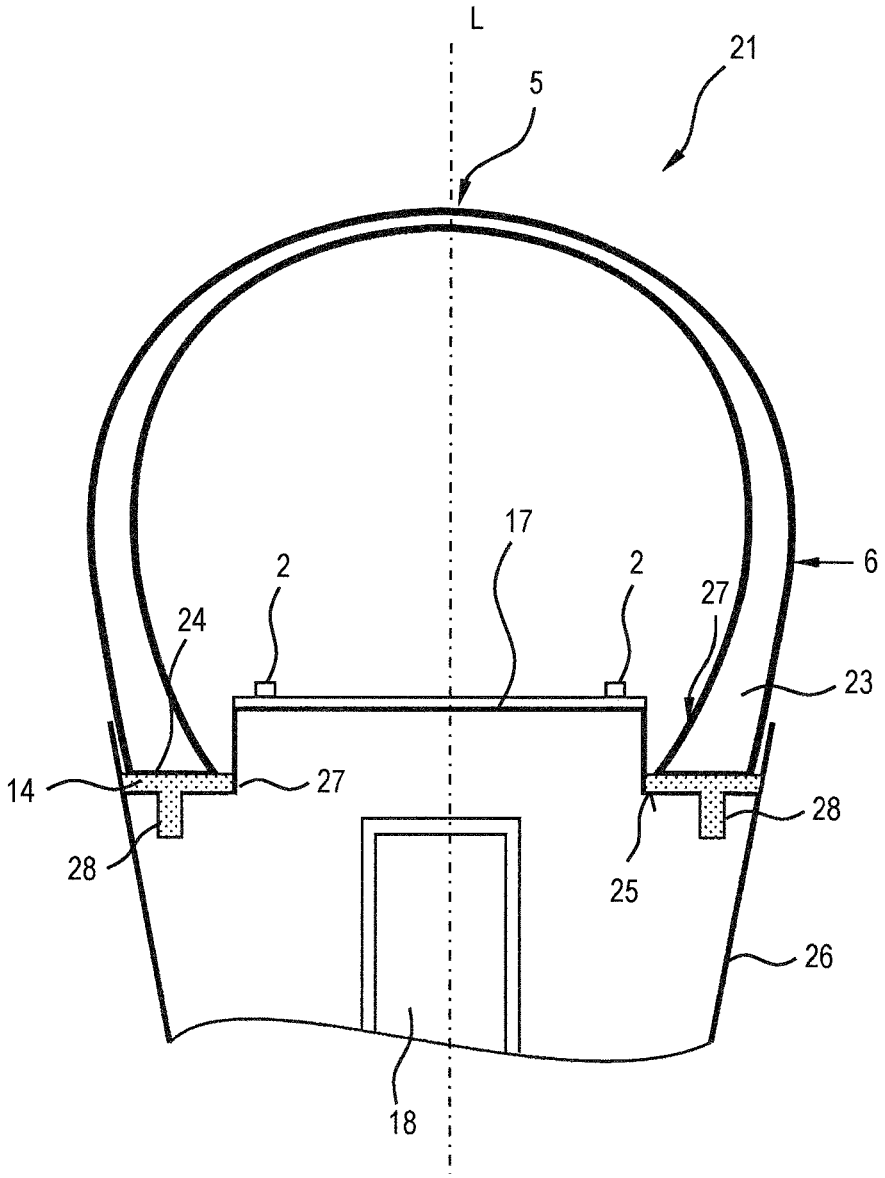


Fig.4

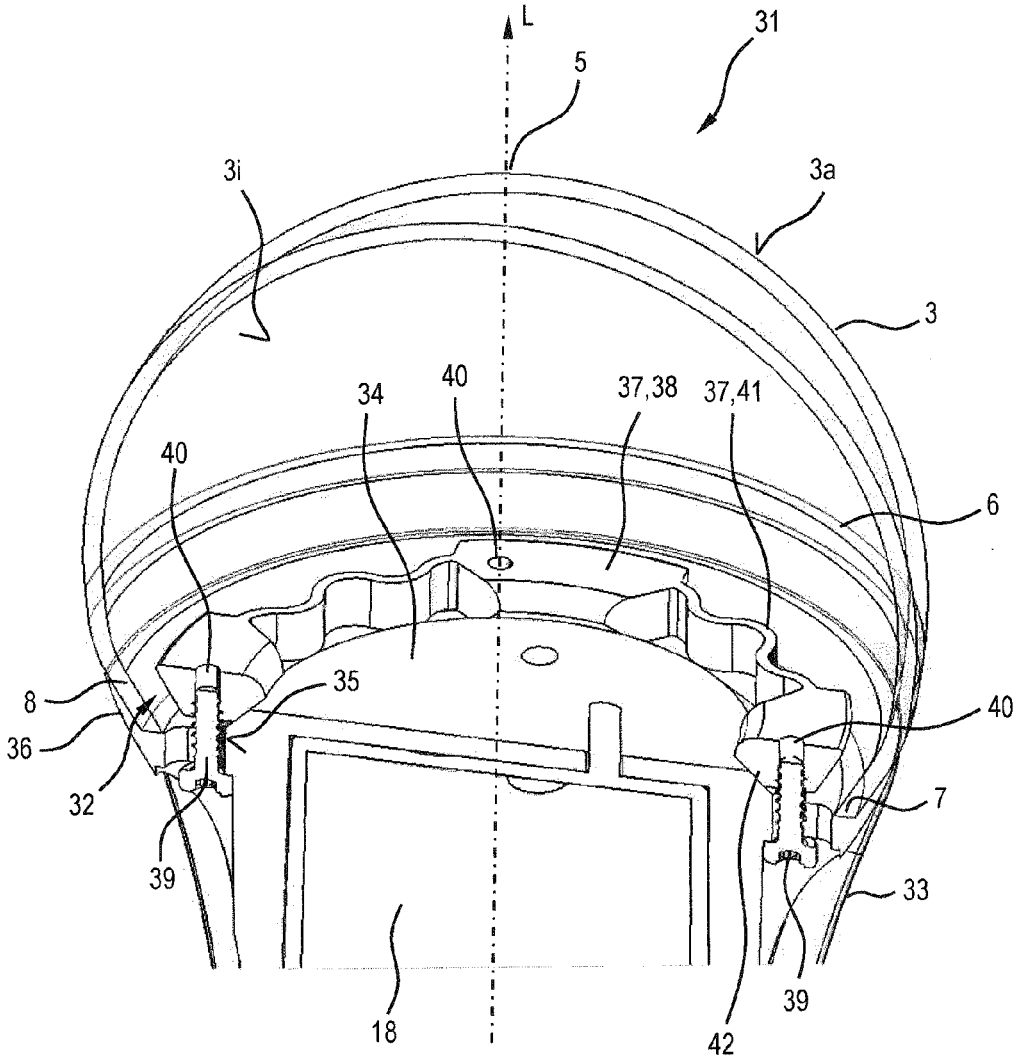


Fig.5

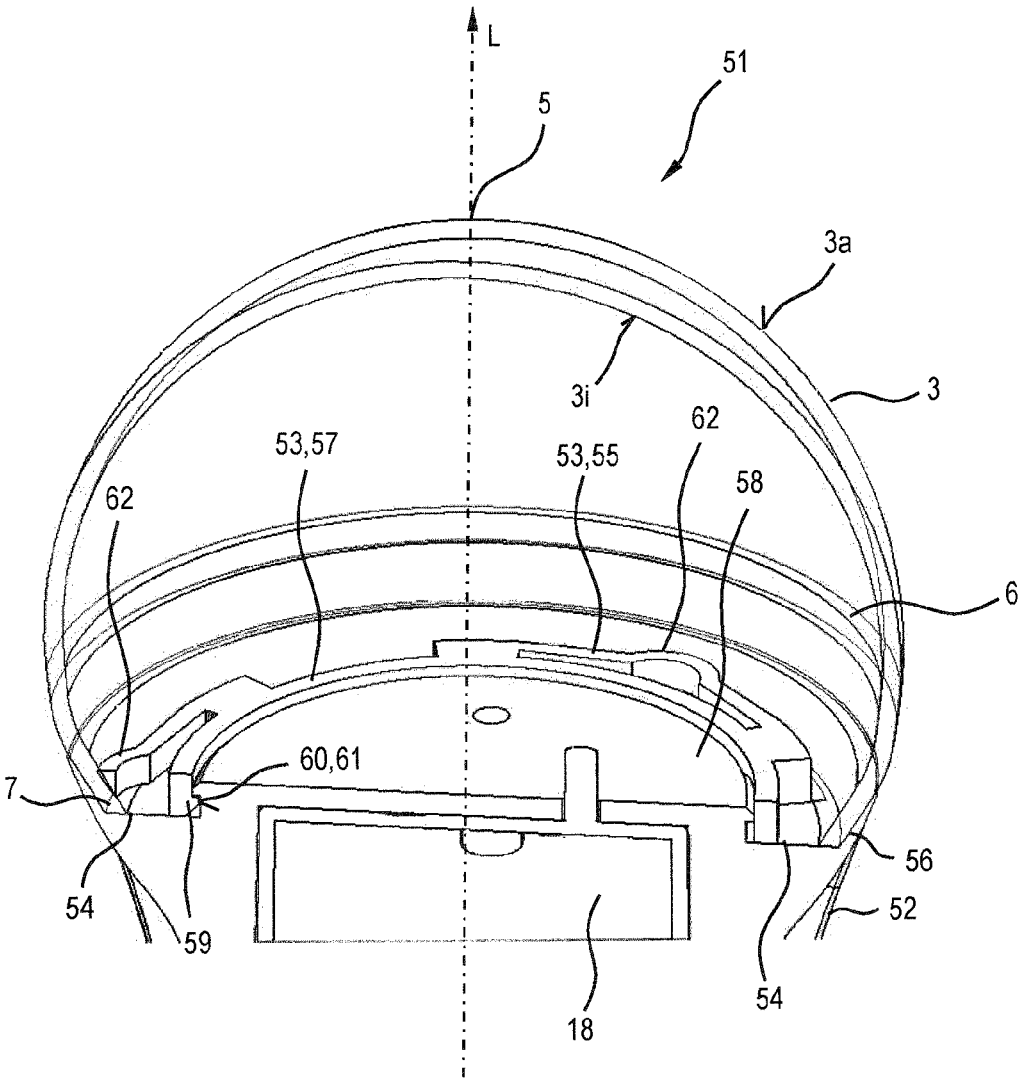


Fig.6

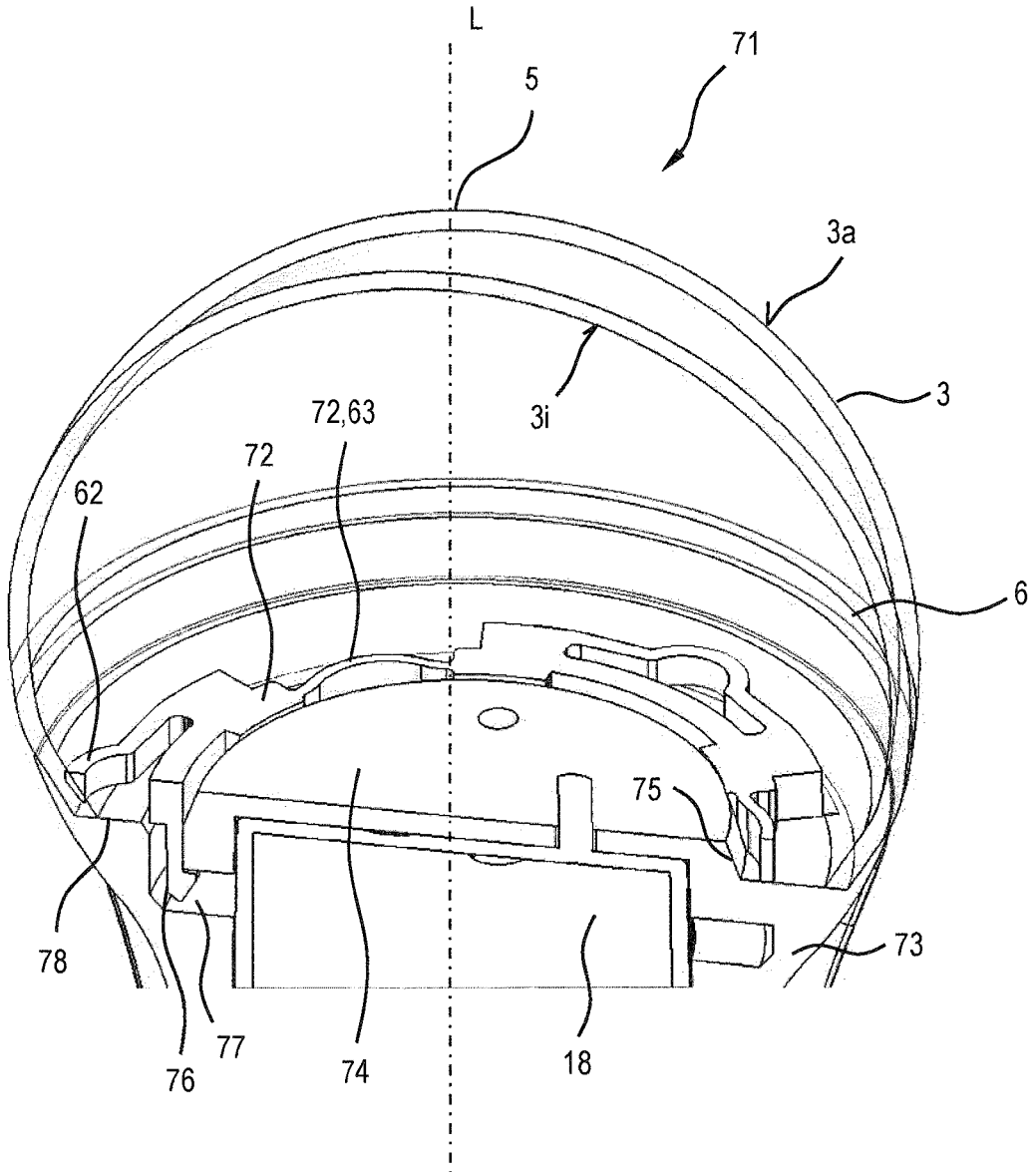


Fig.7

SEMICONDUCTOR LIGHTING DEVICE AND METHOD FOR INSTALLING A COVER ON A MOUNTING OF A SEMICONDUCTOR LIGHTING DEVICE

RELATED APPLICATIONS

[0001] The present application is a national stage entry according to 35 U.S.C. §371 of PCT application No.: PCT/EP2012/051221 filed on Jan. 26, 2012, which claims priority from German application No.: 10 2011 003 968.6 filed on Feb. 11, 2011.

TECHNICAL FIELD

[0002] Various embodiments relate to semiconductor lighting devices which each includes a translucent cover and a mounting for the cover. Various embodiments further relate to methods for installing a cover of a semiconductor lighting device on a mounting of the semiconductor lighting device.

BACKGROUND

[0003] LED lamps are known in which a translucent cover ("bulb") made of glass is fixed to a heat sink made of aluminum. The thermal expansion coefficients of glass and aluminum differ considerably, so that, without suitable measures, it is possible for stresses, cracking and even fracture of the glass bulb to occur.

[0004] In order to avoid damage to the glass bulb, LED lamps are known in which the translucent cover is adhesively bonded onto a flexible and thin plastic ring and the plastic ring is adhesively bonded onto a heat sink. The different thermal expansions of the heat sink and of the bulb in the radial direction are partly compensated for by deformation of the plastic ring.

SUMMARY

[0005] Various embodiments provide an improved attachment of a translucent cover to a semiconductor lighting device.

[0006] Various embodiments provide a semiconductor lighting device including a translucent cover and a mounting for the cover, wherein the mounting has an annular groove, the cover is inserted into the annular groove and the cover is held in the annular groove, at least on a first side, by means of an adhesive.

[0007] This semiconductor lighting device makes it possible that different thermal expansions of the cover and the mounting do not need to be compensated for by deformation of the mounting or another pre-formed solid body. Instead, the different thermal expansion can be compensated for by play of the cover in the groove (in particular on the non adhesively-bonded side) and/or by deformation of the adhesive. Thus, in particular, large relative displacements can be realized and/or a build-up of stress in the cover can be reduced.

[0008] One development is that the cover is substantially connected to the mounting via the adhesive. Thus, a thermal connection to the mounting is likewise made substantially via the adhesive.

[0009] A development that is advantageous for thermal conduction of heat through the adhesive is that the cover and the annular groove have a substantially conformal contour in their contact region or contact area introduced by the adhesive. Thus, the adhesive can be present over a large area as a thin layer, which keeps thermal resistance low.

[0010] The first side can correspond to an outer side of the cover or an edge region thereof. The outside of the cover may in particular then be fixed to an outer circumferential edge of the annular groove by means of the adhesive.

[0011] In particular for this case, it is advantageous for making a simple and firm contact that the cover has an undercut, in particular tapering, edge region. To this end, the cover may have, for example, the shape of a spherical cap or spherical dome which extends beyond the equator or mid-plane thereof.

[0012] Alternatively, the first side may correspond to an inner side of the cover or of an end region thereof. The inner side of the cover may then in particular be fixed to an inner circumferential edge of the annular groove by means of the adhesive.

[0013] In particular for this case, it is advantageous for making a simple and firm contact that the cover has a widening edge region. To this end, the cover can, for example, have the shape of a spherical cap or spherical dome which does not cover the equator.

[0014] The cover may be transparent or opaque.

[0015] The cover may consist of plastic or glass, for example opal glass.

[0016] One refinement is that the cover is held in the annular groove, at least on a second side thereof, in a form-fitting manner by means of an adhesive. As a result, it is possible to prevent the cover detaching from the mounting in the event of degradation of the adhesive action of the adhesive.

[0017] A further refinement is that the second side is an inner side, the cover is inserted into the annular groove with an undercut, in particular tapering, edge region, and the annular groove has an undercut on the inner side thereof. The cover can be inserted simply into the annular groove, while the adhesive (following curing thereof) permits the form-fitting retention (on the inner side) of the cover in the annular groove even in the event of a reduced adhesive action.

[0018] An alternative refinement is that the second side is an outer side, the cover is inserted into the annular groove with a widening edge region, and the annular groove has an undercut on the outer side thereof. The cover may also be inserted simply into the annular groove here, while the adhesive (following curing thereof) permits the form-fitting retention (on the outer side) of the cover in the annular groove even in the event of a reduced adhesive action.

[0019] A refinement for obtaining minimal adhesive thicknesses is that the adhesive has spacers made of filler, for example small spheres, in particular glass spheres. This ensures an adequate adhesive action.

[0020] A refinement that is advantageous for a particularly effective reduction of thermal stresses, in particular in the cover, is that the adhesive may be deformed elastically. In order to avoid damage to the adhesive and/or the adhesive connection in the event of a varying thermal loading, the adhesive exhibits high elongation at failure. The adhesive is particularly preferably a silicone adhesive.

[0021] Advantageously, the adhesive has a high thermal conductivity. In particular, a silicone adhesive having an electrically conductive filler, e.g. graphite, metal particles, carbon nanotubes and so on, may be used for this purpose.

[0022] Various embodiments provide a semiconductor lighting device including a translucent cover and a mounting for the cover, wherein the cover has a widened (or thicker)

edge region and is adhesively bonded with the widened edge region (in particular an associated front side) onto a substantially horizontal attachment surface the mounting. By means of the widened wall region (which has a thicker wall thickness than the rest of the cover), an enlarged contact surface with a correspondingly higher thermal transfer capability and a larger adhesive surface is provided, while the rest of the cover has a comparatively low wall thickness and therefore, overall, also a low weight. The attachment via the substantially horizontal attachment surface has the further advantage of a low overall height or thickness of the adhesive connection. Furthermore, the application of the adhesive is also relatively simply possible, e.g. by being dispensed onto the attachment surface. The attachment surface is preferably substantially flat. A further advantage is the low thermo-mechanical stress which results in the case of this form of attachment. In particular, if there is no form-fitting connection, in the case of a different thermal expansion of the materials, no substantial stresses occur in the cover either.

[0023] One development is that the edge region of the cover (in particular the front face) making contact with the attachment surface has a width or wall thickness of in particular about 3 mm to 5 mm, which permits good thermal contact, high adhesive force and a still low weight.

[0024] One refinement is that the attachment surface has at least one recess (e.g. channel or trough) covered by the cover. The at least one recess can advantageously be used to receive excess adhesive.

[0025] The cover having the widened edge region may also be used as the cover of the semiconductor lighting device in which the mounting has an annular groove, the cover is inserted into the annular groove and the cover is held in the annular groove, at least on a first side, by means of an adhesive.

[0026] Various embodiments further provide a semiconductor lighting device including a translucent cover that is undercut in an edge region, in particular tapers, and a mounting for the cover, wherein the cover is pressed onto the mounting by means of a clamping ring attaching to an inner side of the edge region of said cover.

[0027] One refinement is that the clamping ring is configured to be wedge-shaped, at least in some sections, and is arranged with the at least one wedge-shaped region thereof between the inner side of the cover and the mounting. Thus, the clamping ring is able to achieve a particularly firm force-fitting and form-fitting connection of the cover to the mounting. The at least one wedge-shaped region may, for example, include one or more wedge-shaped incisions or segments, in particular circular segments. Alternatively, the clamping ring may also be configured to be wedge-shaped over substantially the entire circumference thereof. In this case, the clamping ring may in particular be configured to be closed or else open in order to change the circumference.

[0028] One development is that the clamping ring is fixed by means of at least one screw, in particular a self-tapping screw. By means of the at least one screw, the clamping ring in particular may be drawn against the cover. By means of controlled tightening of the screws, the compressive force on the bulb may be adjusted.

[0029] One development is that the clamping ring is inserted into an annular groove in the mounting, into which the cover is also inserted. By means of the clamping ring, the cover may then in particular be pressed against an outer side wall of the annular groove. On the other side, the clamping ring may be supported on an inner region of the mounting surrounded by the annular groove, in particular on an inner side wall of the annular groove.

[0030] A further refinement is that the clamping ring is arranged between the inner side of the cover and the mounting and can be deformed elastically in the radial direction, at least in some sections. The sections or segments that can be deformed in the radial direction are able to press the cover against the mounting from the inside and thus hold the latter in the mounting in a form-fitting and possibly force-fitting manner against the inherent weight thereof, even in a position oriented upside down. The segments that may be deformed in the radial direction may in particular have spring elements.

[0031] A development that is advantageous for secure fixing is that the elastic segments project radially beyond the free edge of the cover and thus achieve the form fit.

[0032] Said clamping ring may in particular be inserted into the inner side of the cover, so that the clamping ring assumes a predetermined position there. The clamping ring may, for example, be latched or clamped into the cover, in particular clipped in.

[0033] Said clamping ring may in particular be latched into the mounting. To this end, the clamping ring can have at least one latching element, e.g. latching hooks or latching lugs. The mounting may have matching opposing latching elements, for example latching cutouts in the base of the annular groove or an undercut inner side wall.

[0034] There is also a refinement is which the clamping ring may be deformed elastically in the circumferential direction thereof, at least in some sections, and in particular is placed on a widening region of the mounting. Consequently, when placed on the widening region of the mounting, the clamping ring is able to expand in the circumferential direction and therefore also in the radial direction and thus hold the cover on the mounting. This facilitates installation of the cover on the mounting.

[0035] The widening region may in particular be the region of the mounting surrounded by the annular groove. The widening may be achieved, for example, by means of a conical or truncated conical outer contour of this region, in particular by means of such a configuration of the outer side wall of the annular groove.

[0036] The clamping ring may then in particular have segments which can be expanded elastically in the circumferential direction and which connect to one another segments holding the cover in the mounting, in particular pressing said cover against the mounting. The segments holding the cover in the mounting can be, for example, wedge-shaped segments and/or radially elastically deformable segments, in particular having radially acting spring elements.

[0037] A further development is that the bulb can be detached from the mounting, in particular if the clamping ring is arranged between the inner side of the cover and the mounting and can be deformed elastically in the radial direction, at least in some sections. The lighting device can in particular be configured such that, when the cover is pulled, the regions or elements that can be deformed elastically in the radial direction, in particular spring elements, give way with increasing force, and the cover can be taken off.

[0038] One refinement is that the clamping ring is produced from plastic. This permits a particularly lightweight and inexpensive clamping ring with high deformability (low modulus of elasticity).

[0039] The mounting may in particular be a heat sink, which permits a particularly simple structure. However, the mounting can also be an intermediate ring, which facilitates installation. In particular, the cover may be adhesively bonded to the intermediate ring in a process step independent of the rest of the lighting device. Long curing times and high curing temperatures of the adhesive may be implemented better as a result; logistic advantages during the production also result. The intermediate ring may in particular be fixed to a heat sink. The connection between the intermediate ring and the heat sink preferably permits a high flow of heat.

[0040] One possible development is additionally that the lighting device is a lamp. The lighting device may in particular be a semiconductor lighting device which has at least one semiconductor light source for light production. The light produced by the at least one semiconductor light source emerges through the cover. The cover may in particular cover the at least one semiconductor light source.

[0041] Preferably, the at least one semiconductor light source includes at least one light-emitting diode. If a plurality of light-emitting diodes is present, these may light up in the same color or in different colors. A color can be monochromatic (e.g. red, green, blue and so on) or multi-chromatic (e.g. white). In addition, the light emitted by the at least one light-emitting diode may be infrared light (IR-LED) or ultraviolet light (UV-LED). A plurality of light-emitting diodes may produce mixed light; e.g. white mixed light. The at least one light-emitting diode may contain at least one wavelength-converting luminescent material (conversion LED). The luminescent material may alternatively or additionally be arranged remotely from the light-emitting diode ("remote phosphor"). The at least one light-emitting diode may be present in the form of at least one individually housed light-emitting diode or in the form of at least one LED chip. A plurality of LED chips may be mounted on a common substrate ("submount"). The at least one light-emitting diode may be equipped with at least individual and/or common optical system for beam guidance, e.g. at least one Fresnel lens, collimator and so on. Instead of or in addition to inorganic light-emitting diodes, for example based on InGaN or AlInGaP, in general organic LEDs (OLEDs, e.g. polymer OLEDs) may also be used. Alternatively, the at least one semiconductor light source may have at least one diode laser, for example.

[0042] The lamp may in particular be a retrofit lamp, in particular an LED retrofit lamp, which is used to replace conventional lamps by a semiconductor lighting device, in particular an LED lamp. The LED retrofit lamp may in particular have an outer contour which approximates the outer contour of the lamp to be replaced and/or which has a similar emission of light.

[0043] Various embodiments further provide a method for installing a translucent cover of a semiconductor lighting device on a mounting of the semiconductor lighting device, wherein the method includes at least the following steps: (a) placing a clamping ring that may be deformed elastically in the circumferential direction thereof on a widening region of the mounting, the widening region of the mounting being surrounded by an annular groove; (b) inserting an undercut, in particular tapering, edge region of the cover into the annular groove of the mounting, the undercut edge region surrounding the clamping ring; and (c) sliding the clamping ring onto the widening region of the mounting until the clamping ring presses on the inner side of the cover.

[0044] As a result of sliding the clamping ring on, for example by means of firmly tightening screws, the wedge-shaped segments of the clamping ring slide downward on the widening region of the mounting, e.g. a conical annular surface of the mounting, e.g. a conical outer side wall of an annular groove, and widen the annular diameter until the segments rest on the undercut inner side of the cover.

[0045] The diameter of the clamping ring is now greater than the inner diameter of the cover, which means that the cover can no longer be taken off or only by means of a force that is higher than the inherent weight of the cover.

[0046] Various embodiments further provide a method for installing a translucent cover of a semiconductor lighting device having an undercut, in particular tapering, edge region on a mounting of the semiconductor lighting device, wherein the method includes at least the following steps: (a) inserting a clamping ring that may be deformed radially elastically, at least in some sections, into the cover; and (b) inserting the cover into an annular groove in the mounting. The clamping ring may then in particular be clipped into the glass bulb and after that latched onto the mounting. This permits particularly simple installation without special tools.

[0047] One refinement is that the clamping ring may be deformed elastically in the circumferential direction thereof, at least in some sections, and the step of inserting the cover into the annular groove includes at least sliding, in particular latching, the clamping ring onto a widening region of the mounting. This further facilitates installation. As it is slid on, in particular latched on, the diameter of the clamping ring is widened and the segments that may be deformed radially elastically (even in the fitted state of a clamping ring), in particular having spring elements, then rest on the inner side of the cover. The diameter of the radially elastically deformable segments is then greater than the internal diameter of the cover, which means that the cover can no longer be taken off or only by means of a force counter to the elastic deformation of the radially elastically deformable segments that is higher than the inherent weight of the cover.

[0048] These methods may in particular be carried out in addition to adhesive bonding of the cover to the mounting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0049] 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 the disclosed embodiments. In the following description, various embodiments described with reference to the following drawings, in which:

[0050] FIG. **1** shows, as a sectional illustration in oblique view, a detail from a lighting device according to a first embodiment;

[0051] FIG. **2** shows, as a sectional illustration in front view, a sketch in detail form of the lighting device according to the first exemplary embodiment;

[0052] FIG. **3** shows, as a sectional illustration in oblique view, a detail from a lighting device according to a second embodiment;

[0053] FIG. **4** shows, as a sectional illustration in front view, a sketch in detail form of the lighting device according to the second exemplary embodiment;

[0054] FIG. **5** shows, as a sectional illustration in oblique view, a detail from a lighting device according to a third embodiment;

[0055] FIG. **6** shows, as a sectional illustration in oblique view, a detail from a lighting device according to a fourth embodiment; and

[0056] FIG. **7** shows, as a sectional illustration in oblique view, a detail from a lighting device according to a fifth embodiment.

DETAILED DESCRIPTION

[0057] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details and embodiments in which the disclosure may be practiced.

[0058] FIG. **1** shows, as a sectional illustration in oblique view, a detail from a lighting device **1** according to a first embodiment. FIG. **2** outlines the lighting device **1** in detail form as a sectional illustration in front view.

[0059] The lighting device **1** is provided as a semiconductor lighting device for use with at least one semiconductor light source, in particular light-emitting diode **2** (not shown). The lighting device **1** is further configured as an incandescent lamp retrofit lamp, in order to replace conventional incandescent lamps.

[0060] The lighting device **1** has a translucent (e.g. transparent or opaque) cover **3** and an annular mounting **4** for the cover **3**.

[0061] The cover **3** consists of glass and has substantially the shape of a dome shaped like a spherical shell with an at least approximately equal wall thickness. The cover **3** is more than hemispherical and extends from the front tip **5** thereof beyond the mid-plane or equator **6** thereof and, at the rear or reverse end thereof, has an annular free edge **7**. In its edge region **8** adjoining the free edge **7**, the cover **3** may have a shape differing from the spherical shell shape, for example a conical or truncated cone shape (in particular with a wall section that is straight in profile). The cover **3** therefore has a shape tapering in the direction of the free edge **7** thereof and widening in the opposite direction along the longitudinal axis L. As a result, an undercut or an undercut shape is achieved on an inner side **3***i* of the edge region **8**.

[0062] The cover **3** is further formed and arranged rotationally symmetrically with respect to a longitudinal axis L of the lighting device **1**, the longitudinal axis L extending from back to front through the lighting device **1**.

[0063] An upper side **9** of the mounting **4**, pointing forward, has an annular groove **10** arranged concentrically around the longitudinal axis L, into which groove the cover **3** is inserted, at least with a part of the undercut edge region **8** thereof. The annular groove **10** has a horizontal base **11** and an outer side wall **12** extending in the longitudinal direction L (that is to say from back to front in the direction of the upper side **9** of the mounting **4**) and serving as an outer side, and an inner side wall **13** widening in the longitudinal direction L and serving as an inner side.

[0064] The outer side wall **12** and the inner side wall **13** are therefore inclined in the same direction, here in the longitudinal direction L, from back to front at an increasing radial distance from the longitudinal axis L. The inner side wall **13** of the annular groove **10** thus has an undercut.

[0065] Here, the mounting **4** is designed as a separately produced intermediate ring, for example of plastic or metal, in particular aluminum. The mounting **4** is fitted by its rear side to a front side of a heat sink **15** over a large area via a thin adhesive layer. The heat sink **15** preferably consists of metal, in particular aluminum.

[0066] The mounting **4** is further arranged laterally around a cylindrical projection **16** of the heat sink **15** that projects forward from the front side of the heat sink **15**, concentrically with respect to the longitudinal axis L, preferably without any gap or with only a little play. The projection **16** is used amongst other things as an installation and positioning aid for fixing the mounting **4**. On a planar front side of the projection **16**, the light-emitting diodes **2** are fitted over a common substrate **17** in the shape of a circular disk. The heat generated by the light-emitting diodes **2** is at least partly transferred via the substrate **17** to the heat sink **15** over a large area. The heat sink **15** further provides a driver cavity to receive a driver (not shown), which driver is able to supply the light-emitting diodes **2** with an electric operating signal (e.g. via electric connections, not shown).

[0067] The outer side wall **12** of the annular groove **10** and the outer side **3***a* of the cover **3** in the edge region **8** have a shape that is substantially identical or conformal at least in profile, so that a gap between them has a substantially constant thickness.

[0068] The cover **3** is fixed to the mounting **4** via a silicone adhesive as adhesive **14**. To this end, first the adhesive **14** and after that the mounting **3** have been introduced into the annular groove **10**. The edge region **8** of the cover **3** has been inserted into the adhesive **14** and is covered by the adhesive **14** on the inner side **3***i* thereof, on the outer side **3***a* thereof and on the free edge **7**. In order to ensure the covering, the adhesive **14** has small glass spheres as filler, which serve as spacers.

[0069] The cover **3** with its outer side **3***a* is at only a slight distance from the outer side wall **12** of the annular groove **10**, so that the two are spaced apart from each other by an only thin layer of adhesive **14**. The cover **3** is therefore held in the annular groove **10** by means of the adhesive **14**, at least on the outer side **3***a* of said cover. As a result, an effective transfer of heat between the cover **3** and the mounting **4** is made possible. This permits effective dissipation of heat which, for example, is transferred out of the space covered by the cover **3** (which space is heated by the light-emitting diodes **2**) to the cover **3**, to the mounting **4** and onward from the latter to the heat sink **15**. For an improved dissipation of heat, the adhesive **14** can have a highly thermally conductive filler.

[0070] The volume between the inner side **3***i* of the edge region **8** of the cover **3** and the inner side of the annular groove **10** configured as an inner side wall **13**, that is to say the volume between opposite undercut regions of the cover **3** and the annular groove **10**, is filled with the adhesive **14**, at least up to a specific height. As a result, after being cured the adhesive **14** acts as a form-fitting barrier which prevents the cover **3** falling out of the mounting **4** even when an adhesive action of the adhesive **14** has dwindled. In other words, the cover **3** is held in a form-fitting manner in the annular groove **10** by means of the adhesive **14**, at least on the inner side **3***i* and **13**.

[0071] FIG. **3** shows, as a sectional illustration in oblique view, a detail from a lighting device **21** according to a second embodiment. FIG. **4** outlines the lighting device **21** in detail form as a sectional illustration in front view.

[0072] As opposed to the lighting device **1**, the lighting device **21** includes a cover **22** having a widened edge region **23** and, at its free end **24**, has a width (in the radial direction) of about three to five millimeters. The cover **22** is adhesively bonded with the free edge **24** of the widened edge region **23** to a substantially horizontal attachment surface **25** of the mounting **26**. The attachment surface **25** here is formed as a base of a flat annular groove **27**, the annular groove **27** delim-

iting the attachment surface **25** laterally. A transfer of heat from the cover **22** to the mounting **26** takes place substantially via a contact surface with the attachment surface **25**, which is covered with adhesive **14**.

[0073] As a result of the widened edge region (which has a thicker wall thickness then the rest of the cover) of the cover **22**, a large contact surface with a correspondingly high heat transfer capability and a large adhesive surface is provided, while the rest of the cover **22** has a comparatively low wall thickness and therefore, overall, also a low weight. The adhesive connection has only a low overall height or thickness. Furthermore, the application of the adhesive **14** is also relatively simply possible, for example by being dispensed onto the attachment surface **25**. A further advantage is the low thermo-mechanical stress which results in the case of this form of attachment. Despite the different thermal expansions of the cover **22** and of the mounting **26**, no substantial stresses occur in the cover **22**.

[0074] The attachment surface **25** here has an annual recess **28**, trough or channel covered by the free edge **24** of the cover **22**, which can receive excess adhesive **14**.

[0075] The mounting **26** is now not an intermediate ring but the heat sink itself. The annular groove **27** does not have an undercut side wall for the form-fitting retention of the cover **22**.

[0076] FIG. **5** shows, as a sectional illustration in oblique view, a lighting device **31** according to a third embodiment. The lighting device **31** has the cover **3** that tapers in an edge region **8** and is therefore undercut there. The cover **3** is inserted into an annular groove **32** in the front side of a mounting **33** formed as a heat sink (similar to the mounting **26**), the annular groove **32** being deeper than the annular groove **27** of the mounting **26**. The groove **32** surrounds laterally and delimits a projection **34** projecting forward (in the direction of the longitudinal axis L), the circumferential surface of which corresponds to an inner side or inner side wall **35** of the annular groove **32**. The cover **3** is seated with the free edge **7** thereof on the base of the annular groove **32** and makes contact, with the outer side **3***a* of the edge region **8** thereof, with an outer side or outer side wall **36** of the annular groove **32**.

[0077] The cover **3** is pressed against the mounting **33**, more precisely the outer side wall **36** of the annular groove **32**, by means of a clamping ring **37** placed on an inner side **3***i* of the edge region **8**, and is thus held. In this way, the clamping ring **37** is able to achieve a particularly firm force-fitting and form-fitting connection or fixing of the cover **3** to the mounting **33**. To this end, the clamping ring **37** is seated on the projection **34** and has a plurality of wedge-shaped regions or segments **38**, four here, arranged rotationally symmetrically around the longitudinal axis L. The wedge-shaped segments **38** are configured as solid bodies or blocks which have an outline in the shape of a circular segment which, on the outer side thereof, are substantially conformal with the inner side **3***i* of the edge region **8** of the cover **3** and on the inner side thereof, are substantially conformal with the projection **34** of the mounting **33**. In profile, the wedge-shaped segments **38** have a wedge shape.

[0078] The clamping ring **37** is fixed by means of a plurality of self-tapping screws **39**. The screws **39** are led with their pin-like threaded region through the mounting **33** to a respective wedge-shaped segment **38**. In each of the wedge-shaped segments **38**, a hole **40** is provided to receive the screws **39**, so that the wedge-shaped segments **38** can be drawn against the mounting **33** and onto the cover **3** by tightening the screws **39**. By means of controlled tightening of the screws **39**, the compressive force on the cover **3** can be adjusted.

[0079] The clamping ring **37** may furthermore be deformed elastically in its circumferential direction, at least in some sections, as a result of the fact that adjacent wedge-shaped segments **38** are connected by segments **41** that can be extended elastically in the circumferential direction. At the same time, the projection **34** is configured to be conical or in the form of a truncated cone, at least in the front region **42** thereof, such that it widens in the attachment direction of the clamping ring **37**, i.e. counter to the longitudinal direction L or rearward. Consequently, as it is placed on the front, widening region **42**, the clamping ring **37** expands in the circumferential direction and therefore also in the radial direction. In particular, in its unexpanded state the clamping ring **37** has a maximum diameter which is smaller than the inner diameter of the cover **3** at the free edge **7** thereof or the (attachment) opening of the cover **3**. As the clamping ring **37** is placed on the widening region **42** of the projection **34**, the maximum diameter of the clamping ring **37** is enlarged to such an extent that it is then larger than the inner diameter of the cover **3** at the free edge **7** of the latter. This facilitates installation of the cover **3** on the mounting **33**.

[0080] For example, in order to install the cover **3**, firstly the clamping ring **37** may be placed on the widening region **42**, the clamping ring **37** not yet being expanded or expanded only slightly in the circumferential direction, so that the maximum diameter thereof is smaller than the inner diameter of the cover **3** at the free edge **7** of the latter. Consequently, the cover **3** can be inserted with the edge region **8** thereof into the annular groove **32** and, for this purpose, is led past the clamping ring **37**. The edge region **8** of the cover **3** therefore surrounds the clamping ring **37** laterally. After that, by tightening the screws **39**, the clamping ring is slid onto the region **42** widening in the direction of movement of the clamping ring **37** until the clamping ring **37** presses on the inner side **31** of the edge region **8** of the cover **3**.

[0081] The cover **3** may additionally be fixed to the mounting **33** by means of an adhesive (not shown).

[0082] FIG. **6** shows, as a sectional illustration in oblique view, a detail of a lighting device **51** according to a fourth embodiment. The lighting device **51** has a clamping ring **53** for fixing the cover **3** to a mounting **52**. Here, too, the cover **3** is inserted into a front-side annular groove **54** in the mounting **52** formed as a heat sink.

[0083] The clamping ring **53** is arranged between the inner side **3***i* of the cover **3** and the mounting **52**, in a way similar to the clamping ring **37**. However, the mounting **52** is now pressed against an outer side wall **56** of the annular groove **54** by sections or segments **55** of the clamping ring **53** that can be deformed in the radial direction, and is thus held in the mounting **52** in a form-fitting and possibly force-fitting manner counter to the inherent weight thereof, even in a position of the lighting device **51** that is oriented upside down. To this end, the segments **55** each have a spring element **62** located on the outside of the inner ring **57** and acting radially outward. The spring elements **62** are consequently likewise arranged rotationally symmetrically about the longitudinal axis L of the lighting device.

[0084] The spring elements **62** force the cover **3** from the inside against the outer side wall **56** of the annular groove **54** of the mounting **52**.

[0085] The clamping ring **53** has an inner ring **57** that does not widen in the circumferential direction, which can be pulled over a projection **58** projecting forward and belonging to the mounting **52**. The inner ring **57** has latching lugs **59** which engage in the projection **58**. To this end, the projection **58** has an undercut **61** serving as a latching cutout on the circumferential surface thereof, which corresponds to an inner side wall **60** of the annular groove **54**. The clamping ring **53** may thus be positioned and fixed on the projection **58**.

[0086] In order to install the translucent cover **3**, the procedure may be as follows: firstly, the clamping ring **53** is inserted into the cover **3**. This is possible here, since the clamping ring **53** with spring elements **62** pressed in radially has an outer diameter which is smaller than the inner diameter of the cover **3** at the free edge **7** thereof.

[0087] As a result, the clamping ring **53** assumes a predetermined position on the inner side **3***i* of the cover. The inner side **3***i* of the cover **3** can be configured specifically for this purpose, for example have receptacles (not shown) to receive spring elements **62**. The clamping ring **53** may, for example, be latched and/or clamped into the cover **3**, in particular clipped in.

[0088] Then, the cover **3** equipped with the clamping ring **53** is inserted into the annular groove **54** in the mounting **52**. The clamping ring **53** is drawn over the projection **58** and latched to the latter.

[0089] The cover **3** may be detached from the mounting **52** since, if a pull is applied to the cover **3** in the direction of the longitudinal axis L, the spring elements **62** give way or are forced inward and the cover **3** may be taken off.

[0090] The cover **3** can additionally be fixed to the mounting **52** by means of an adhesive (not shown).

[0091] FIG. **7** shows, as a sectional illustration in oblique view, a detail from a lighting device **71** according to a fifth embodiment. The lighting device **71** is configured in a way similar to the lighting device **51**.

[0092] The lighting device **71** has a clamping ring **72** which has spring elements **62** which are connected by segments **63** that can be expanded elastically in the circumferential direction. This facilitates installation of the mounting **73** configured as a heat sink, in particular in an annular groove **78** in the mounting **73**, since the clamping ring **72** can be inserted into the cover **3** more simply than the clamping ring **53**. At least part of the pressing force is only generated as the clamping ring **72** is placed on a front-side projection **74** which, in a way similar to the projection **34**, has a region **75** widening in the attachment direction. As a result of being placed on the region **75**, the clamping ring **72** is expanded in the circumferential direction and thus widened in the radial direction.

[0093] In order to be fixed to the mounting **73**, the clamping ring **72** has latching hooks **76** fitted to the underside, which engage in matching latching cutouts **77** in the base of the annular groove **78**.

[0094] The cover **3** may additionally be fixed to the mounting **73** by means of an adhesive (not shown).

[0095] While the disclosed embodiments 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 disclosed embodiments as defined by the appended claims. The scope of the disclosed embodiments 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.

LIST OF DESIGNATIONS

[0096] **1** Lighting device
[0097] **2** Light-emitting diode
[0098] **3** Cover
[0099] **3***a* Outer side of the cover
[0100] **3***i* Inner side of the cover
[0101] **4** Mounting
[0102] **5** Tip of the cover
[0103] **6** Equator
[0104] **7** Free edge of the cover
[0105] **8** Edge region of the cover
[0106] **9** Upper side
[0107] **10** Annular groove
[0108] **11** Horizontal base of the annular groove
[0109] **12** Outer side wall of the annular groove
[0110] **13** Inner side wall of the annular groove
[0111] **14** Adhesive
[0112] **15** Heat sink
[0113] **16** Projection of the heat sink
[0114] **17** Substrate
[0115] **18** Driver cavity
[0116] **21** Lighting device
[0117] **22** Cover
[0118] **23** Widened edge region of the cover
[0119] **24** Free edge of the cover
[0120] **25** Attachment surface of the mounting
[0121] **26** Mounting
[0122] **27** Annular groove
[0123] **28** Recess
[0124] **31** Lighting device
[0125] **32** Annular groove
[0126] **33** Mounting
[0127] **34** Projection
[0128] **35** Inner side wall of the annular groove
[0129] **36** Outer side wall of the annular groove
[0130] **37** Clamping ring
[0131] **38** Wedge-shaped segment of the clamping ring
[0132] **39** Screws
[0133] **40** Hole in the wedge-shaped segment of the clamping ring
[0134] **41** Segment of the clamping ring that can be expanded elastically in the circumferential direction
[0135] **42** Widening region of the projection
[0136] **51** Lighting device
[0137] **52** Mounting
[0138] **53** Clamping ring
[0139] **54** Annular groove
[0140] **55** Segments of the clamping ring that can be deformed in the radial direction
[0141] **56** Outer side wall of the annular groove
[0142] **57** Inner ring of the clamping ring
[0143] **58** Projection
[0144] **59** Latching lugs of the inner ring
[0145] **60** Inner side wall of the annular groove
[0146] **61** Undercut of the inner side wall
[0147] **62** Spring element of the clamping ring
[0148] **63** Segment of the clamping ring that can be expanded elastically in the circumferential direction
[0149] **71** Lighting device
[0150] **72** Clamping ring

[0151] **93** Mounting
[0152] **74** Projection
[0153] **75** Widening region of the projection
[0154] **76** Latching hook of the clamping ring
[0155] **77** Latching cutouts of the mounting
[0156] **78** Annular groove
[0157] L Longitudinal axis

1. A semiconductor lighting device, comprising a translucent cover and a mounting for the cover, wherein
the mounting has an annular groove,
the cover is inserted into the annular groove and
the cover is held in the annular groove, at least on a first side, by means of an adhesive.

2. The semiconductor lighting device as claimed in claim **1**, wherein the cover is held in the annular groove, at least on a second side thereof, in a form-fitting manner by means of the adhesive.

3. The semiconductor lighting device as claimed in claim **2**, wherein the second side is an inner side, the cover is inserted into the annular groove with an undercut edge region, and the annular groove has an undercut on the inner side thereof.

4. The semiconductor lighting device as claimed in claim **2**, wherein the second side is an outer side, the cover is inserted into the annular groove with a widening edge region, and the annular groove has an undercut on the outer side thereof.

5. The semiconductor lighting device as claimed in claim **1**, wherein the adhesive has spacers.

6. The semiconductor lighting device as claimed in claim **1**, comprising a translucent cover and a mounting for the cover, wherein the cover has a widened edge region and is adhesively bonded with the widened edge region onto a substantially horizontal attachment surface of the mounting.

7. The semiconductor lighting device as claimed in claim **6**, wherein the attachment surface of the mounting has at least one recess covered by the cover.

8. The semiconductor lighting device as claimed in claim **1**, comprising a translucent cover that is undercut in an edge region, and a mounting for the cover, wherein the cover is pressed onto the mounting by means of a clamping ring attaching to an inner side of the edge region of said cover.

9. The semiconductor lighting device as claimed in claim **8**, wherein the clamping ring is configured to be wedge-shaped, at least in some sections, and is arranged with the at least one wedge-shaped region thereof between the inner side of the cover and the mounting.

10. The semiconductor lighting device as claimed in claim **8**, wherein the clamping ring is arranged between the inner side of the cover and the mounting and can be deformed elastically in the radial direction, at least in some sections.

11. The semiconductor lighting device as claimed in claim **9**, wherein the clamping ring can be deformed elastically in the circumferential direction thereof, at least in some sections, and is placed on a widening region of the mounting.

12. The semiconductor lighting device as claimed in claim **1**, wherein the mounting is a heat sink and an intermediate ring.

13. A method for installing a translucent cover of a semiconductor lighting device on a mounting of the semiconductor lighting device, the method at least comprising:
placing a clamping ring that can be deformed elastically in the circumferential direction thereof on a widening region of the mounting, the widening region of the mounting being surrounded by an annular groove;
inserting an undercut edge region of the cover into the annular groove of the mounting, the undercut edge region surrounding the clamping ring; and
sliding the clamping ring onto the widening region of the mounting until the clamping ring presses on the inner side of the cover.

14. A method for installing a translucent cover of a semiconductor lighting device having an undercut edge region on a mounting of the semiconductor lighting device, the method at least comprising:
inserting a clamping ring that can be deformed radially elastically, at least in some sections, into the cover; and
inserting the cover into an annular groove in the mounting.

15. The method as claimed in claim **14**, where the clamping ring can be deformed elastically in the circumferential direction thereof, at least in some sections, and the step of inserting the cover into the annular groove comprises at least
sliding the clamping ring onto a widening region of the mounting.

16. The semiconductor lighting device as claimed in claim **6**, wherein the attachment surface is substantially flat.

17. The semiconductor lighting device as claimed in claim **3**, wherein the edge region is tapered.

18. The semiconductor lighting device as claimed in claim **8**, wherein the edge region is tapered.

19. The method as claimed in claim **13**, wherein the edge region is tapered.

20. The method as claimed in claim **14**, wherein the edge region is tapered.

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