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Inventor(s) Henrici; Philipp et al.

LED connection element and light guide element

Abstract

A connection element electrically connects an LED light module. The LED light module has a printed circuit board with contact springs for the electrical supply of the LED. The connection element includes an annular frame to cover the printed circuit board and to hold it mechanically on an arrangement surface of a counter bearing. A contact arrangement is mounted in the frame and serves to supply the LEDs with electricity. The frame is divided into an outer ring and an inner ring. The outer ring is provided to surround the printed circuit board and to hold it in the parallel direction to the arrangement surface of the counter bearing. The inner ring at least regionally surrounds the printed circuit board and is provided to hold the printed circuit board in the vertical direction to the surface of the counter bearing. The inner ring is implemented in a light directing component.

Inventors: **Henrici; Philipp (Arnsberg, DE), Baumeister; Olaf (Sundern, DE), Bäcker; Tobias (Welver-Berwicke, DE)**

Applicant: **BJB GmbH & Co. KG** (Arnsberg, DE)

Family ID: **1000008505611**

Assignee: **BJB GmbH & Co. KG (Arnsberg, DE)**

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of German Patent Application DE 10 2024 104 553.1, filed on Feb. 19, 2024, the content of which is incorporated in its entirety.

TECHNICAL FIELD

[0002] The application relates to a connection element for the electrical connection of an LED light module.

[0003] The application additionally relates to a light directing component for a luminaire, having a component basic body which spans a component space, wherein the component basic body has a base part which forms an opening for receiving a light module.

BACKGROUND

[0004] Connection elements for electrically connecting an LED light module are well known in the prior art, such as from EP 2 083 489 A1 of the applicant, for example. This is a ring element that surrounds a printed circuit board and is able to hold the printed circuit board between itself and a counter bearing, in particular a heat sink. For this purpose, the ring element is fastened to the counter bearing using, for example, screw bolts. It sits on the printed circuit board with a part of its surface facing towards the printed circuit board. The ring element carries contacts in contact chambers. These contacts have a clamping section into which the stripped end of a connecting conductor is to be inserted. The connecting conductor is thus held in the clamping section and electrically contacted. Each contact then has spring legs that serve as pressure contacts and rest on contact fields on the printed circuit board. The connection element from the aforementioned patent specification thus serves both for electrically contacting and for mechanically holding the printed circuit board on a counter bearing. The printed circuit board itself carries an LED. It thus represents a light module which is used in luminaires instead of known filament lamps or similar conventional light modules.

SUMMARY

[0005] Connection elements have proved extremely successful in practice and are used in particular for spot lighting where LED light modules are used.

[0006] LED technology has developed considerably in the meantime. Printed circuit boards with attached LEDs are now available in a large number of luminous intensities and outputs, which is why the shape and, above all, the size of the printed circuit boards and the LEDs arranged on them vary greatly from manufacturer to manufacturer and in different performance classes.

[0007] There are therefore a plurality of connection elements on the market, each of which can be used with many specific LED printed circuit boards from a particular manufacturer and a particular performance class. This is advantageous in principle, since suitable connection elements are available for every application. However, this offer does not meet the requirements of the lighting industry. There, partial components of luminaires are stored pre-assembled in order to then be finally assembled when a certain type of light is purchased.

[0008] For example, a certain type of luminaire is offered in different wattages, i.e. with different luminosity or colour temperature of the light module. On the one hand, the standardised housing components are provided for this type of luminaire. On the other hand, the actual lighting

equipment-usually consisting of an LED light module, mounted on a suitably dimensioned heat sink-is kept in stock in different variants. In this way, a modular system can be used for incoming orders of luminaires, which enables simple final assembly of the required luminaire.
[0009] A disadvantage here, however, is stocking a large number of lighting devices. The completely pre-assembled unit consisting of LED light module, connection element and suitable heat sink represents a not inconsiderable value of the actual luminaire. Depending on the number of variants of a type of luminaire, a large amount of stock is required.
[0010] As a result, according to DE 20 2023 105 716 U1 of the applicant, a generic connection element has been developed, which compensates for existing disadvantages by the two-part construction of the frame of the connection element in the outer ring and inner ring.
[0011] However, the connection elements are also increasingly subject to the requirement of quick interchangeability and at the same time sustainability, as well as the premise of the safety aspect. Simplified handling and an increasing reduction in the number of components are also becoming more and more important in the lighting industry, although the light quality of the light sources used must not be impaired. Optimisation of the light quality emitted is also desired and even required.
[0012] At the same time, the demand for light directing components is also increasing. These can be optics, reflectors, lenses or also collimators, for example. On the one hand, these should ensure the best possible light emission and thus light efficiency. On the other hand, the idea of interchangeability and sustainability is also becoming increasingly important for light directing components under the premise of safety and easy handling of the light directing components.
[0013] An object of the application is, on the one hand, to create a connection element which, in addition to optimised handling, is still subject to the required safety criteria and ensures a reduction in the number of components under the premise of high-quality light quality.
[0014] The object is solved by a connection element for the electrical connection of an LED light module. The LED light module has a printed circuit board which is provided with contact springs for the electrical supply of the LED. The connection element has an annular frame which is provided to surround a printed circuit board and to hold it mechanically on an arrangement surface of a counter-bearing. The connection element includes a contact arrangement which is mounted in the frame and serves for the electrical supply of the LED. The frame is divided into an outer ring and an inner ring. The outer ring is provided to surround the printed circuit board and to be held in a parallel direction in relation to the arrangement surface of the counter-bearing. The inner ring at least regionally surrounds the printed circuit board and is provided to hold the printed circuit board in a vertical direction in relation to the surface of the counter bearing.
[0015] The inner ring and the light directing component are no longer two separate components, but that the inner ring is part of the light directing component. On the one hand, this ensures component reduction and, on the other hand, the manufacturer can now pre-assemble the connection element and the light directing component. The arrangement of the inner ring with the light directing component on the outer ring can be carried out at the assembly end position. The reduction in components is additionally associated with a reduction in time, since fewer components now need to be arranged next to one another.
[0016] For this purpose, it is provided that the inner ring forms the base part of the light directing component. The inner ring implemented in the light directing component is arranged downstream of the outer ring in the direction of light emission. This means that the inner ring is mounted on the outer ring in such a way that the inner ring can be inserted into the outer ring vertically against the direction of light emission for fastening to the outer ring. For this purpose, the inner ring and thus the light directing component is arranged in the outer ring.
[0017] It is envisaged that the inner ring forms at least one fastening element which interacts with a fastening element of the outer ring for fastening. This interaction serves to arrange the components of the connection element fixedly, albeit potentially also detachably, on one another and thus to

arrange the connection element functionally and securely in the final assembly position.
[0018] In addition, by fastening the light directing component in the immediate vicinity of the printed circuit board with LED, it is ensured that the light emitted by the LED or the light beams radiate directly into the light directing component and that this guides the light beams away. The light emitted from the light directing component thus has a high degree of light quality and light intensity, since there is virtually no loss of light beams. Overall, the light efficiency of the light module is thus significantly improved.
[0019] It is furthermore provided that the inner ring forms a stop means as a fastening element and the outer ring forms a stop means recess as a fastening element.
[0020] The advantage here is that the stop means can be inserted into the stop means recess in order to arrange the inner ring in the outer ring and the inner ring and the outer ring can be fastened together by twisting the inner ring in the manner of a bayonet lock. Bayonet connections are particularly stable connections that can withstand mechanical loads, in particular vibrations.
[0021] It is also envisaged that the fastening element of the inner ring and the fastening element of the outer ring are screw fasteners. The advantage of this type of fastening element is that it can be loosened. The inner ring, which forms the screwing means, is arranged on the outer ring and then moved against the direction of light emission and thus screwed against the outer ring. The outer ring and inner ring with light directing component are fastened to each other by the application of force. The inner ring with screwing means can be detached by the inner ring with light directing component being able to be unscrewed again in the direction of light emission. It is advantageous that both the fastening and the loosening of the inner ring with screwing means is also possible without tools. In addition, the loosening of the screwing means is reversible. This means that further fastening processes are possible even after the initial arrangement and subsequent loosening of the inner ring with screwing means.
[0022] It is provided that the inner ring has an outer contour which is shaped as an outer thread, and the outer ring has an inner contour which is shaped as an inner thread. The outer thread of the inner ring interacts with the inner thread of the outer ring for fastening in the outer ring. As a result of the interaction of the inner thread of the inner ring with the outer thread of the outer ring, the inner ring with the light directing component and the outer ring are fastened together by means of a self-locking frictional connection, i.e. a frictional connection. This fastening method is very stable, since loosening is only possible by moving the two threads apart. Thus, this fastening is also securely protected against strong mechanical loads, in particular vibrations.
[0023] It is also possible that the inner ring has an inner contour which is shaped as an inner thread, and the outer ring has an outer contour which is shaped as an outer thread, wherein the outer thread of the inner ring interacts with the inner thread of the outer ring for fastening in the outer ring.
[0024] Alternatively, it is envisaged that the fastening element of the inner ring and the fastening element of the outer ring are latching means that interact with each other.
[0025] The fastening element of the inner ring forms a spring-receiving chamber for a catch spring, which extends in relation to the outer ring resting on the arrangement surface into a region below the arranging surface, wherein the outer ring as a fastening element forms a dome for receiving the catch springs.
[0026] In order to be able to compensate for high tolerances with regard to the thickness of the printed circuit board and optionally thermal conductors arranged between the printed circuit board and the counter bearing, it is necessary for the inner ring to be able to perform a comparatively large movement stroke vertically to the arrangement surface of the counter bearing or in the light emission direction of the LED. At the same time, the catch spring must be able to exert sufficient pressure forces in the direction of the arrangement surface in any position of the inner ring caused by the tolerances.
[0027] This requires a catch spring that can cover a comparatively large spring path and is capable of withstanding sufficient pressure forces. Space must be created in the connection element for a

large spring path. Certain dimensions of the catch spring element are required for large spring forces. These requirements for a catch spring contradict the technical need to create connection elements that are as flat as possible in order to avoid shading of the emerging light by the connection element.
[0028] Shifting the required construction space for the catch spring to be used to a region below the arrangement plane of the counter bearing or at least extending into this region is beneficial. In this way, the thickness of the connection element measured in the direction of light emission or vertically to the arrangement plane of the counter bearing can be reduced to what is absolutely necessary. Shadowing of the emerging light by the connection element is reliably avoided or greatly reduced. Nevertheless, there is sufficient construction space for a catch spring element, which requires a sufficiently large spring receiving chamber due to the spring forces to be applied and, in particular, the required spring path.
[0029] It is envisaged that the spring receiving chamber is formed by a dome that emerges from the underside of the outer ring and is directed in particular against the direction of light emission. The spring element can be arranged in this dome and is thus provided with sufficient movement space for the required spring path, in particular in the case of a spring element shown in the exemplary embodiment with a pivot axis aligned in parallel to the arrangement surface.
[0030] On the other hand, the object of the disclosure is to create a light directing component that ensures the most light-efficient emission of the light module possible, also guarantees safe and easy handling and is conducive to interchangeability and sustainability.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0031] The invention is now explained in more detail with reference to six exemplary embodiments, from which further advantages and features emerge.
[0032] FIG. **1** shows a first embodiment of the first connection element with light directing component in an exploded depiction.
[0033] FIG. **2** is a perspective view of the first connection with light directing component according to FIG. **1**.
[0034] FIG. **3** is a top view of the first connection element with light directing component according to FIG. **2**.
[0035] FIG. **4**A is an exploded depiction of the sectional depiction of the first connection element with reflector according to intersecting lines IIIA-IIIA from FIG. **3**.
[0036] FIG. **4**B is a sectional depiction of the first connection element with light directing component according to intersecting lines IIIA-IIIA from FIG. **3**.
[0037] FIG. **5** shows a second embodiment of the second connection element with light directing component in an exploded depiction.
[0038] FIG. **6** is a perspective view of the second connection element with light directing component in the assembled state according to FIG. **5**.
[0039] FIG. **7** is a top view of the second connection element with light directing component in the assembled state according to FIG. **6**.
[0040] FIG. **8**A shows an exploded view in a sectional depiction of the second connection element with light directing component in the assembled state according to intersecting lines VIIB-VIIB from FIG. **7**.
[0041] FIG. **8**B is a sectional depiction of the second connection element with light directing component in the assembled state according to intersecting lines VIIB-VIIB from FIG. **7**.
[0042] FIG. **9** shows a third embodiment of the third connection element with light directing component in an exploded depiction.

[0043] FIG. **10** shows a fourth embodiment of the fourth connection element with light directing component.
[0044] FIG. **11** shows a fifth embodiment of the fifth connection element with light directing component.
[0045] FIG. **12** shows a sixth embodiment of the sixth connection element.
DETAILED DESCRIPTION
[0046] In FIGS. **1** to **4**B, a first embodiment is overall provided with reference number **100**. A second embodiment is shown in FIGS. **5** to **8**B and identified overall with reference number **200**. FIG. **9** shows the third embodiment overall with the reference number **300**. In FIG. **10**, the fourth embodiment is shown with reference number **400**. A fifth embodiment **600** is depicted in FIG. **11**. Finally, FIG. **12** shows a sixth embodiment **700**.
[0047] The embodiments **100**/**200**/**300**/**400**/**600**/**700** have a number of identical components. Insofar as identical or identically functioning components are used, these are given the same name and differ only in that they use either the number range **100**, the number range **200**, the number range **300**, the number range **400**, the number range **600** or the number range **700**.
[0048] Thus, what has been said about the first embodiment always applies to the second to sixth embodiments, insofar as identical or identically functioning components are affected.
[0049] In all figures, the installation direction E is defined as perpendicular in the direction of the arrangement plane **510** on the surface **511** of a heat sink **500** and the light emission direction R is defined as perpendicular away from the arrangement plane **510**. The arrangement plane **510** as the surface **511** of a heat sink **500**, on which all embodiments can be mounted, is shown.
[0050] It also applies to all figures that a system axis X runs through the centre point M of the arrangement of the outer and inner ring in the light emission direction R.
[0051] FIGS. **1** to **4** show the first embodiment **100** of the first connection element **110** with a light directing component **105**, which is formed as a reflector **111**.
[0052] In FIG. **1**, the connection element **110** and the reflector **111** is depicted in an exploded view. The connection element **110** has an outer ring **112**. On the one hand, the outer ring **112** interacts with a printed circuit board **114**, which carries LEDs **115** as light modules and contact springs K for contacting. On the other hand, the connection element **110** co-operates with a counter bearing, for example a heat sink (not depicted). Instead of the heat sink, however, the counter bearing can also be a light component of any type.
[0053] The connection element **110** is fixed to the heat sink by means of two screws **117**, which form a screw head **118** and a screw body **119**. Here, the connection element **110** holds the LED **115** of the printed circuit board **114** between itself and the heat sink.
[0054] The outer ring **112** firstly has a bottom base plate **120**. The bottom base plate **120** in turn forms an aperture **121**. This aperture **121** defines the inner silhouette **122** of the outer ring **112**, which is subdivided into a rectangular, in particular square, insert contour **123** and an engagement contour **124**. The engagement contours **124** merge into the insert contour **123**.
[0055] An annular collar **125** sits on the bottom base plate **120**, said annular collar surrounding the aperture **121** and having receiving holes **126**. The receiving holes **126** serve to receive the screw **117**.
[0056] The annular collar **125** forms inner wall sections **125**, which are interrupted by fastening elements **136** formed as stop means receivers **128**, which run on a common radius around a centre point M. The stop means receivers **128** form blind hole sections **129** mounted in parallel to the bottom base plate **120**.
[0057] The contact arrangement provided for the power supply of the printed circuit board **114** is not depicted in the exemplary embodiments.
[0058] The reflector **111** has a reflector base body **130**, which in turn spans a reflector chamber **131**. The reflector base body **130** has a base part **132** with an opening **133** for receiving the LEDs **115**. The base part **132** is simultaneously the first inner ring **132**A of the connection element **110**.

On the one hand, the inner ring **132**A has an underside U, which points in the direction of the outer ring **112**, and also has two diametrically opposed fastening elements **134** on the outside, which are formed as stop means **135**.

[0059] FIGS. **2** to **4** show the assembled state of the connection element **110** with reflector **111**. It can be seen from FIG. **3** that the opening **133** is arranged above the printed circuit board **114** with LED **115** inserted in the outer ring **112**, and the reflector **111** does not cover the printed circuit board **114**.

[0060] FIG. **3** shows the top view of the connection element **110** assembled with the reflector **111**. It can be clearly seen that the opening **133** of the reflector **111** surrounds the LEDs **115** and that the inner ring **132**A abuts directly on the printed circuit board **114** (not depicted), and the light rays of the LEDs **115** shine directly into the reflector chamber **131** and are not deflected by other components.

[0061] FIG. **4**A shows the outer ring **112** and the reflector **111** with inner ring **132**A. The arrangement of the blind hole sections **129** in the inner wall sections **125** of the outer ring **112** can be clearly seen. These serve to receive the stop means **135**.

[0062] In the assembled state of the connection element **110** with reflector **111**, it can clearly be seen in FIG. **4**B that the stop means **135** of the inner ring **132**A lie in the blind hole sections **129** of the outer ring **112** and arrange the reflector **111** on the outer ring **112**.

[0063] The operating mechanism of the connection element **110** with the reflector **111** is now explained below.

[0064] Firstly, the outer ring **112** is fixedly screwed onto the heat sink not depicted by means of the screws **117** interacting with the receiving holes **126**. The printed circuit board **114** with the LEDs **115** is then inserted loosely into the insertion contour **123**. Within the outer ring **112**, the printed circuit board **114** is now securely held against horizontal or arrangement surface-parallel shifting.

[0065] The reflector **111** is then fixed in the outer ring **112** with the base part **132** formed as the inner ring **132**A.

[0066] For this purpose, the stop means **135** of the inner ring **132**A are inserted into the stop means receivers **128** of the outer ring **112** and then moved into the blind hole sections **129** in the manner of a bayonet lock. This results in the fastening of the inner ring **132**A with the reflector **111** on the outer ring **112**. The bayonet locking is a particularly stable fastening method that can withstand mechanical loads in particular. The force exerted by the arranged stopping means **136** is transferred to the outer ring **112** and the printed circuit board **114**, such that these are fastened due to the contact pressure of the inner ring **132**A. The printed circuit board **114** can no longer fall out of the insertion contour **123**.

[0067] Since the contact bridge (not depicted) is seated on the inner ring **132**A of it, the printed circuit board **114** is contacted when the inner ring **132**A is fully arranged and is thus functional.

[0068] It is particularly advantageous that the reflector **111** is now arranged particularly close to the printed circuit board **114** and the LEDs **115**. This allows the light emitted by the LEDs **115** to radiate directly into the reflector base **130** and from there leave the reflector **111** in the light emission direction R.

[0069] It is thus ensured that the light efficiency is particularly high, since the light beams are not unnecessarily deflected by the outer ring **112**, but rather shine directly into the reflector base body **130**.

[0070] A second embodiment **200** of the connection element **210** and the reflector **211** is depicted in FIGS. **5** to **8**B.

[0071] The connection element **210** has an outer ring **212**. The outer ring **212** has an upper side S and a lower side T. Fastening elements **235** formed as domes **240** protrude from the underside of the outer ring **212**. A receiving chamber **241** of the dome **240** allows the inner ring **232**A to be inserted into the outer ring **212**.

[0072] A catch spring **244** is respectively seated in the receiving chamber **241** of the dome **240**.

These initially comprise a spring limb **245**, which is served by a latching leg **246** for anchoring in the outer ring **212**, in particular inside its dome **240**. In the concrete design, the latching leg **246** is directed radially outwards and towards the upper side of the connection element **210** pointing away from the counter bearing. However, this is not absolutely necessary for the function of the latching leg **246**. In addition, in the exemplary embodiment, the latching leg **246** protrudes from the lower end of the spring limb **245** facing towards the heat sink.

[0073] At its end facing towards the upper side of the connection element **210**, the spring limb **245** bears a latching contour overall provided with the reference numeral **247**, which is directed radially inwards in the direction of the inner ring **232**A. Starting from a latching contour apex **248**, which also defines the maximum radial inner position of the latching contour **247**, a retaining leg **249** drops at an angle in the direction of the heat sink and opens into the spring limb **245**. Starting from the latching contour apex **248**, an expanding leg **250** extends radially outwards in the direction of the upper side of the connection element **210** and also forms the free, upper end of the catch spring **244**.

[0074] The inner ring **232**A has two fastening elements **234** on the outer periphery, which are formed as a spring receiving chamber **242**. The spring receiving chamber **242** respectively has a spring support leg **243**. Each spring support leg **243** forms a latching lug **251**, which points radially outwards with respect to the light emission direction R. Each latching lug **251** has a locking surface **252** pointing towards the upper side facing away from the counter bearing and an expanding surface **253** pointing in the direction of the counter bearing. Starting from a latching lug apex **254**, which also outwardly defines the maximum radial extension of the latching lug **251**, the locking surface **252** rises as an inclined surface in the direction of a vertical axis V. In contrast, the spreading surface **253** is formed as an inclined surface on the spring support leg **243** that slopes downwards in the direction of the vertical axis V.

[0075] FIGS. **8**A and **8**B also allow a detailed view of the dome **240** of the outer ring **212**.

[0076] Firstly, the dome **240** has an insertion opening **255** towards the upper side of the connection element **210**, said insertion opening enabling access to a dome interior **256**. The dome interior **256** can be divided into various functional regions as described below.

[0077] Firstly, the dome interior **256** provides a spring support leg receiver **257**, in which the spring support leg **243** is inserted when the connection element **210** is assembled. The spring support leg receiver **257** is arranged radially inside the dome interior **256**.

[0078] A latching leg receiver **258** is provided radially on the outside of the dome interior **256**. Moreover, this forms a latching leg seat **259**. The free end of the latching leg **246** is supported on this latching leg seat **259** for anchoring the catch spring **244** in the dome **240**. The arrangement of the latching leg **259** in the latching leg receiver **258**, including the anchoring of the latching leg **246** in the latching leg seat **258**, can be seen in FIG. **8**B.

[0079] A spring leg shaft **260** is formed in the dome **240** between the spring support leg receiver **257** and the latching leg receiver **258**. The spring leg shaft **260** is delimited in relation to the spring support leg receiver **257** by a support wall **261**, which prevents excessive displacement of the spring leg **245** radially inwardly in the direction of the spring support leg **243**. In the direction of the latching leg receptacle **258**, the spring leg shaft **260** is delimited by a guide pin **262**, which holds the lower end of the spring leg **245** in a stable position in the spring leg shaft **260** and prevents the spring leg **245** from jumping over into the latching leg receiver **258**.

[0080] The support wall **261** as well as the guide pin **262** are orientated in parallel to the vertical axis V, such that the functional spaces, namely the spring support leg receiver **257**, the latching leg receiver **258** and the spring leg shaft **260** are vertically separated from one another and accessible via the insertion opening **255** of the dome **240**.

[0081] Below, the assembled state of the outer ring **212** with the inner ring **232**A is described with reference to FIG. **8**.

[0082] Firstly, the latching springs **244** are pushed into the respectively corresponding dome **240**

against the direction of light emission R, i.e. from the upper side of the connection element **210**. Here, the spring limbs **245** enter the spring leg shaft **260**. At the same time, the latching leg **246** is held in the latching leg seat **259** of the latching leg receiver **258**. In this way, the latching spring **244** latches in the dome **240**. The latching contour **247** of the latching spring **244** extends radially inwards in the direction of the vertical axis V into the spring support leg receiver **257**.
[0083] The outer ring **212** is now placed on the heat sink, wherein the domes **240** are pushed into the cavities of the heat sink, which are not depicted. In this way, the underside of the outer ring **212** facing towards the heat sink comes to rest on the arrangement surface of the heat sink.
[0084] To finish assembling the connection element **210**, the printed circuit board **214**, i.e. the LED light module **215**, is now inserted into the insertion contour **223** formed by the outer ring **212**, such that the underside of the printed circuit board **214** also abuts on the arrangement surface of the heat sink. Thermal conductive means (not depicted) are optionally still present between the printed circuit board **214** and the heat sink.
[0085] Inside the outer ring **212**, the printed circuit board **214** is now securely held against horizontal or arrangement surface-parallel shifting.
[0086] The inner ring **232**A with the reflector **211** is now placed on the outer ring **212** against the direction of light emission R. Here, the spring support legs **243** are inserted into the respectively allocated dome **240** and there into the corresponding spring support leg receiver **260**. In doing so, the expansion surfaces **253** of the respective latching lug **251** come into contact with the respectively allocated expansion leg **250** of the catch spring **244**, wherein the resulting pairing of inclined surfaces **253**/**250** leads to a radial outward displacement of the latching contour **247**. This movement reaches its maximum when the latching contour apex **248** is positioned on the latching nose apex **254**.
[0087] Subsequently, with continued insertion movement against the light emission direction R, the retaining legs **249** engage with the respective locking surface **252** of the latching lug **251**. Here, the latching contour **247** is shifted radially inwards in a spring-back resilient manner, wherein the pairing of inclined surfaces between the retaining leg **249** and the locking surface **252** apply a force component directed in the direction of the arrangement surface to the inner ring **232**A. In doing so, the inner ring **232**A with the reflector **211** is braced against the inserted printed circuit board **214** and ensures sufficient contact pressure of the printed circuit board **214** on the heat sink in order to promote optimum heat dissipation. In the same way, the aforementioned force component, which braces the inner ring **232**A in the direction of the arrangement surface, also promotes correct contact of the contact arrangement with the contact fields of the printed circuit board **214** in order to achieve correct electrical transition values (not depicted).
[0088] Due to the domes **240** extending into a region below the arrangement surface, a sufficiently large space is created in order to create an elongated spring element in the form of the catch spring **244** in the direction of light emission R or in parallel to the vertical axis V, which provides sufficiently large spring travel for holding the inner ring **232**A in the outer ring **212** via its longitudinal extension of the spring limb **245** within the spring leg shaft **256**.
[0089] It is also particularly advantageous with this assembling that the reflector **211** is now arranged directly with the inner ring **232** A on the printed circuit board **214** and the LEDs **215**. As a result, the light emitted by the LEDs **215** can shine directly into the reflector base body **230** and from there leave the reflector **111** in the light emission direction R. The light beams are not deflected by the outer ring **232**, as is otherwise the case in the prior art. This ensures a particularly high degree of light efficiency.
[0090] As an alternative to the reflectors **111** and **211**, the light directing component **305**, **605** can also be formed as a collimator **370**, **670** or collimator lens, as shown in FIGS. **9** and **11**. Furthermore, the light directing component **405**, **705** can also be formed as a holding frame **430**, **730** for a collimator **473**, **773**. Here, the respective contact bridges (not depicted) are seated in the holding frame **430**, **730**.

[0091] In FIGS. **9** and **11**, the inner ring **332**A, **632**A is formed as the base part **332**, **632** of the collimator **370**, **670**. The arrangement and operating principle of the collimator **370** on the outer ring **312** is identical to the arrangement of the reflector **111** according to the first embodiment **100**. The collimator **370** has a light-emitting collimator body **371**.
[0092] The arrangement and the operating principle of the collimator **670** on the outer ring **612** is identical to the arrangement of the reflector **211** according to the second embodiment **200**. The collimator **670** also forms a light-emitting collimator body **671**.
[0093] FIGS. **10** and **12** show the light directing component **405**, **705** formed as a holding frame **430**, **730** for a collimator **473**, **773**. Here, the respective inner ring **432**A, **732**A is formed as a base part **432**, **732** of the holding frame **430**, **730**, which interact with the respective collimator **473**, **773**. For this purpose, the holding frames **430**, **730** respectively form latching arms **480**, **780**, which interact with latching receivers **472**, **772**, which are formed by the collimators **473** and **773**. During assembly with the holding frame **430**, **730**, the latching arms **480**, **780** engage in the latching receivers **472**, **772** of the collimator **473**, **773**.
[0094] The arrangement and the operating principle of the holding frame **430** with collimator **473** on the outer ring **412** is identical to the arrangement of the reflector **111** according to the first embodiment **100**.
[0095] Similarly, the arrangement and the operating principle of the holding frame **730** with collimator **773** on the outer ring **712** is identical to the arrangement of the reflector **211** according to the second embodiment **200**.
[0096] Further other light directing components are also conceivable, which can be formed as other types of optics.
[0097] In the above description, it is depicted that the light directing component and the inner ring are combined to form a single component. The inner ring, which is formed as part of the light directing component, is held in the outer ring by fastening means. A bayonet-like fixing by means of a plug-in rotary movement and a purely vertical insertion and latching of the inner ring in the outer ring has been presented. In DE 10 2024 104 511.6, further concrete embodiments for fastening the inner ring to the outer ring for a similar LED connection element are depicted and explained. The fastening methods provided there for an inner ring without a light directing component can also be applied to the present inner ring as part of the light directing component. Reference is therefore made to the content of DE 10 2024 104 511.6, which, with its full wording, is part of this application.

LIST OF REFERENCE NUMBERS

[0098] **100** first embodiment [0099] **105** light directing component [0100] **110** first connection element [0101] **111** reflector [0102] **112** outer ring [0103] **114** printed circuit board [0104] **115** LED [0105] **117** screw [0106] **118** screw head [0107] **119** screw body [0108] **120** bottom base plate [0109] **121** aperture [0110] **122** inner silhouette [0111] **123** insertion contour [0112] **124** engagement contours [0113] **125** annular collar [0114] **126** receiving holes [0115] **128** stop means receiver [0116] **129** blind hole sections [0117] **130** reflector base body [0118] **131** reflector chamber [0119] **132** base part [0120] **132**A inner ring [0121] **133** opening [0122] **134** fastening elements of the inner ring [0123] **135** fastening elements of the outer ring **112** [0124] **136** stop means [0125] **200** second embodiment [0126] **205** light directing component [0127] **210** connection element [0128] **211** reflector [0129] **212** outer ring [0130] **214** printed circuit board [0131] **215** LED [0132] **217** screw [0133] **218** screw head [0134] **219** screw body [0135] **220** bottom base plate [0136] **221** aperture [0137] **222** inner silhouette [0138] **223** insertion contour [0139] **224** engagement contours [0140] **225** annular collar [0141] **226** receiving holes [0142] **230** reflector base body [0143] **231** reflector chamber [0144] **232** base part [0145] **232**A inner ring [0146] **233** opening [0147] **234** fastening elements of the inner ring [0148] **235** fastening elements of the outer ring [0149] **240** dome [0150] **241** receiving chamber [0151] **242** spring receiving chamber [0152] **243** spring support leg [0153] **244** catch spring [0154] **245** spring limb [0155] **246**

latching leg [0156] **247** latching contour [0157] **248** latching contour apex [0158] **249** holding leg [0159] **250** expanding leg [0160] **251** latching lug [0161] **252** locking surface [0162] **253** spreading surface [0163] **254** latching lug apex [0164] **255** insertion opening [0165] **256** dome inner chamber [0166] **257** spring support leg receiver [0167] **258** latching leg receiver [0168] **259** latching leg seat [0169] **260** spring limb shaft [0170] **261** support wall [0171] **262** guiding pin [0172] **300** third embodiment [0173] **305** light directing component [0174] **310** third connection element [0175] **312** outer ring [0176] **314** printed circuit board [0177] **315** LED [0178] **317** screw [0179] **318** screw head [0180] **319** screw body [0181] **320** bottom base plate [0182] **321** aperture [0183] **322** inner silhouette [0184] **323** insertion contour [0185] **324** engagement contours [0186] **325** annular collar [0187] **326** receiving holes [0188] **328** stop means recess [0189] **329** blind hole sections [0190] **330** component body [0191] **331** component chamber [0192] **332** base part [0193] **332**A inner ring [0194] **333** opening [0195] **334** fastening elements of the inner ring [0196] **335** fastening elements of the outer ring **312** [0197] **336** stop means [0198] **370** collimator of the third embodiment [0199] **371** collimator body [0200] **372** latching receiver [0201] **400** fourth embodiment [0202] **405** light directing component [0203] **410** fourth connection element [0204] **412** outer ring [0205] **414** printed circuit board [0206] **415** LED [0207] **417** screw [0208] **418** screw head [0209] **419** screw body [0210] **420** bottom base plate [0211] **421** aperture [0212] **422** inner silhouette [0213] **423** insertion contour [0214] **424** engagement contours [0215] **425** annular collar [0216] **426** receiving holes [0217] **428** stop means recess [0218] **429** blind hole sections [0219] **430** holding frame [0220] **431** component chamber [0221] **432** base part [0222] **432**A inner ring [0223] **433** opening [0224] **434** fastening elements of the inner ring [0225] **435** fastening elements of the outer ring **412** [0226] **436** stop means [0227] **471** collimator body [0228] **472** latching receiver [0229] **473** collimator of the fourth embodiment [0230] **480** latching arm [0231] **500** counter bearing/heat sink [0232] **510** arrangement surface of **500** [0233] **511** surface of **500** [0234] **600** fifth embodiment [0235] **605** light directing component [0236] **610** fifth connection element [0237] **612** outer ring [0238] **614** printed circuit board [0239] **615** LED [0240] **617** screw [0241] **618** screw head [0242] **619** screw body [0243] **620** bottom base plate [0244] **621** aperture [0245] **622** inner silhouette [0246] **623** insertion contour [0247] **624** engagement contours [0248] **625** annular collar [0249] **626** receiving holes [0250] **630** component body [0251] **631** component chamber [0252] **632** base part [0253] **632**A inner ring [0254] **633** opening [0255] **634** fastening elements of the inner ring [0256] **635** fastening elements of the outer ring [0257] **640** dome [0258] **641** receiving chamber [0259] **642** spring receiving chamber [0260] **643** spring support leg [0261] **644** catch spring [0262] **645** spring limb [0263] **646** latching leg [0264] **647** latching contour [0265] **648** latching contour apex [0266] **649** holding leg [0267] **650** expanding leg [0268] **651** latching lug [0269] **652** locking surface [0270] **653** spreading surface [0271] **654** latching lug apex [0272] **655** insertion opening [0273] **656** dome inner chamber [0274] **657** spring support leg receiver [0275] **658** latching leg receiver [0276] **659** latching leg seat [0277] **660** spring limb shaft [0278] **661** support wall [0279] **662** guiding pin [0280] **670** collimator of the fifth embodiment [0281] **671** collimator body [0282] **672** latching receiver [0283] **700** sixth embodiment [0284] **705** light directing component [0285] **710** sixth connection element [0286] **712** outer ring [0287] **714** printed circuit board [0288] **715** LED [0289] **717** screw [0290] **718** screw head [0291] **719** screw body [0292] **720** bottom base plate [0293] **721** aperture [0294] **722** inner silhouette [0295] **723** insertion contour [0296] **724** engagement contours [0297] **725** annular collar [0298] **726** receiving holes [0299] **730** holding frame [0300] **731** component chamber [0301] **732** base part [0302] **732**A inner ring [0303] **733** opening [0304] **734** fastening elements of the inner ring [0305] **735** fastening elements of the outer ring [0306] **740** dome [0307] **741** receiving chamber [0308] **742** spring receiving chamber [0309] **743** spring support leg [0310] **744** catch spring [0311] **745** spring limb [0312] **746** latching leg [0313] **747** latching contour [0314] **748** latching contour apex [0315] **749** holding leg [0316] **750** expanding leg [0317] **751** latching lug [0318] **752** locking surface [0319] **753** spreading surface [0320] **754** latching lug apex [0321] **755** insertion opening [0322] **756** dome inner chamber [0323]

757 spring support leg receiver [0324] **758** latching leg receiver [0325] **759** latching leg seat [0326] **760** spring limb shaft [0327] **761** support wall [0328] **762** guiding pin [0329] **771** collimator body [0330] **772** latching receiver [0331] **773** collimator of the sixth embodiment [0332] **780** latching arm [0333] E installation direction [0334] K contact spring [0335] M centre point [0336] R direction of light emission [0337] S upper side of the outer ring [0338] T lower side of the outer ring [0339] V vertical axis [0340] U under side of the inner ring [0341] X system axis

Claims

1. A connection element (**110**, **210**, **310**, **410**, **610**, **710**) for electrically connecting an LED light module (**115**, **215**, **315**, **415**, **615**, **715**), the LED light module (**115**, **215**, **315**, **415**, **615**, **715**) having a printed circuit board (**114**, **214**, **314**, **414**, **614**, **714**) provided with contact springs (K) for an electrical supply of an LED, the connection element (**110**, **210**, **310**, **410**, **610**, **710**) comprising: an annular frame, the annular frame being configured to cover the printed circuit board (**114**, **214**, **314**, **414**, **614**, **714**) and to hold the printed circuit board (**114**, **214**, **314**, **414**, **614**, **714**) mechanically on an arrangement surface (**510**) of a counter bearing (**500**); and a contact arrangement, the contact arrangement being mounted in the annular frame and configured to supply the LED light module (**115**, **215**, **315**, **415**, **615**, **715**) with electricity, wherein the annular frame is divided into an outer ring (**112**, **212**, **312**, **412**, **612**, **712**) and an inner ring (**132**A, **232**A, **323**A, **432**A, **632**A, **732**A), wherein the outer ring (**112**, **212**, **312**, **412**, **612**, **712**) is configured to surround the printed circuit board (**114**, **214**, **314**, **414**, **614**, **714**) and to hold the printed circuit board (**114**, **214**, **314**, **414**, **614**, **714**) in a parallel direction to the arrangement surface (**510**) of the counter bearing (**500**), wherein the inner ring (**132**A, **232**A, **323**A, **432**A, **632**A, **732**A) at least regionally surrounds the printed circuit board (**114**, **214**, **314**, **414**, **614**, **714**) and is configured to hold the printed circuit board (**114**, **214**, **314**, **414**, **614**, **714**) in a vertical direction to a surface (**511**) of the counter bearing (**500**), and wherein the inner ring (**132**A, **232**A, **323**A, **432**A, **632**A, **732**A) is implemented in a light directing component (**105**, **205**, **305**, **405**, **605**, **705**).
2. The connection element (**110**, **210**, **310**, **410**, **610**, **710**) according to claim 1, wherein the inner ring (**132**A, **232**A, **323**A, **432**A, **632**A, **732**A) forms a base part (**132**, **232**, **323**, **432**, **632**, **732**) of the light directing component (**105**, **205**, **305**, **405**, **605**, **705**), wherein the inner ring (**132**A, **232**A, **323**A, **432**A, **632**A, **732**A) is arranged downstream of the outer ring (**112**, **212**, **312**, **412**, **612**, **712**) in a direction of light emission (R).
3. The connection element (**110**, **210**, **310**, **410**, **610**, **710**) according to claim 1, wherein the inner ring (**132**A, **232**A, **323**A, **432**A, **632**A, **732**A) forms an inner fastening element (**134**, **234**, **334**, **434**, **634**, **734**) which interacts for fastening with an outer fastening element (**135**, **235**, **335**, **435**, **635**, **735**) of the outer ring (**112**, **212**, **312**, **412**, **612**, **712**).
4. The connection element (**110**, **310**, **410**) according to claim 1, wherein the inner ring (**132**A, **323**A, **432**A) forms a stop (**136**, **336**, **436**) as an inner fastening element (**134**, **334**, **434**), and wherein the outer ring (**112**, **312**, **412**) forms a stop receiver (**128**, **328**, **428**) as an outer fastening element (**135**, **335**, **435**).
5. The connection element (**110**, **310**, **410**) according to claim 4, wherein, to arrange the inner ring (**132**A, **332**A, **432**A) in the outer ring (**112**, **312**, **412**), the stop (**136**, **336**, **436**) is inserted into the stop receiver (**128**, **328**, **428**), and the inner ring (**132**A, **332**A, **432**A) and the outer ring (**112**, **312**, **412**) are fastened to each other by turning the inner ring (**132**A, **332**A, **432**A) in a bayonet-style locking motion.
6. The connection element (**110**, **310**, **410**) according to claim 1, wherein an inner fastening element (**134**, **334**, **434**) of the inner ring (**132**A, **332**A, **432**A) and an outer fastening element (**135**, **335**, **435**) of the outer ring (**112**, **312**, **412**) are screwing means.
7. The connection element (**110**, **310**, **410**) according to claim 6, wherein the inner ring (**132**A, **332**A, **432**A) has an outer contour which is formed as an outer thread, and the outer ring (**112**, **312**,

412) has an inner contour which is formed as an inner thread, and wherein the outer thread of the inner ring (**132**A, **332**A, **432**A) interacts with the inner thread of the outer ring (**112**, **312**, **412**) for fastening in the outer ring.

8. The connection element (**110**, **310**, **410**) according to claim 6, wherein the inner ring (**132**A, **332**A) has an inner contour which is formed as an inner thread, and the outer ring (**112**, **312**, **412**) has an outer contour which is formed as an outer thread, and wherein the outer thread of the inner ring for fastening in the outer ring (**112**, **312**, **412**) interacts with the inner thread of the outer ring (**112**, **312**, **412**).

9. The connection element (**210**, **610**, **710**) according to claim 1, wherein an inner fastening element (**234**) of the inner ring (**232**A, **632**A, **732**A) and an outer fastening element (**235**, **635**, **735**) of the outer ring (**212**, **612**, **712**) are latching means (**244**, **644**, **744**).

10. The connection element (**210**, **610**, **710**) according to claim 9, wherein the inner fastening element (**234**, **634**, **734**) of the inner ring (**232**A, **632**A, **732**A) forms a spring-receiving chamber (**242**, **642**, **742**) for catch springs (**244**, **644**, **744**), which extends in relation to the outer ring (**212**, **612**, **712**) abutting on the arrangement surface (**510**) into a region below the arrangement surface (**510**), wherein the outer ring (**212**, **612**, **712**) forms a dome (**240**, **640**, **740**) as a fastening element (**235**, **635**, **735**) for receiving the catch springs (**244**, **644**, **744**), and wherein the dome (**240**, **640**, **740**) protrudes from an underside of the outer ring (**212**, **612**, **712**).

11. A light directing component (**105**, **205**, **305**, **405**, **605**, **705**) for a luminaire, comprising: a component base body (**130**, **230**, **330**, **430**, **630**, **730**) which spans a component chamber (**131**, **231**, **321**, **421**, **621**, **721**), wherein the component base body (**130**, **230**, **330**, **430**, **630**, **730**) has a base part (**132**, **232**, **332**, **432**, **632**, **732**) which forms an opening (**133**, **233**, **333**, **433**, **633**, **733**) for receiving a light module (**115**, **215**, **315**, **415**, **615**, **715**), and wherein the base part (**132**, **232**, **332**, **432**, **632**, **732**) of the light directing component (**105**, **205**, **305**, **405**, **605**, **705**) is formed as an inner ring (**132**A, **232**A) of the connection element (**111**, **211**, **311**, **411**, **611**, **711**) according to claim 1.