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(54) **LED CONNECTION ELEMENT**

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(57) **ABSTRACT**

A connection element electrically connects an LED light source. The LED light source has a circuit board with contact fields to supply an LED. A frame rests on an arrangement surface of a counter-bearing and holds the circuit board thereon. The frame includes an outer ring and an inner ring. The inner ring is held within the outer ring and overlaid on the circuit board to hold the circuit board vertically to the arrangement surface. The outer ring surrounds the circuit board and holds the circuit board parallel to the arrangement surface on the counter-bearing. Locking lugs are formed by the inner ring. Locking springs are arranged in the outer ring, overlap the locking lugs of the inner ring, and exert a tensile force on the inner ring towards the arrangement surface. A spring receiving space for the locking spring extends into an area below the arrangement surface.

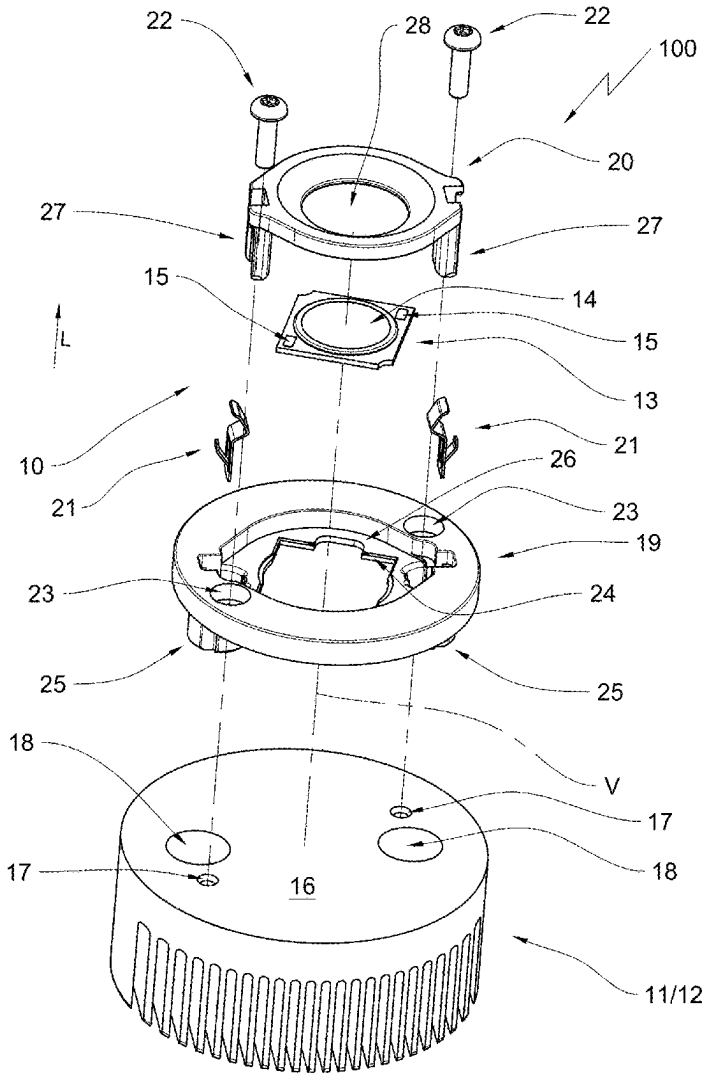
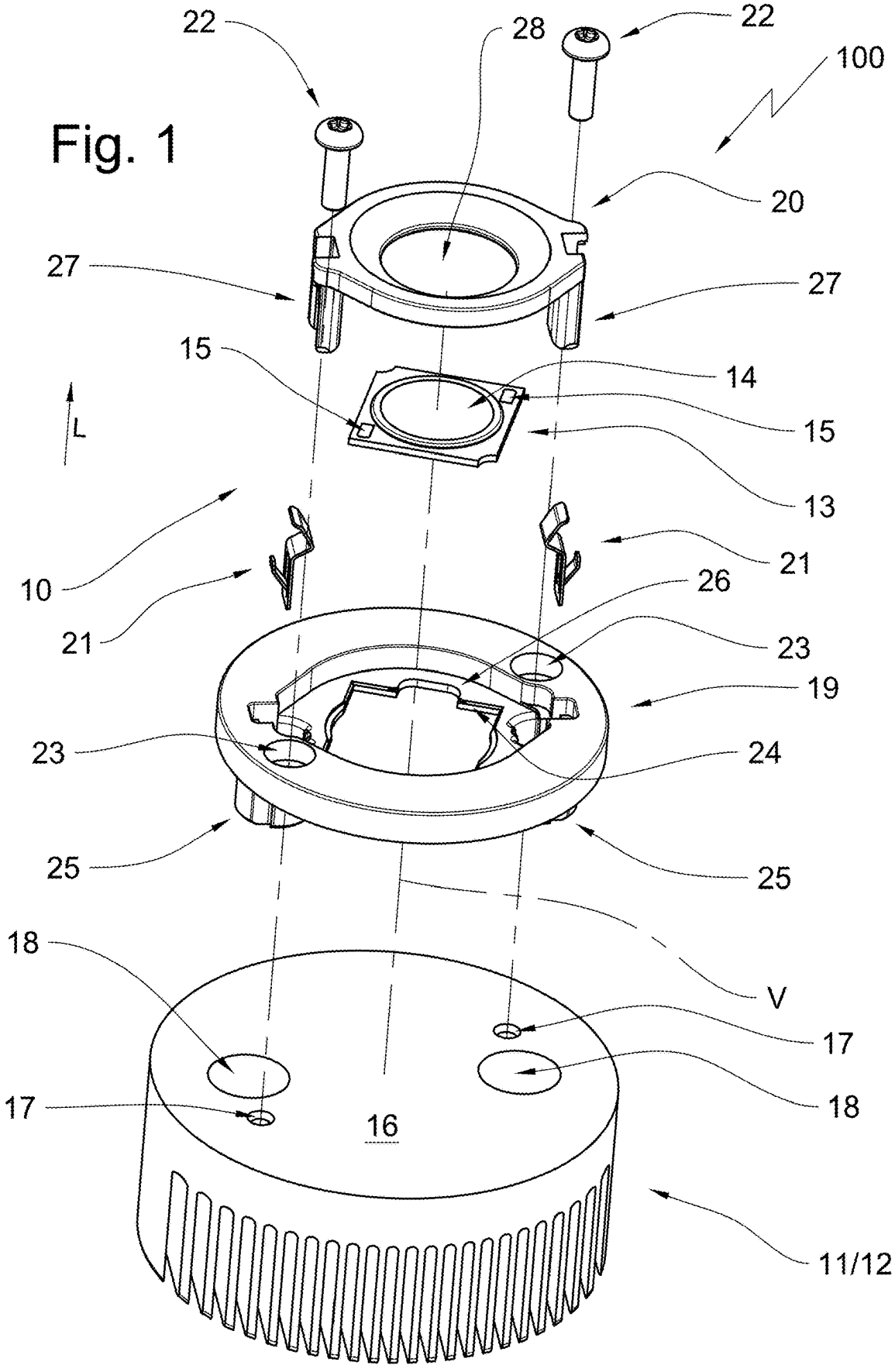


Fig. 1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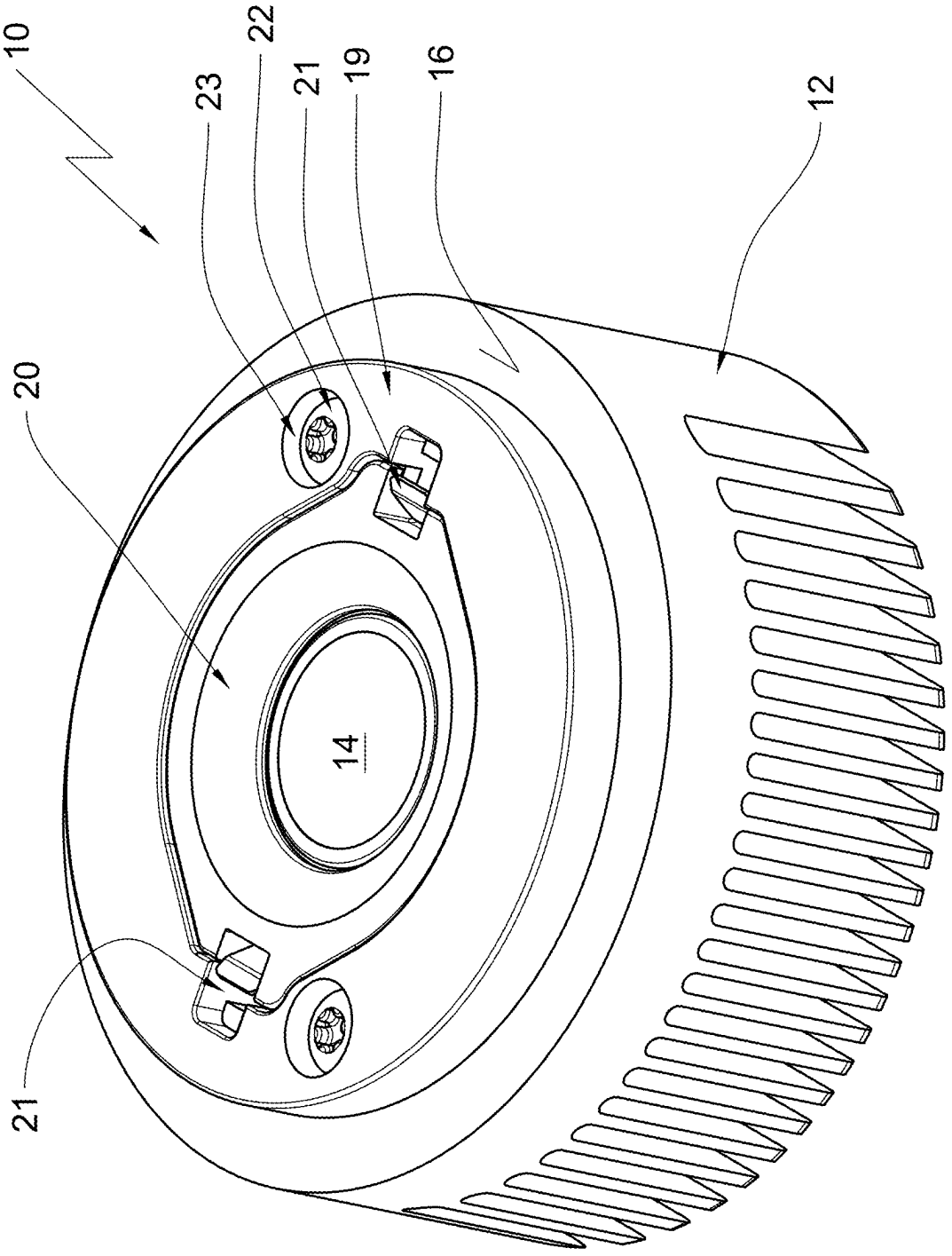


Fig. 2

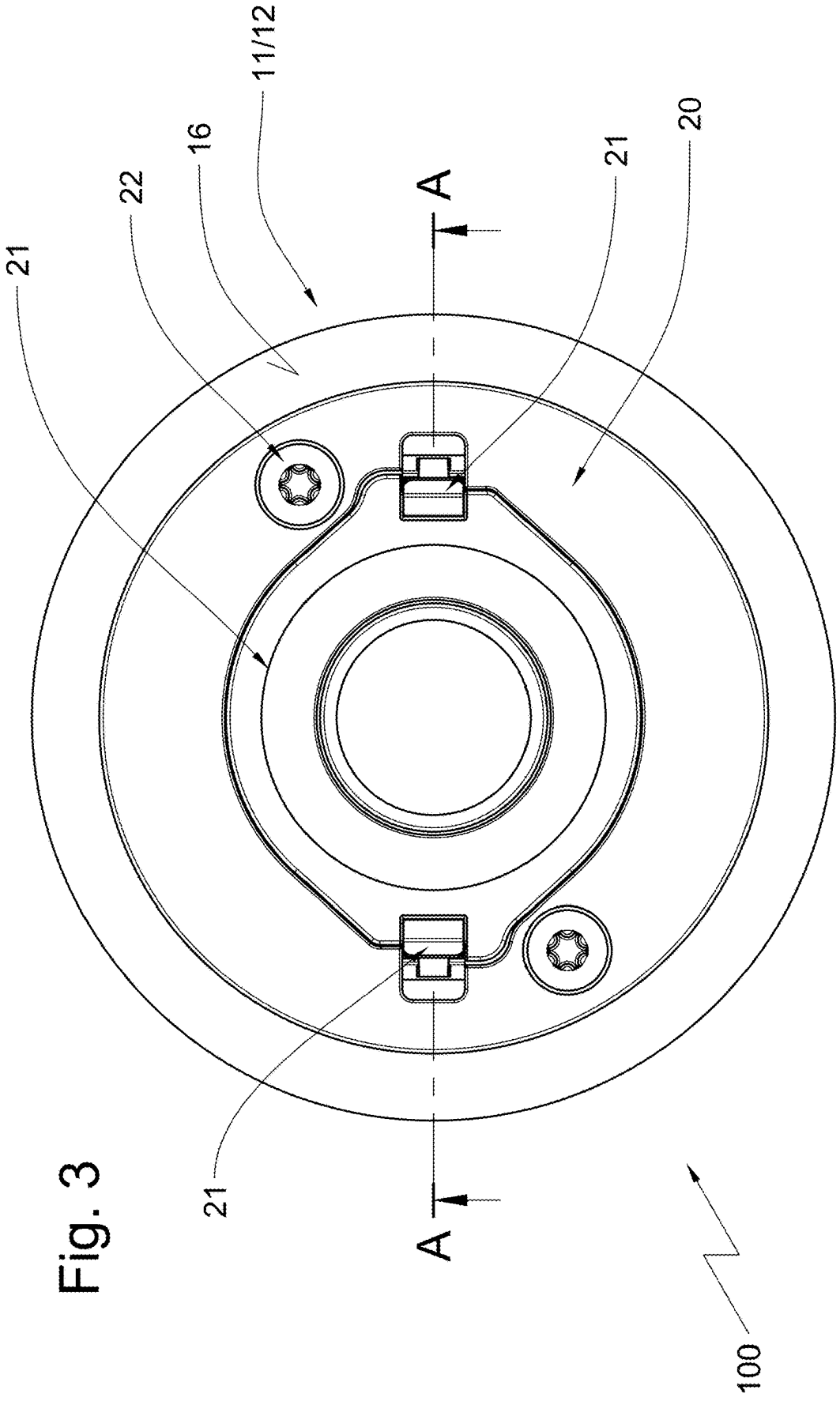
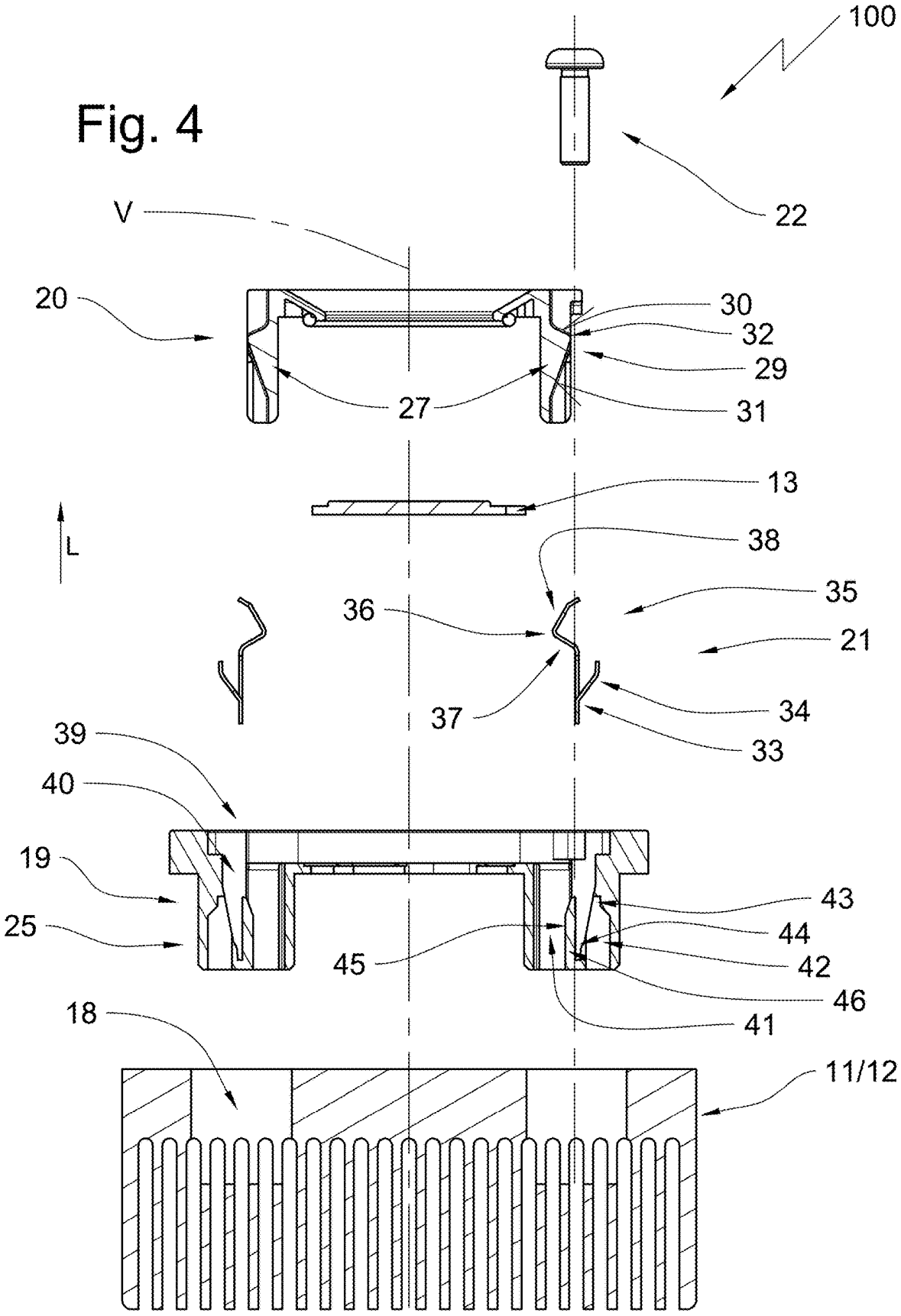


Fig. 3

Fig. 4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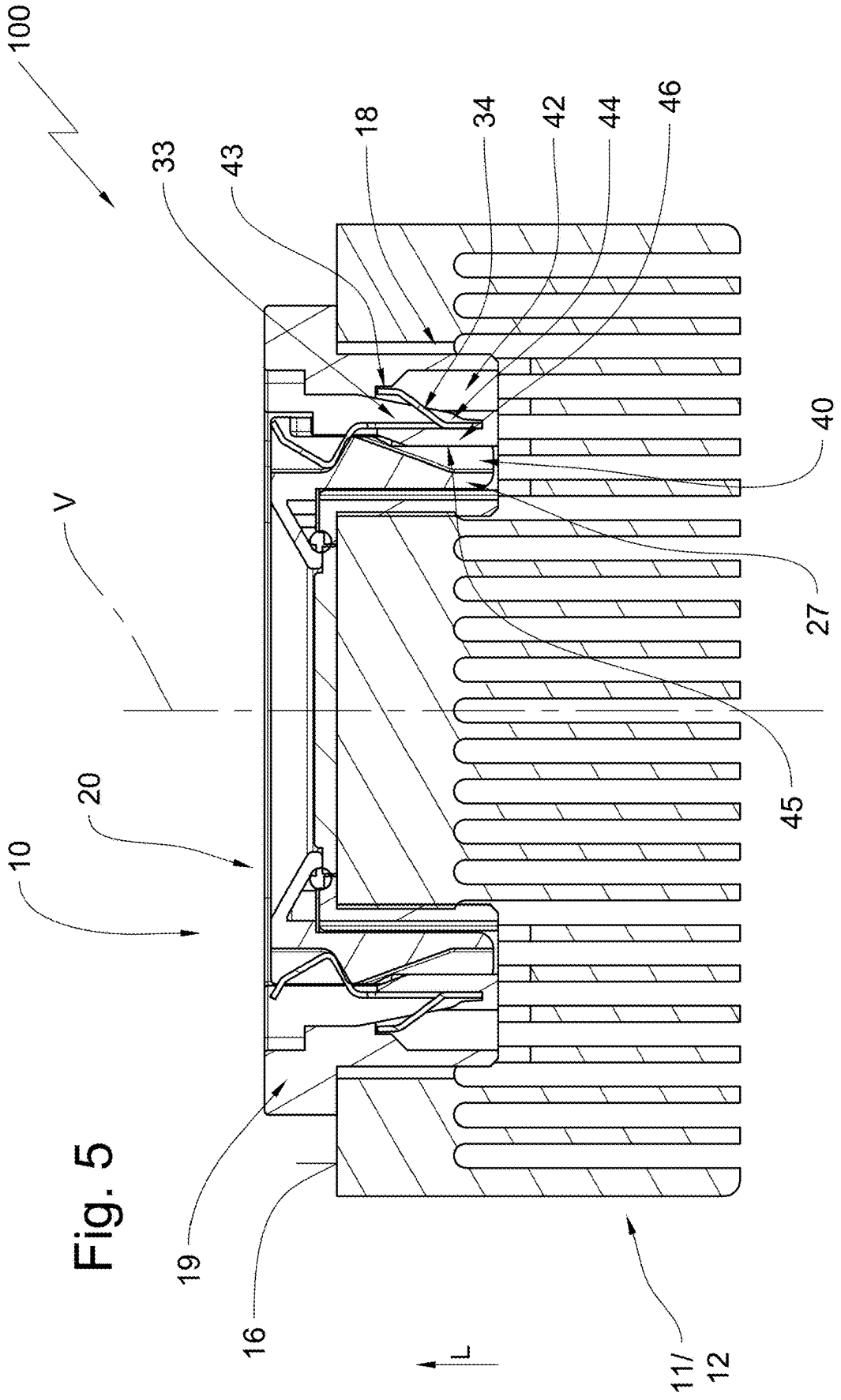
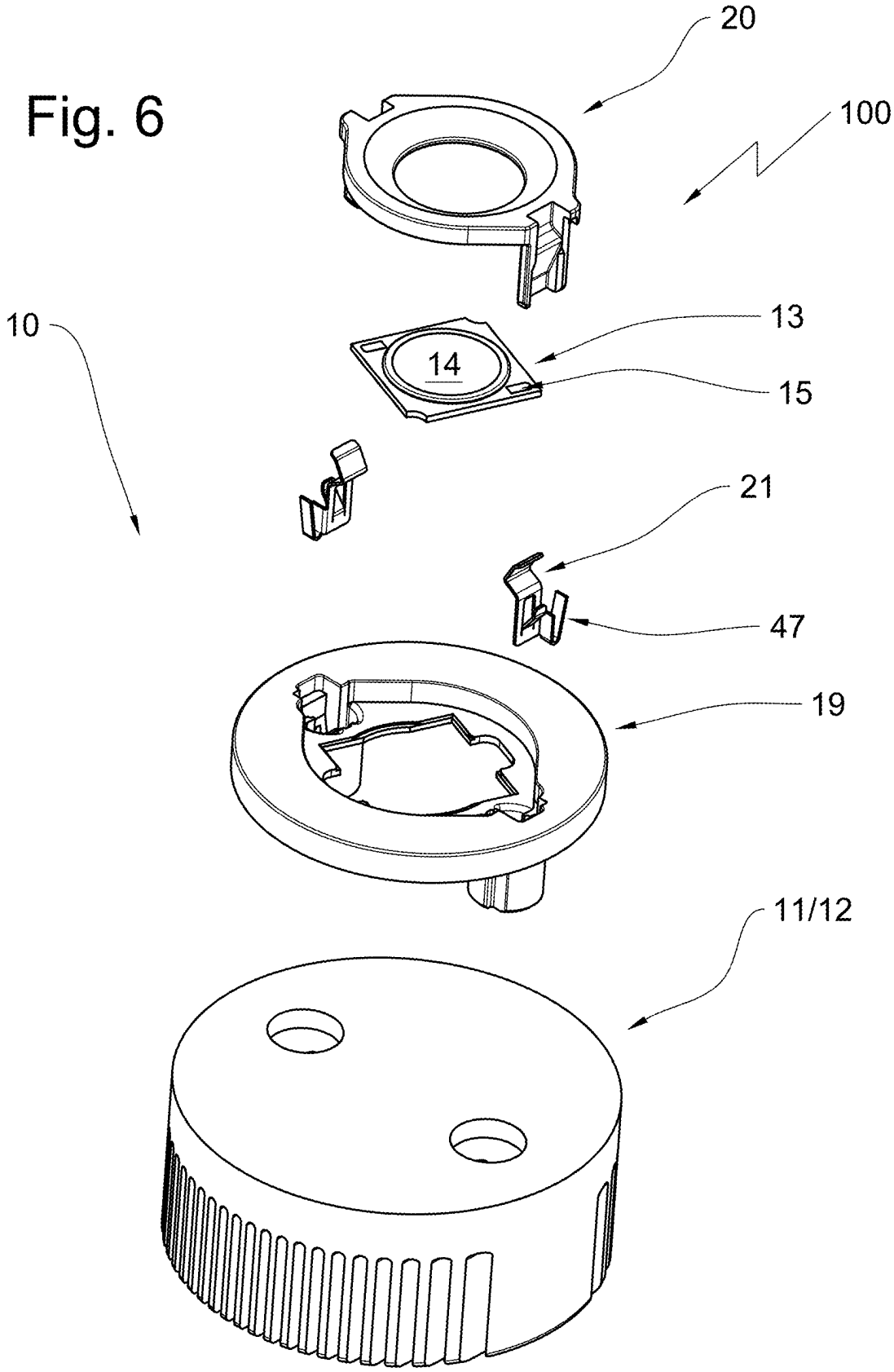


Fig. 5

Fig. 6



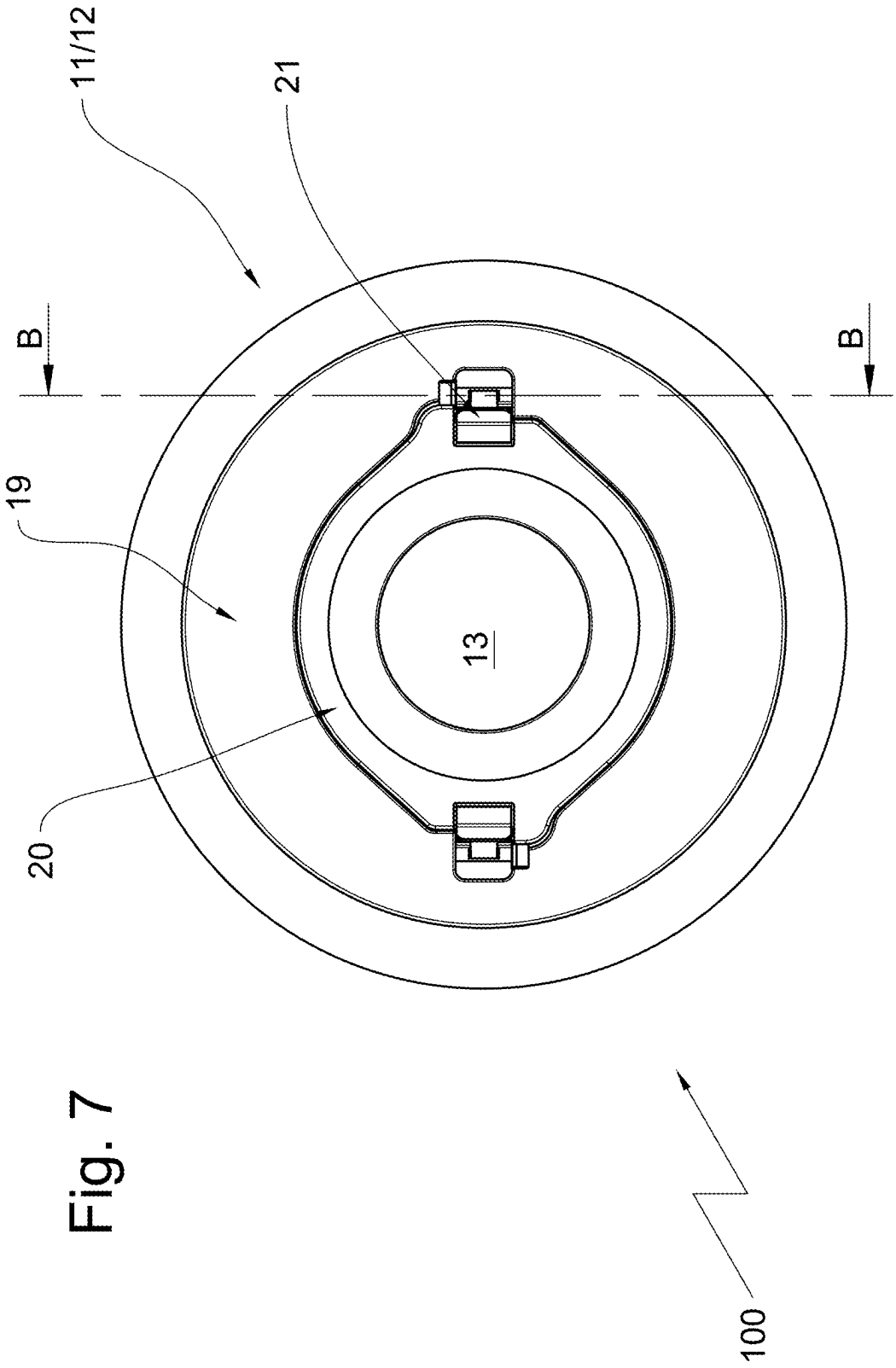


Fig. 7

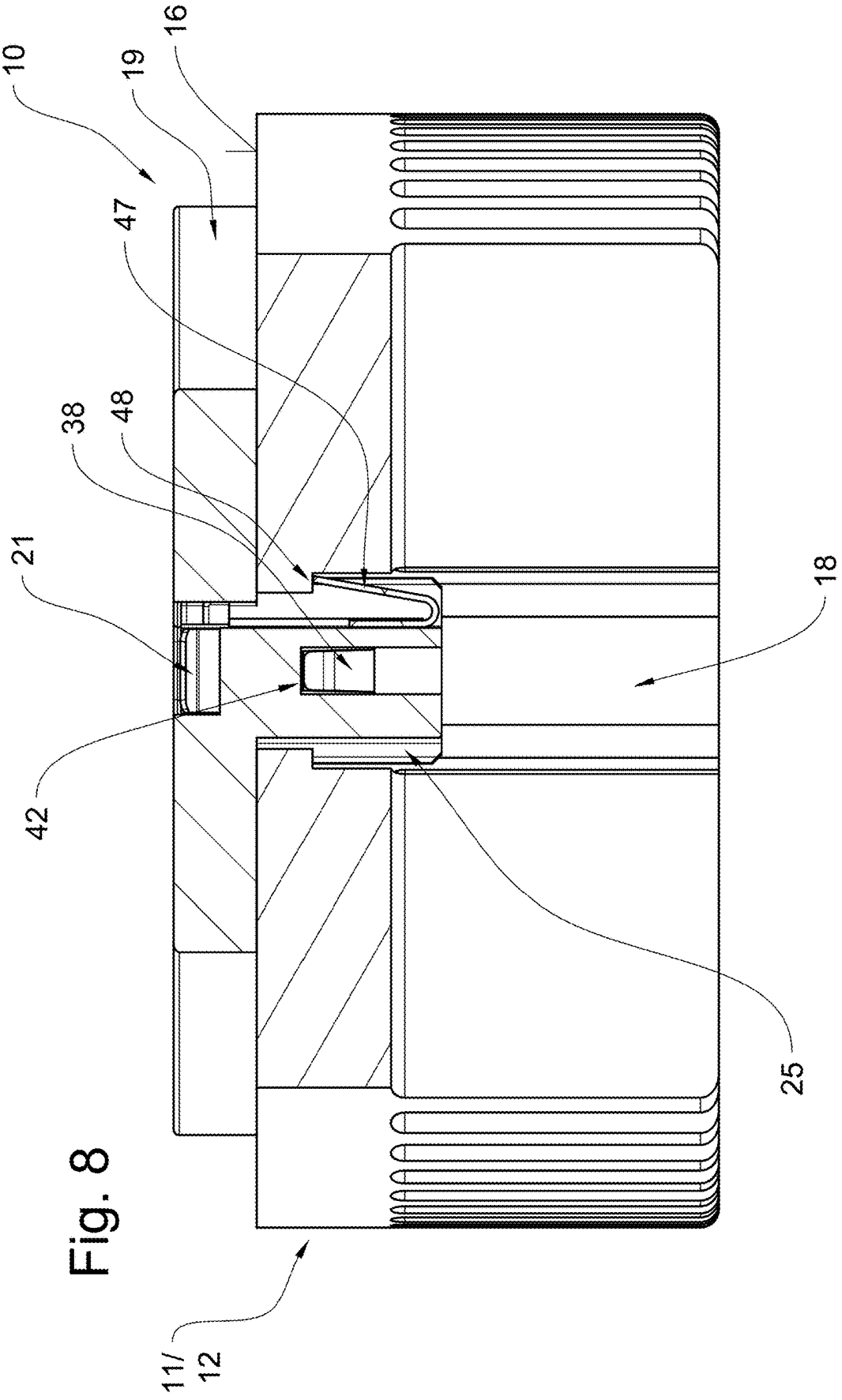


Fig. 8

LED CONNECTION ELEMENT

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of German Patent Application DE 10 2024 104 503.5, filed on Feb. 19, 2024, the content of which is incorporated by reference in its entirety.

BACKGROUND

[0002] Connection elements for the electrical connection of an LED light source and for simultaneous mechanical fixing are known, for example, from the applicant's EP 2 083 489 A1. A ring-shaped component in the broadest sense has an integrated contact arrangement which enables the connection of external connecting conductors and transfers the electricity thus fed in to contact fields of a circuit board provided with LEDs.

[0003] The ring-shaped component is simultaneously overlaid on the circuit board. For this purpose, the component has a central recess which receives the circuit board.

[0004] Using suitable fasteners such as screws, expansion dowels, etc., the ring-shaped component is fixed on a counter-bearing, usually a heat sink or a light sheet, thus holding the circuit board between itself and the counter-bearing.

[0005] In this way, the LED light source is mechanically fixed and electrically connected to a corresponding power supply.

[0006] This type of connection element is widely used in the manufacture of modern luminaires using LED light sources and has been further developed compared to the exemplary embodiment disclosed in the aforementioned publication.

[0007] In particular, the dimensions of the contact arrangement have been minimized in order to make the connection element as flat as possible in terms of its height measured in the direction of light emission. This avoids any shading of the light emitted from the LED caused by the connection element, which significantly improves the efficiency of the light source.

[0008] In addition, optics and reflectors mounted on the connection element can be moved closer to the plane of light emission of the LED. In this way, the efficiency of reflectors and optics can be significantly improved.

[0009] The applicant has published a further development of such connection elements corresponding to the generic concept in German utility model DE 20 2023 105 716 U1. In that document, for reasons of improved logistics, the ring-shaped connection element is divided into an inner ring and an outer ring. The outer ring serves to fix the circuit board in a direction parallel to an arrangement surface of the counter-bearing. The inner ring is inserted into the outer ring and is overlaid on the circuit board at least in some areas. In this way, the inner ring secures the circuit board in the direction vertical to the arrangement surface on the counter-bearing. Also in this embodiment, the connection element has a contact arrangement which enables the electrical connection of the circuit board to external connection conductors.

SUMMARY

[0010] The disclosure relates to a connection element for the electrical connection of an LED light source. The LED light source has a circuit board which is provided with contact fields for the electrical supply of the LED. The connection element includes a frame which is intended to rest on an arrangement surface of a counter-bearing and to hold the circuit board on this arrangement surface. The frame is formed by an outer ring and an inner ring. The inner ring is held within the outer ring and is intended to be overlaid on the circuit board at least in some areas and thus to hold the circuit board vertically to the arrangement surface on the counter-bearing. The outer ring is intended to surround the circuit board and to hold the circuit board parallel to the arrangement surface on the counter-bearing. Locking lugs are formed by the inner ring. Locking springs are arranged in the outer ring, overlap the locking lugs of the inner ring and exert a tensile force on the inner ring in the direction of the arrangement surface.

[0011] A number of detailed requirements must be taken into account for the mechanical fixing, electrical supply and safe operation of an LED light source. The thickness of the circuit boards—measured in the direction of light emission or vertically to the arrangement surface—is subject to considerable variations.

[0012] The circuit boards must be pressed onto the counter-bearing with a certain pressing force to ensure optimized heat dissipation. The durability of the LED light source can only be guaranteed if the operating heat generated by the LED is sufficiently dissipated.

[0013] In order to optimize the heat transfer from the circuit board to the counter-bearing, various types of heat conducting agents are introduced between the circuit board and the counter-bearing. These range from thermal pastes to comparatively strong/thick thermal pads. Generally, the manufacturer of a luminaire selects the heat conducting agent they consider suitable. The connection element must also be able to compensate for the additional thermal conductivity layer introduced.

[0014] Finally, it is important to ensure that the contact forces between the contact fields of the circuit board and the contact arrangement of the connection element are optimized to ensure the lowest possible electrical contact resistance. In a two-part connection element, on which the present application is based, the contact arrangement comprises a connection contact seated in the outer ring, to which the connection conductors are attached. The inner ring carries a supply contact that rests on the contact field of the circuit board.

[0015] The connection contact and the supply contact also have mutual contact surfaces in order ultimately to be able to supply electricity. With the two-part connection element according to the disclosure, it is therefore also important to ensure that the pressing forces between the connection contact and the supply contact are also optimized for the lowest possible contact resistance.

[0016] The object of the present disclosure is therefore to provide a suitable locking spring arrangement for a two-part connection element, which ensures sufficient pressing forces of the inner ring on the circuit board whilst taking into account the required tolerance compensation.

[0017] The object is achieved by a connection element as disclosed herein, according to which a spring receiving space for the locking spring is provided, which extends in

relation to the frame resting on the arrangement surface into an area below the arrangement surface.

[0018] In order to be able to compensate for large tolerances with regard to the thickness of the circuit board and, if applicable, heat conducting agents arranged between the circuit board and the counter-bearing, it is necessary that the inner ring can perform a comparatively large movement stroke vertically to the arrangement surface of the counter-bearing or in the direction of light emission from the LED. At the same time, the locking spring must be able to exert sufficient pressing forces in the direction of the arrangement surface in every position of the inner ring caused by the tolerances.

[0019] This requires a locking spring that can cover a comparatively large spring travel and is able to apply sufficient pressing forces. For a large spring travel, space must be created in the connection element. For large spring forces, certain dimensions of the locking spring element are required. These requirements for a locking spring are inconsistent with the technical need to create connection elements that are as flat as possible in order to avoid emerging light being shaded by the connection element.

[0020] The disclosed design provides for the required installation space for the locking spring that is to be used to be moved to an area below the arrangement plane of the counter-bearing or at least to be pulled into this area. 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 the absolute minimum. Shading of the emerging light by the connection element is safely avoided or greatly reduced. Nevertheless, there is sufficient installation space for a locking spring element, which requires a sufficiently large spring receiving space due to the spring forces to be applied and in particular the required spring travel.

[0021] In one specific embodiment, the spring receiving space is formed by a pin which rises from the underside of the outer ring and is directed in particular counter to the direction of light emission. The spring element can be arranged in this pin and thus receives sufficient space for movement for the required spring travel, particularly in the case of a spring element shown in the exemplary embodiment with a pivot axis aligned parallel to the arrangement surface.

[0022] In a further alternative embodiment, the spring receiving space is formed by a cavity in the counter-bearing. For example, a corresponding cavity or recess-whether configured as a blind hole or a through hole-can therefore be made in a heat sink. A locking spring seated here therefore has sufficient installation space and sufficient space to generate extensive spring travel.

[0023] In a particularly preferred embodiment, it is provided that the pin of the outer ring forming the spring receiving space be seated in the cavity of the counter-bearing. In this way, the pin formed by the outer ring is well protected against mechanical damage by the surrounding material of the counter-bearing, in particular the heat sink.

[0024] In order to be able to absorb high spring forces, a sufficient material thickness is required in the area of interaction with the locking spring, especially in the case of an inner ring made of plastic. Specifically, the locking projection must therefore be formed to be sufficiently strong that it does not undergo any plastic deformation under the influence of the spring forces of the locking spring.

[0025] However, this means that space must be created for a correspondingly thick material support, which-as already discussed above-runs counter to the requirements, in particular, for flat connection elements.

[0026] Beneficially, the inner ring forms a spring support leg which carries the locking projection. In particular, it is provided here that the spring support leg protrudes into the spring receiving space and rests against a wall bordering the spring receiving space.

[0027] The inventors recognized that the spring receiving space creates space to provide a locking projection that is sufficiently dimensioned to absorb the spring forces, without this having a disadvantageous effect on the dimensioning of that part of the connection element located above the arrangement surface.

[0028] In addition, the inventors recognized that the locking projection can be kept comparatively small in its dimensions if it rests against a wall bordering the spring space and is supported there. The wall that borders the pin or that borders the cavity is therefore used to absorb the forces acting on the locking projection. This means that the spring support leg forming the locking projection can be dimensioned to be smaller, since the spring forces are also absorbed by the respective wall.

[0029] In a particularly preferred embodiment, the spring support leg rests against the wall forming the pin, which is in turn supported against the wall bordering the cavity. Since the counter-bearing is usually made of a metal, especially aluminium, the pin and spring support leg components made of the plastic material of the inner ring and outer ring are supported very well on a more stable material in a load-dissipating manner.

[0030] The inventors further recognized that the locking spring for holding the inner ring is also suitable for fixing the outer ring to the counter-bearing. In this way, the locking spring of the outer ring has a double purpose.

[0031] Particularly when the counter-bearing is a heat sink, undercuts are often formed when drilling the holes for the cavity in the area of the cooling fins into which the locking spring for fastening the outer ring to the counter-bearing can engage.

[0032] Alternatively, it is conceivable for the pin of the outer ring to be formed in the manner of an expansion dowel. For this purpose, the pin can be configured with a slot vertical to the arrangement surface, for example. The pin walls are deflected via an expansion element and can engage on the counter-bearing in a friction-fitting and/or form-fitting manner. Here too, undercuts formed by drilling holes in a heat sink in the area of the cooling fins are suitable, for example.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] The invention will now be explained in more detail by reference to two exemplary embodiments showing further advantages and features.

[0034] FIG. **1** shows a connection element, an LED light source, and a counter-bearing in an exploded view.

[0035] FIG. **2** shows the assembly according to FIG. **1** in assembled form.

[0036] FIG. **3** shows the assembly according to FIG. **2** in a view from above.

[0037] FIG. **4** shows a sectional view of the assembly along section line A-A in FIG. **3**.

[0038] FIG. **5** shows a sectional view of the assembled assembly in FIG. **3** along section line A-A.

[0039] FIG. **6** shows an exploded view of an alternative embodiment.

[0040] FIG. **7** shows a view from above of the embodiment according to FIG. **6**.

[0041] FIG. **8** shows a sectional view along section line B-B as in FIG. **6**.

DETAILED DESCRIPTION

[0042] In the figures, an assembly using the connection element **10** as a whole is provided with the reference numeral **100**.

[0043] In addition to the counter-bearing **11** in the form of a heat sink **12**, the assembly **100** also comprises a circuit board **13**. The circuit board **13** is provided with an LED **14** and also carries contact fields **15**.

[0044] The counter-bearing **11** has an arrangement surface **16** aligned with the circuit board **13**, which is penetrated by threaded holes **17** and cavities **18**.

[0045] The connection element **10** comprises an outer ring **19** and an inner ring **20** and also has locking springs **21**. The contact arrangement provided for the electricity supply of the circuit board **13** is not shown in the exemplary embodiments.

[0046] Screw bolts **22** pass through fastening holes **23** in the outer ring **19** and, to fasten the outer ring **19** to the heat sink **12**, are inserted into threaded holes **17** therein.

[0047] The outer ring **19** forms a receiving frame **24** into which the circuit board **13** is to be inserted.

[0048] Pins **25** rise from the underside of the outer ring **19** facing towards the arrangement surface **16**. A receiving space **26** allows the inner ring **20** to be inserted into the outer ring **19**. A vertical axis V, which is parallel to the direction of light emission or vertical to the arrangement plane, forms the central axis of the connection element **10**.

[0049] Spring support legs **27** emerge from the inner ring **20** on its underside facing towards the arrangement surface **16**. In addition, the inner ring **20** forms a central light passage opening **28** which surrounds the LED **14**.

[0050] FIG. **2** shows the assembly **100** according to FIG. **1** in assembled form. Here, the interaction of the components shown in FIG. **1** is already partially visible. The outer ring **20** rests on the arrangement surface **16** of the heat sink **12** with its underside facing towards the arrangement surface **16**. The screw bolts **22** are seated in the fastening holes **23** and engage with their threaded shaft into the threaded holes **17** of the heat sink **12** (which are not visible here because they are covered by the outer ring **19**). In this way, the outer ring **19** is firmly arranged on the heat sink **12** or counter-bearing **11**.

[0051] As one can imagine, the pins **25** rising from the underside of the outer ring **19** are seated in the cavities **18** of the heat sink **12** so that the outer ring **19** can lie flat on the arrangement surface **16**.

[0052] The locking springs **21** are seated in the pin **25** respectively assigned to them, the spring support legs **27** also penetrating into the respectively assigned pins **25**. In this way, the inner ring **20** can lie in the receiving space **26** of the outer ring **19** (not designated here) and surround the LED **14** with its light passage opening **28** (not designated here).

[0053] FIG. **3** shows a plan view of the assembly **100** according to FIG. **2** and serves in particular to illustrate the position of the section along section line A-A for FIGS. **4** and **5** described below.

[0054] FIGS. **4** and **5** show a sectional view through the assembly **100**, wherein FIG. **4** is an exploded view of the section and FIG. **5** is a sectional view of the assembly **100** in the assembled state.

[0055] The sectional view according to FIG. **4** shows the inner ring **20**. Each spring support leg **27** forms a locking lug **29** which points radially outwards with respect to the direction of light emission L or the vertical axis V. Each locking lug **29** has a locking surface **30** pointing towards the top opposite the counter-bearing **11** and a spreading surface **31** pointing in the direction of the counter-bearing **11**. Starting from a locking lug vertex **32**, which at the same time defines the maximum radial extension of the locking lug **29** outwards, the locking surface **30** rises as an inclined surface in the direction of the vertical axis V. The spreading surface **31**, on the other hand, is formed as an inclined surface on the spring support leg **27** that slopes down in the direction of the vertical axis V.

[0056] FIG. **4** also shows the locking springs **21**. These first comprise a spring leg **33** which serves as a locking leg **34** for anchoring in the outer ring **19**, in particular within its pin **25**. In the specific embodiment, the locking leg **34** is directed radially outwards and towards the top of the connection element **10** facing away from the counter-bearing **11**. However, this is not a mandatory requirement for the functioning of the locking leg **34**. In the exemplary embodiment, the locking leg **34** also emerges from the lower end of the spring leg **33** facing towards the heat sink **12**.

[0057] At its end facing towards the top of the connection element **10**, the spring leg **33** carries a locking contour which is provided as a whole with the reference numeral **35** and is directed radially inwards in the direction of the inner ring **20**. Starting from a locking contour vertex **36**, which simultaneously defines the maximum radial inner position of the locking contour **35**, a retaining leg **37** slopes down obliquely in the direction of the heat sink **12** and ends in the spring leg **33**. In the direction of the top of the connection element **10**, a spreading leg **38** extends radially outwards from the locking contour vertex **36** and forms the free, upper end of the locking spring **21**.

[0058] FIG. **4** also gives a detailed view inside the pin **25** of the outer ring **19**.

[0059] Firstly, the pin **25** has an insertion opening **39** towards the top of the connection element **10**, which allows access to the pin interior **40**. The pin interior **40** can be divided into various functional areas as described below.

[0060] Firstly, the pin interior **40** provides a spring support leg receptacle **41** into which the spring support leg **27** is inserted when the connection element **10** is assembled (see FIG. **5**). The spring support leg receptacle **41** is arranged radially inward in the pin interior **40**.

[0061] A locking leg receptacle **42** is provided radially outwardly in the pin interior **40**. This also forms a locking leg seat **43**. The free end of the locking leg **34** is supported on this locking leg seat **43** for anchoring the locking spring **21** in the pin **25**. The arrangement of the locking leg **34** in the locking leg receptacle **42** including the anchoring of the locking leg **34** in the locking leg seat **43** is shown in FIG. **5**.

[0062] A spring leg shaft **44** is formed in the pin **25** between the spring support leg receptacle **41** and the locking

leg receptacle **42**. For the spring support leg receptacle **41**, the spring leg shaft **44** is bordered by a support wall **45** which prevents an excessive displacement of the spring leg **33** radially inwards in the direction of the spring support leg. In the direction of the locking leg receptacle **42**, the spring leg shaft **44** is bordered by a guide pin **46** which holds the lower end of the spring leg **33** in a stable position in the spring leg shaft **44** and prevents the spring leg **33** from jumping over into the locking leg receptacle **42**.

[0063] The support wall **45** as well as the guide pin **46** are directed vertically to the arrangement surface of the counter-bearing **11** or parallel to the vertical axis V, so that the functional spaces, namely the spring support leg receptacle **41**, the locking leg receptacle **42** and the spring leg shaft **44** are vertically separated from one another and accessible via the insertion opening **39** of the pin **25**.

[0064] From the combination of FIGS. **4** and **5** it is evident how the assembly **100**, in particular the connection element **10**, is assembled.

[0065] Firstly, the locking springs **21** are inserted into the respective associated pin **25** counter to the direction of light emission L, that is to say from the top of the connection element **10**. The spring legs **33** enter the spring leg shaft **44** here. At the same time, the locking leg **34** is held in the locking leg seat **43** of the locking leg receptacle **42**. In this way, the locking spring **21** locks in the pin **25**. The locking contour **35** of the locking spring **21** extends radially inwards in the direction of the vertical axis V into the spring support leg receptacle **41**.

[0066] The outer ring **19** is now placed on the heat sink **12**, the pins **25** being inserted into the cavities **18**. In this way, the underside of the outer ring **19** facing towards the heat sink **12** comes to rest on the arrangement surface **16** of the heat sink **12**.

[0067] To assemble the assembly **100**, the circuit board **13**, that is to say the LED light source, is now inserted into the receiving frame **24** formed by the outer ring **19**, so that the underside of the circuit board **13** likewise rests on the arrangement surface **16** of the heat sink **12**. If applicable, heat conducting agents-not shown in the drawings-are arranged between the circuit board **13** and the heat sink **12**.

[0068] Within the outer ring **19**, the circuit board **13** is now securely held against horizontal displacement or displacement parallel to the arrangement surface.

[0069] The inner ring **20** is now placed on the outer ring **19** counter to the direction of light emission L. The spring support legs **27** are inserted here into the respectively associated pin **25** and there into the corresponding spring support leg receptacle **41**. In this case, the spreading surfaces **31** of the respective locking lug **29** come into contact with the respectively associated spreading leg **38** of the locking spring **21**, the resulting inclined surface pairing **31**/**38** leading to a displacement of the locking contour **35** radially outwards. This movement reaches its maximum when the locking contour vertex **36** is on the locking lug vertex **32**. Subsequently, as the insertion movement continues counter to the direction of light emission L, the retaining legs **37** engage with the respective locking surface **30** of the locking lug **29**. In this case, the locking contour **35** is displaced radially inwards in an elastic manner returning the spring, the inclined surface pairing **31**/**38** between the holding leg **37** and the locking surface **30** applying a force component to the inner ring **20** directed in the direction of the arrangement surface **16**. As a result, the inner ring **20** is clamped against the inserted circuit board **13** and ensures sufficient contact pressure of the circuit board **13** on the heat sink **12** in order to promote optimal heat dissipation. In the same way—not described in further detail here—the aforementioned force component, which clamps the inner ring **20** in the direction of the arrangement surface **16**, also promotes correct contact of the contact arrangement on the contact fields **15** of the circuit board **13** in order to achieve correct electrical contact values.

[0070] Owing to the locking pins **25** extending into an area below the arrangement surface **16**, a sufficiently large space is created to create a spring element in the form of the locking spring **21** which is elongated in the direction of light emission L or parallel to the vertical axis V and which, via its longitudinal extension of the spring leg **33** within the spring leg shaft **44**, offers sufficiently large spring travel for holding the inner ring **20** in the outer ring **19**.

[0071] FIG. **6** shows an exploded view of an alternative embodiment. The statements made in relation to FIG. **1** also apply to this depiction. This is also an assembly **100** with a connection element **10**, which holds an LED light source—consisting of a circuit board **13** with contact fields **15** and LED **14**—on a counter-bearing **11** in the form of a heat sink **12**. The connection element **10** is divided into an outer ring **19** and an inner ring **20**, wherein the outer ring **19** carries locking springs **21** for holding the inner ring **20**.

[0072] The statements made in relation to the first embodiment also apply to the second embodiment. However, the two embodiments differ with regard to the fastening of the connection element **10** to the heat sink **12**. As shown in FIG. **6**, the locking spring **21** has an additional component in the form of a fixing pin **47** which returns the spring in an elastic manner and is arranged on the locking spring **21** as an additional locking means. This—as will be described shortly—serves to fasten the outer ring **19** to the heat sink **12** so that the screw bolts **22** known from the first exemplary embodiment can be dispensed with.

[0073] FIG. **7** shows the second embodiment in assembled form. FIG. **7** serves in particular to illustrate the position of the section line B-B for which FIG. **8** is the corresponding sectional view.

[0074] FIG. **8** first shows the heat sink **12** with the cavity **18** known from the first embodiment which extends from the top of the heat sink **12** provided with the connection element **10** to its underside as a continuous hole. The cavity **18** has a step **48** which narrows the cavity diameter and contributes to the fixing of the outer ring **19** of the connection element **10**. The locking spring **21** is anchored in the outer ring **19**. Owing to the position of the sectioning, the locking leg **34** of the locking spring **21** can be seen seated in the locking leg receptacle **42**. It can also be seen from FIG. **8** how the fixing pin **47**, which in the second embodiment is additionally arranged on the locking spring **21**, engages behind the step **48** in the manner of a locking element and thus holds the locking spring **21** in the cavity **18**. Through the connection between the locking spring **21** and the outer ring **19**, the outer ring **19** is thereby firmly anchored on the heat sink **12** and the outer ring **19** in turn holds the inner ring **20** (not visible here) so that the connection element **10** is arranged on the heat sink **12** via the locking spring **21**.

[0075] Advantageously, additional screw bolts **22** for fixing the connection element **10** on the heat sink **12** can be dispensed with.

[0076] The pin **25** can be configured as a type of expansion dowel. The locking pin **25** can be expanded in circumference via slots in the locking pin **25** that are aligned vertically to the arrangement surface **16** and an expansion element that can be inserted into the locking pin **25** so that it lies in the cavity **18** of the heat sink **12** in a friction-fitting or form-fitting manner. The locking spring **21** can serve as an expansion element here.

LIST OF REFERENCE NUMERALS

[0077] **10** Connection element
[0078] **11** Counter-bearing
[0079] **12** Heat sink
[0080] **13** Circuit board
[0081] **14** LED
[0082] **15** Contact field
[0083] **16** Arrangement surface
[0084] **17** Threaded hole
[0085] **18** Cavity
[0086] **19** Outer ring
[0087] **20** Inner ring
[0088] **21** Locking spring
[0089] **22** Screw bolts
[0090] **23** Fastening holes
[0091] **24** Receiving frame
[0092] **25** Pin
[0093] **26** Receiving space
[0094] **27** Spring support leg
[0095] **28** Light passage opening
[0096] **29** Locking lug
[0097] **30** Locking surface
[0098] **31** Spreading surface
[0099] **32** Locking lug vertex
[0100] **33** Spring leg
[0101] **34** Locking leg
[0102] **35** Locking contour
[0103] **36** Locking contour vertex
[0104] **37** Holding leg
[0105] **38** Spreading leg
[0106] **39** Insertion opening
[0107] **40** Pin interior
[0108] **41** Spring support leg receptacle
[0109] **42** Locking leg receptacle
[0110] **43** Locking leg seat
[0111] **44** Spring leg shaft
[0112] **45** Support wall
[0113] **46** Guide pin
[0114] **47** Fixing pin
[0115] **48** Step
[0116] V Axis
[0117] L Direction of light emission
[0118] **100** Assembly

What is claimed is:

1. A connection element (**10**) for electrically connecting an LED light source, the LED light source having a circuit board (**13**) with contact fields (**15**) for electrically supplying an LED (**14**), the connection element (**10**) comprising:

a frame (**24**) configured to rest on an arrangement surface (**16**) of a counter-bearing (**11**) and to hold the circuit board (**13**) on the arrangement surface (**16**),

wherein the frame is formed by an outer ring (**19**) and an inner ring (**20**),

wherein the inner ring (**20**) is held within the outer ring (**19**) and

configured to be overlaid on the circuit board (**13**) at least in some areas and thereby hold the circuit board (**13**) vertically to the arrangement surface (**16**) on the counter-bearing (**11**), and

wherein the outer ring (**19**) is configured to surround the circuit board (**13**) and to hold the circuit board (**13**) parallel to the arrangement surface (**16**) on the counter-bearing (**11**);

locking lugs (**29**) which are formed by the inner ring (**20**);

locking springs (**21**) arranged in the outer ring (**19**) to overlap the locking lugs (**29**) of the inner ring (**20**) and to exert a tensile force on the inner ring (**20**) towards the arrangement surface (**16**); and

a spring receiving space for the locking spring (**21**), wherein the spring receiving space extends in relation to the frame (**24**) resting on the arrangement surface (**16**) into an area below the arrangement surface (**16**).

2. The connection element (**10**) according to claim **1**,

wherein the spring receiving space is formed by a pin (**25**) which rises from an underside of the outer ring (**19**).

3. The connection element (**10**) according to claim **2**,

wherein the locking spring (**21**) is held in a form-fitting manner in the pin (**25**).

4. The connection element (**10**) according to claim **1**,

wherein the spring receiving space is formed by a cavity (**18**) in the counter-bearing (**11**).

5. The connection element (**10**) according to claim **1**,

wherein the spring receiving space is formed by a cavity (**18**) in the counter-bearing (**11**),

wherein the spring receiving space is formed by a pin (**25**) which rises from an underside of the outer ring (**19**), and

wherein the pin (**25**) is seated in der cavity (**18**).

6. The connection element (**10**) according to claim **5**,

wherein the inner ring (**20**) forms a spring support leg (**27**) which carries a locking projection.

7. The connection element (**10**) according to claim **6**,

wherein the spring support leg (**27**) protrudes into the spring receiving space and rests against a wall bordering the spring receiving space.

8. The connection element (**10**) according to claim **7**,

wherein the spring support leg (**27**) is supported on a wall section of the counter-bearing (**11**) bordering the cavity (**18**).

9. The connection element (**10**) according to claim **7**,

wherein the spring support leg (**27**) is supported on the pin (**25**) rising from the outer ring (**19**).

10. The connection element (**10**) according to claim **5**,

wherein the pin (**25**) is configured as an expansion dowel in order to hold the outer ring (**19**) in a form-fitting or friction-fitting manner on the counter-bearing (**11**).

11. The connection element (**10**) according to claim **1**,

wherein the locking spring (**21**) arranged in the outer ring (**19**) fixes the inner ring (**20**) to the outer ring (**19**) and the outer ring (**19**) to the counter-bearing (**11**).

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