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(54) LED LIGHT FIXTURE AND METHOD OF MOUNTING THEREOF

(57) The invention relates to a light-emitting diode fixture and a method for the assembly of a light-emitting diode fixture. The light-emitting diode fixture comprises a housing (2) with a base (23) and a planar supporting surface (24), a light-emitting diode-carrier substrate (7), a light-emitting diode holder (5), a coupling region in an edge portion (5A) of the light-emitting diode holder with a second pair of contact tabs (11A, 11B), a connector (3) with a coupling region in an edge portion (3A) with a third pair of contact tabs (17A, 17B), joined together by mating engagement ends when the second and third pair of contact tabs (11A, 11B; 17A, 17B), respectively, are in current conducting contact. In order to facilitate the assembly process, the connector (3) and the light-emitting diode holder (5) each comprises a body with a central mounting axis (C-C), that the engagement ends of the light-emitting diode holder (5) and the connector (3) overlap each other in the coupling region with mating edge portions (5A, 3A), guide pins (13, 13) and insert openings (15, 15) parallel to the mounting axis (C-C), and that the connector (3) and the light-emitting diode holder (5) are pretensioned by fasteners (27, 27; 20, 20) in the direction of the mounting axis (C-C) against the supporting surface (24) with a clamping action between the overlapping edge portions (5A, 3A).

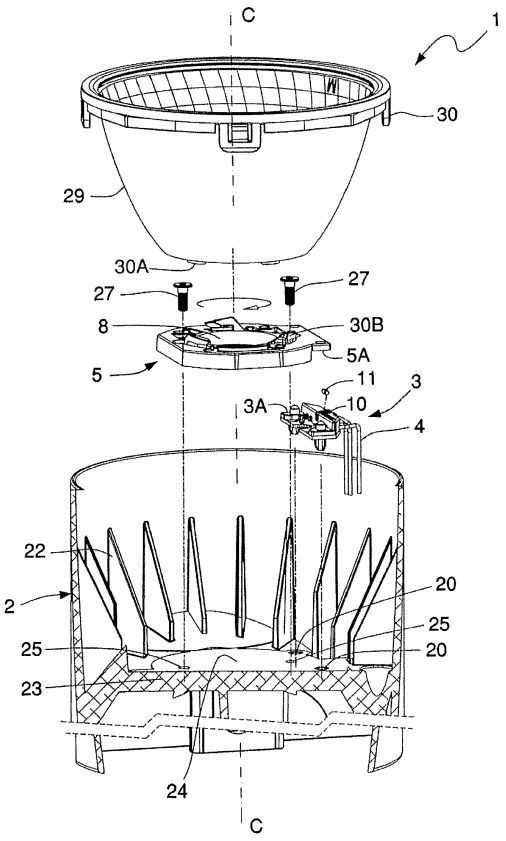

FIG.1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a light-emitting diode fixture and a method for the assembly of such a light-emitting diode fixture.

BACKGROUND

[0002] Light-emitting diode fixtures, also called LED fixtures, normally comprise a light-emitting diode holder which carries a light-emitting diode substrate. The fixture also includes a housing in which the light-emitting diode substrate is received. The light-emitting diode-carrier substrate consists of a plate on whose top side are arranged light-emitting diodes and contact tabs associated with the light-emitting diodes. The light-emitting diode-carrier substrate is secured in a recess on the underside of the light-emitting diode holder. Via an opening in the light-emitting diode holder, light from the light-emitting diodes can emerge from the top side of the light-emitting diode holder when the light-emitting diodes are activated by making an electric current flow through them. The fixture may also include a reflector whose purpose is to disperse the light from the light-emitting diodes.

[0003] From the light-emitting diode holder wires run to an electric energy source for the power supply of the light-emitting diode holder substrate. A thermal paste may be applied on a surface in the housing against which lies a heat sink on the underside of the light-emitting diode-carrier substrate when the light-emitting diode holder is mounted in the housing. Automated flexible manufacturing of light-emitting diode fixtures requires them to be assembled easily and effectively in modular form, such as by means of a robot.

OBJECT OF THE INVENTION

[0004] One object of the present invention is to create a light-emitting diode fixture that significantly facilitates the assembly of LED-fixtures, especially the automated assembly with so-called pick-and-place machines (picking robots). The mutual positioning of the various parts with respect to the housing is very important, since for example an automated screw-driving machine usually requires a tolerance range of $\pm$ 0.1 mm, for example in order to center a screw in a particular threaded hole.

[0005] Another object of the invention is to make it possible to configure each lighting fixture to the customer's needs by so-called modular design. A modular design makes it easy to provide a tailor-made product by selecting components during the manufacturing. It should also be easy to exchange the light-emitting diode holder substrate for other components when needed. Possible configuration options may include the choice of one or more of the following components: light-emitting diode substrate (chip), current-limiting resistor, reflector. From a production technology standpoint, it is desirable for the final configuration of the light-emitting diode fixture to be determined as late as possible in the production chain.

[0006] By the term LED fixture is intended, in the following, both a holder for a light-emitting diode (LED) and the electrical connector and the supplemental equipment needed for the light source to operate. COB is an abbreviation for "Chip on Board", briefly put it can be said that this is a cluster of light-emitting diodes packaged together on a printed circuit. The term light-emitting diode substrate used here thus means a so-called COB.

[0007] In a light-emitting diode, LED, it is the current through the light-emitting diode which determines its luminous power, not the voltage. Thus, the LED has no electrical resistance of its own, which means that a current limiter has to be built into the electrical circuit. The forward voltage (Uf) across a light-emitting diode varies between around 1.9 V (red) to around 3.6 V (blue) and is customarily defined at 20 mA current in the forward direction (If). If the maximum current in the forward direction (If max) is exceeded, the light-emitting diode might be destroyed. An optional current-limiting resistance or resistor is therefore normally coupled in series with the light-emitting diode. An LED lighting fixture is therefore configured by choosing a suitable current-limiting resistor.

SUMMARY OF THE INVENTION

[0008] The object of the invention is achieved with a light-emitting diode fixture having the characteristics and features set forth in claim 1.

[0009] The term contact tab or tongue used herein should be construed in its wider sense and not be limited strictly to a particular shape. In this regard, a tab is considered which, when in contact with a mating tab, can make an electrical circuit. The term underside, used herein, means a side facing a supporting surface for mounting in the housing or an underlying component resting against this side in the assembled state.

[0010] According to one exemplary embodiment, a first pair of contact tabs is arranged in a recess on the underside of the light-emitting diode holder, a second pair of contact tabs is arranged on the underside of one edge portion of the light-emitting diode holder, and a third pair of contact tabs is arranged on a top side of the connector which, when the connector is secured to the housing, is facing away from a supporting surface of the housing against which the connector rests. This means therefore that the light-emitting diode holder can exert a pressure on the connector which holds the connector in position relative to the housing and which guarantees a good electrical contact for the second pair of contact tabs on the light-emitting diode holder and the third pair of contact tabs of the connector. Conveniently, the light-emitting diode fixture comprises fasteners in the form of at least one screw and the light-emitting diode holder is secured to the housing by means of said screw, which extends

through the light-emitting diode holder in a direction perpendicular to the plane in which the contact tabs contact each other. In this way, a reliable contacting free of play is achieved.

[0011] According to one exemplary embodiment, the light-emitting diode holder is configured to clamp the connector between itself and the housing when the light-emitting diode holder is secured against the housing. In this way, the need for separate fastening components for the connector is reduced or eliminated altogether.

[0012] According to one exemplary embodiment, the light-emitting diode holder is configured to press an underside or heat sink of the light-emitting diode-carrier substrate against a heat-dissipating supporting surface in the housing when the light-emitting diode holder is mounted in the housing.

[0013] According to one exemplary embodiment, the connector and the light-emitting diode holder have interacting guide pins and insert openings for fixing the position of the light-emitting diode holder relative to the connector in a mounting direction in a normal to a supporting surface in the housing. During a robotized mounting of first the connector and then the light-emitting diode holder against the supporting surface, the position of the connector can therefore be utilized for a subsequent precise positioning of the light-emitting diode holder, which is a technical advantage.

[0014] According to one exemplary embodiment, the guide pins are tapering in the direction toward their free end. The insert openings can extend for a bit into or through the light-emitting diode holder. Automated positioning of the light-emitting diode holder on the connector is facilitated in this way.

[0015] The invention also relates to a method for the assembly of a light-emitting diode fixture as claimed in the invention, provided with a light-emitting diode substrate, according to the procedures and operation as set forth in claim 10.

[0016] Positioning of both connector and light-emitting diode holder is done by a substantially linear displacement along a mounting axis C-C which can but does not necessarily have to be parallel to the center line of the housing. The mounting axis C-C is conveniently perpendicular to a supporting surface in the housing. The light-emitting diode holder is secured by introduction of screws into openings in the light-emitting diode holder and by them being screwed home in threaded mounting holes in the housing, arranged in the supporting surface which the light-emitting diode holder is braced against. The screws and the mounting holes extend in a direction perpendicular to said supporting surface. The structure according to the invention thus favors a simplified robotized mounting of the light-emitting diode fixture in that all mounting can occur in a particular direction. A substantial advantage of the invention is furthermore that, when replacing the light-emitting diode substrate, it is necessary to dismount only the light-emitting diode holder itself, but not the connector. Moreover, it is an advantage that the connector comprises a removable printed-circuit substrate with a holder for a current-limiting resistor which is accessible and replaceable via an opening in the dielectric piece forming the body of the connector.

DESCRIPTION OF FIGURES

[0017] In the following, an exemplary embodiment will be described in further detail with reference to the accompanying drawings, in which:

Fig. 1 shows a side view, partly in cross section, of a light-emitting diode fixture according to the present invention;
Fig. 2 shows a perspective view of the light-emitting diode fixture according to fig. 1, in the assembled state;
Fig. 3 shows a perspective view from the bottom of a light-emitting diode holder forming part of the light-emitting diode fixture shown in fig. 1 and fig. 2,
Fig. 4 shows a perspective view from above of the light-emitting diode holder in fig. 3;
Fig. 5 shows a perspective view from the bottom of a connector forming part of the light-emitting diode fixture shown in fig. 1 and fig. 2; and
Fig. 6 shows a perspective view from above of the connector in fig. 5;
Fig. 7 shows a perspective view from above of the connector in fig. 5 with the parts disassembled.

DESCRIPTION OF AN EMBODIMENT

[0018] Fig. 1 shows an exemplary embodiment of a light-emitting diode fixture 1 according to the present invention. The light-emitting diode fixture 1 comprises a housing 2, a connector 3 which is configured to be mounted in the housing 2 and which connector comprises electrical conductors 4 for connection to an electric energy source, and a holder 10 for receiving an optional current-limiting resistor 11 which is snapped into place between contacting terminals in the holder. Moreover, the light-emitting diode fixture 1 comprises a light-emitting diode holder 5, having on an underside (see fig. 4) a recess 6 or an indentation to retain and carry a light-emitting diode-carrier substrate 7. The light-emitting diode holder is made of a dielectric material such as injection-molded plastic with electrically conductive cutout metal tabs which engage with the light-emitting diode holder. In the embodiment shown, the light-emitting diode-carrier substrate 7 is snapped into the complementary shaped recess 6 and retained there by the action of a ledge 21:1 or shoulder formed in one edge portion of the recess and resilient plastic tongues 21:2 formed in an opposite edge portion of the recess.

[0019] In one part of the recess 6, the light-emitting diode holder has a first pair of contact tabs 9A, 9B which are visible in fig. 4 because portions of the light-emitting diode-carrier substrate 7 have been cut away. Said first

pair of contact tabs 9A, 9B is configured to make electrical contact with a corresponding pair of contact tabs (not visible in the figures) which are arranged in familiar fashion on a top side of the light-emitting diode-carrier substrate 7. In fig. 1, C-C denotes a mounting axis through the light-emitting diode fixture.

[0020] The light-emitting diode-carrier substrate 7 is of the COB type and has contact tabs on the same side (top side) as is provided with light-emitting diodes. The light-emitting diode-carrier substrate 7 consists of a dielectric wafer on which light-emitting diodes and contact tabs are arranged. The top side of the light-emitting diode-carrier substrate 7 with light-emitting diodes is seen in part in fig. 3 where it is arranged in the recess 6 situated on the underside of the light-emitting diode holder 5, cf. fig. 4. The light-emitting diode-carrier substrate 7 may comprise, besides a dielectric wafer, a heat-dissipating lower metal plate, a so-called heat sink, which is shown in fig. 4 and which, when a thermal paste is applied, can efficiently divert heat from the light-emitting diodes.

[0021] As will appear from figs 2 and 3, the light-emitting diode holder 5 has an opening 8 on a top side in the middle of the recess 6, wherein said opening 8 is configured to let through light from the light-emitting diodes on the light-emitting diode-carrier substrate 7 to the other side of the light-emitting diode holder 5. The light-emitting diode holder 5 is configured to be mounted in the housing 2 with its underside facing a supporting surface 24 in the housing 2.

[0022] As will appear from fig. 4, the light-emitting diode holder 5 has a coupling region in which it has a second pair of contact tabs 11A, 11B which are electrically connected to said first pair of contact tabs 9A, 9B and which are provided to contact, when the connector 3 and the light-emitting diode holder 5 are mounted in the housing 2, a third pair of contact tabs 17A, 17B which are arranged on the connector 3, as shown in fig. 5.

[0023] The light-emitting diode fixture 1 has first guide members 18, 20 and second guide members 13, 15 whereby the connector 3 is guided relative to the housing 2 via said first guide members while the light-emitting diode holder 5 is guided in position relative to the housing 2 and the connector 3 secured on the housing 2 via said second guide members.

[0024] In the shown exemplary embodiment, said first and second guide members comprise respective pairs of guide pins 13, 13; 18, 18 and insert openings 15, 15, 20, 20 that are oriented in parallel with the mounting axis C-C. Each guide pin 13, 13; 18, 18 tapers toward its free end like a thorn or a dome. Said first and second pairs of guide pins 13, 13 and 18, 18, respectively, are arranged on the connector 3. More particularly, the connector 3 comprises a body which is made of a dielectric material such as injection-molded plastic, having a first 13, 13 and a second pair of guide pins 18, 18, respectively, which are parallel to the central mounting axis C-C and project in opposite directions from a plane of the connector which is parallel to a planar supporting surface 24 forming a mounting support for the housing 2. The first pair of guide pins 13, 13 is situated on a top side of the body of the connector 3 while the second pair of guide pins 18, 18 is situated on an underside of the body. The connector 3 further comprises a dismountable printed-circuit substrate 14 on which said third pair of contact tabs 11A, 11B is arranged, and insert openings 12, 12 by which the printed-circuit substrate 14 is mounted onto the body of the connector 3 in that said second pair of guide pins 18, 18 is inserted with force-fit engagement through said insert openings 12, 12. The body of the connector 3 is provided with an opening 16 through which a holder 10 mounted on the printed-circuit substrate 14 for holding a replaceable current-limiting resistor 11 is accessible when the printed-circuit substrate 14 is mounted in place.

[0025] The underside of the connector 3 bears against a supporting surface 24 in the housing 2 when the connector 3 is mounted. The first pair of guide pins 13, 13 on the top side of the connector 3 interacts with insert openings 15, 15 situated in a coupling region at a side edge or an edge portion 5A of the light-emitting diode holder 5.

[0026] As will appear best from figs 3-6, the respective coupling regions of the light-emitting diode holder 5 and the connector 3 form respective overlapping engagement ends having mutually fitting edge portions 5A, 3A. These edge portions 5A, 3A have mutually engaging step or L-shaped formations, seen in cross section, that offer a combination of supporting and guiding planes due to their being oriented at an angle to and in parallel with, respectively, the mounting axis C-C.

[0027] Thus, the connector 3 acts as a positioning aid for the light-emitting diode holder 5 in the housing 2. It is therefore important for the connector 3 to be previously positioned precisely on the housing 2, in order to guarantee that the light-emitting diode holder 5 can in turn be positioned precisely with respect to threaded mounting holes 25 in the housing 2, for screwing tight the light-emitting diode holder 5. Therefore, the housing 2 and the connector 3 have the mentioned first pair of guide members 18, 18; 20, 20 by which the connector 3 is guided into position relative to the housing 2. The mounting holes 20, 20 in the mounting surface 24 of the base 23 contain a pair of insert openings, corresponding to the guide pins 18, 18, which provide a force fit engagement.

[0028] As mentioned above, the housing 2 serves to dissipate heat from the light-emitting diodes on the light-emitting diode-carrier substrate 7. In order to produce a cooling effect, the housing 2 comprises cooling flanges 22 which in the exemplary embodiment shown project from an inner wall of the housing. The housing 2 is substantially cylindrical and has a base 23 or bottom which forms said supporting surface 24 for the mounting of the connector 3 and the light-emitting diode holder 5. Moreover, the light-emitting diode fixture contains fasteners for securing the light-emitting diode holder 5 against the supporting surface 24 of the housing 2. In the example

shown here, the fasteners comprise a pair of screws 27, 27 arranged in the base 23 of the housing 2 and corresponding threaded mounting holes 25, 25 for screwing tight the light-emitting diode holder 5 in the base 23 of the housing 2. When the light-emitting diode holder 5 is mounted securely against the base 23, the underside of the light-emitting diode-carrier substrate 7 (see fig. 4) lies against the supporting surface 24. The base 23 of the housing 2 may be provided with an opening (not visible in the figures) for leading through the conductors 4 of the connector 3. The housing 2 is conveniently made of a material with good thermal conductivity, such as aluminum.

[0029] As will appear from fig. 1, the light-emitting diode fixture 1 comprises a reflector 29 which is secured to the top side of the light-emitting diode holder by snap-locking members. To this end, the reflector 29 comprises a first locking element 30A which forms a first active part of a bayonet mount. The light-emitting diode holder 5 is outfitted, on its top side, with a second locking element 30B which forms a second part of said bayonet mount by which the reflector 29 is brought against the light-emitting diode holder 5 in the mounting axis C-C direction and mounted on the top side of the light-emitting diode holder 5 by being twisted about an axis forming a normal to the main surface of the light-emitting diode-carrier substrate 7. The circular arc shaped arrow in fig. 1 illustrates how the reflector 29 is twisted firmly on the light-emitting diode holder 5.

[0030] The light-emitting diode fixture 1 is assembled as follows, by hand or by a robot: the connector 3 is secured against the mounting surface 24 of the housing in the mounting direction C-C by the first pair of guide pins 18, 18 being inserted into corresponding mounting holes 20, 20 in the base 23 of the housing. The light-emitting diode holder 5, which is provided in a complementary process step with a predetermined light-emitting diode-carrier substrate 7 with the desired luminous flux (lm), is mounted by being moved in the mounting direction C-C towards the connector so that the insert openings 15, 15 in the coupling region of the light-emitting diode holder 5 are penetrated by the thorn-like guide pins 13, 13 on the top side of the connector 3. The light-emitting diode holder 5 is finally secured to the housing 2 by means of the removable locking members by the screws 27, 27 being inserted through the openings 31, 31 in the light-emitting diode holder and screwed home in the threaded mounting holes 25, 25 in the base 23 of the housing 2. The lighting fixture is configured by a previously determined reflector 29 being secured to the top side of the light-emitting diode holder 5 at the opening 8 for letting through light, and by a resistor 11 with a predetermined resistance (Ω) being installed in the holder 10 of the connector 3.

[0031] It will be understood that all of the above described assembly measures occur by displacement of respective components in substantially the same direction, the mounting direction C-C, which is uniformly perpendicular to the plane of extension of the supporting surface 24.

Claims

1. Light-emitting diode fixture, comprising:

a housing (2) with a base (23) having a planar supporting surface (24) for mounting of a flat dielectrical light-emitting diode-carrier substrate (7) of the type having a top side provided with both contact tabs and light-emitting diodes and an underside provided with a heat-dissipating heat sink,

a light-emitting diode-carrier substrate (5) having on an underside a recess (6) in which the light-emitting diode-carrier substrate (7) is retained and a light opening (8) for the light-emitting diode-carrier substrate (7) on a top side, a first pair of contact tabs (9A, 9B) in the recess,

a coupling region in one edge portion (5A) of the light-emitting diode holder with a second pair of contact tabs (11A, 11B),

a connector (3) for an outside power supply of the light-emitting diode-carrier substrate (7) and a coupling region in an edge portion (3A) with a third pair of contact tabs (17A, 17B),

wherein the respective coupling regions of the light-emitting diode holder (5) and the connector (3) are joined together by mating engagement ends in which the second and third pair of contact tabs (11A, 11B; 17A, 17B), respectively, are in current conducting contact,

characterized in that the connector (3) and the light-emitting diode holder (5) each comprises a dielectric body with a central mounting axis (C-C) which forms a normal to the planar supporting surface (24) of the housing (2), that the engagement ends of the light-emitting diode holder (5) and the connector (3) overlap each other in the coupling region with mating edge portions (5A, 3A) and said edge portions furthermore comprise guiding members having mutually interacting guide pins (13, 13) and insert openings (15, 15) oriented parallel to said the mounting axis (C-C), and that the connector (3) and the light-emitting diode holder (5) are mutually pretensioned by fasteners (27, 27; 20, 20) in the direction of the mounting axis (C-C) against the supporting surface (24) and furthermore against the supporting surface with the heat-dissipating heat sink of the light-emitting diode-carrier substrate (7) resting against said supporting surface in combination with a clamping action occurring in the region between said overlapping edge portions (5A, 3A).

2. The light-emitting diode fixture according to claim 1,

wherein the mating edge portions (5A, 3A) of the light-emitting diode holder (5) and the connector (3), with overlapping engagement ends, have mutually engaging portions in step formation, seen in a cross-sectional view, which provide a combination of supporting and guiding planes oriented at an angle to and in parallel with, respectively, the central mounting axis (C-C).

3. The light-emitting diode fixture according to any one of claims 1 - 2, wherein the connector (3) comprises a body having a first and second pair of guide pins (13, 13; 18, 18), respectively, which are parallel to the central mounting axis (C-C) and which project in opposite directions from a plane of the connector which is parallel to the planar supporting surface (24) of the housing.

4. The light-emitting diode fixture according to claim 3, wherein the connector (3) comprises a printed-circuit substrate (14) on which said third pair of contact tabs (11A, 11B) is arranged, and insert openings (12, 12) by which the printed-circuit substrate is mounted onto the connector in the direction of the mounting axis (C-C) by said second pair of second guide pins (18, 18), which project from an underside of the body of the connector, being inserted with force-fit engagement in said insert openings.

5. The light-emitting diode fixture according to claim 4, wherein the body of the connector (3) is provided with an opening (16) through which a holder (10) mounted on the printed-circuit substrate (14) to receive an optional current-limiting resistor (11) is accessible when the printed-circuit substrate is mounted onto the body of the connector.

6. The light-emitting diode fixture according to any one of claims 4 - 5, wherein the connector (3) with corresponding printed-circuit substrate (3A) is mounted on the supporting surface (24) of the housing (2) by interaction between the second pair of guide pins (18, 18) extending through said printed-circuit substrate and furthermore with force-fit engagement in mounting holes (20, 20) in the base (23) of the housing.

7. The light-emitting diode fixture according to any one of claims 1 - 6, wherein each and every one of the first pair of guide pins (13, 13) situated on a top side of the connector (3) and the second pair of guide pins (18, 18) situated on an underside of the connector is tapered toward its free end.

8. The light-emitting diode fixture according to any one of claims 1 - 7, wherein the fasteners pretensioning the overlapping combination of light-emitting diode holder (5) and connector (3) against the supporting surface (24) comprise openings (31, 31) arranged in the light-emitting diode holder and oriented parallel to said mounting axis (C-C), and screw members (27, 27) extending through the openings and interacting with threaded mounting holes in the base (23).

9. The light-emitting diode fixture according to any one of claims 1 - 8, configured to be mounted on the planar supporting surface (24) in the housing (2) of the light-emitting diode fixture, **characterized in that** the connector (3) comprises an assembly formed from a body of injection-molded dielectric material such as plastic, a printed-circuit substrate (14) mounted on said body and provided with a pair of contact tabs (17A, 17B), and a first and a second pair of guide pins (13, 13; 18, 18), respectively, which are parallel to the central mounting axis (C-C) and which project in opposite directions from a plane of the connector, which plane is parallel to the planar supporting surface (24) of the housing.

10. A method for assembling the light-emitting diode fixture according to any one of claims 1-9, provided with a light-emitting diode substrate (7), said method being **characterized in that** it involves the following steps of the operation:

- that a connector (3) is positioned relative to the housing (2) in a position in which it is suitable for being secured to the housing (2),
- that a light-emitting diode substrate (7) is positioned in a recess (6) on the underside of the light-emitting diode holder (5) so that a pair of contact tabs on the top side of the light-emitting diode substrate (7) is brought into contact with a first pair of contact tabs (9A, 9B) of the light-emitting diode holder (5) and the light-emitting diodes on the light-emitting diode substrate (7) are situated facing a translucent opening (8) of the light-emitting diode holder,
- that the light-emitting diode holder (5) is positioned relative to the housing (2) guided by the connector (3) mounted on the housing with the aid of guiding members (13, 13, 15, 15) operating between the light-emitting diode holder and the connector and oriented in a mounting direction (C-C) with the underside of the light-emitting diode holder (5) facing a supporting surface (24) on the housing (2), second and third pairs of contact tabs (11A, 11B; 17A, 17B) arranging the light-emitting diode holder and the connector respectively are brought into contact, and
- that the light-emitting diode holder (5) is secured to the housing (2), clamping the connector between itself and the housing.

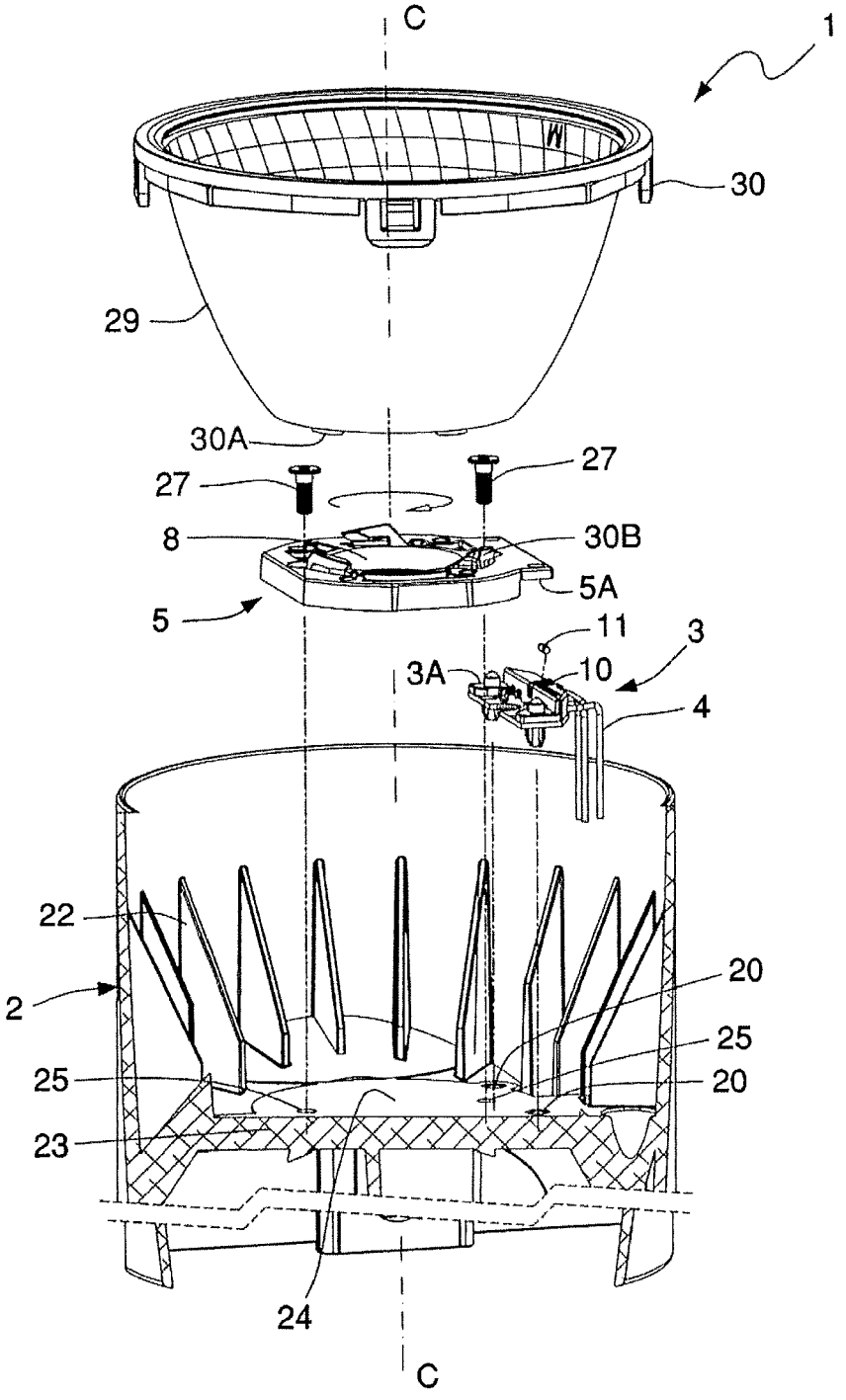

FIG.1

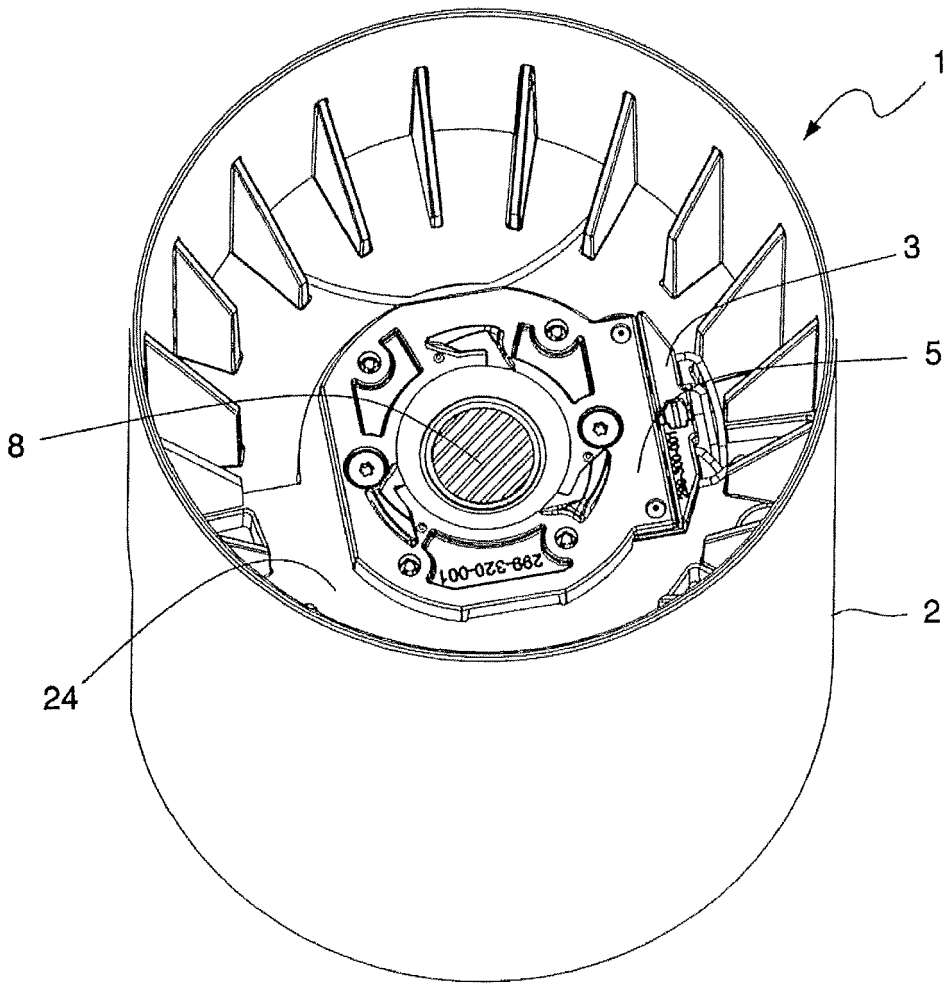

FIG.2

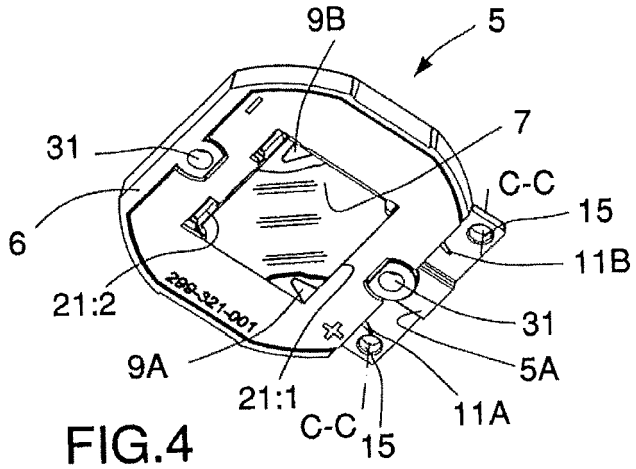

FIG.4

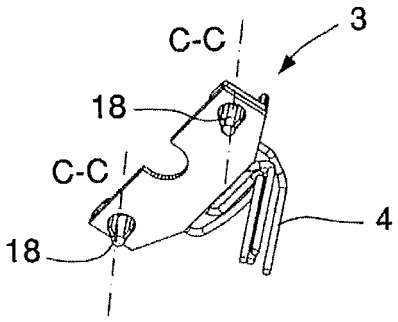

FIG.6

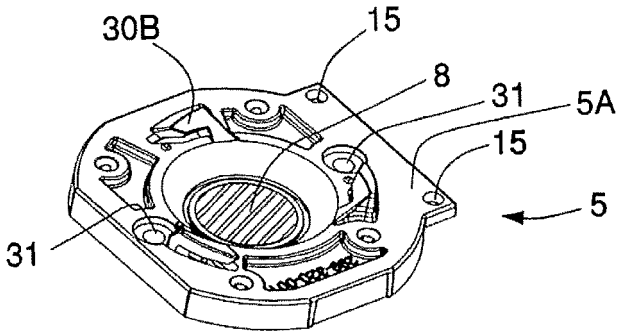

FIG.3

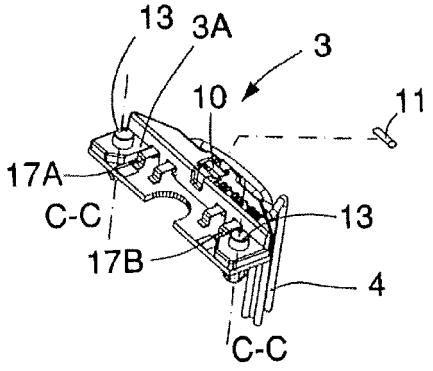

FIG.5

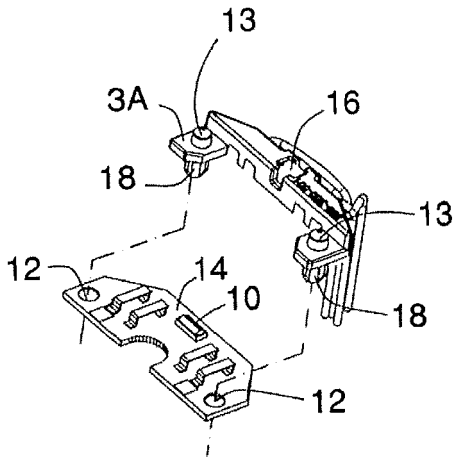

FIG.7

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 16 8573

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 333 407 A1 (TYCO ELECTRONICS CORP [US]) 15 June 2011 (2011-06-15) * paragraph [0063]; figures 23-24 * * paragraph [0034] - paragraph [0046]; figures 1-6 *	1-10	INV. F21V19/00 F21V23/06 ADD. F21Y115/10
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F21V
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 June 2018	Thibaut, Arthur

CATEGORY OF CITED DOCUMENTS

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