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(54) **LUMINAIRE HAVING A PIVOTABLE LED**

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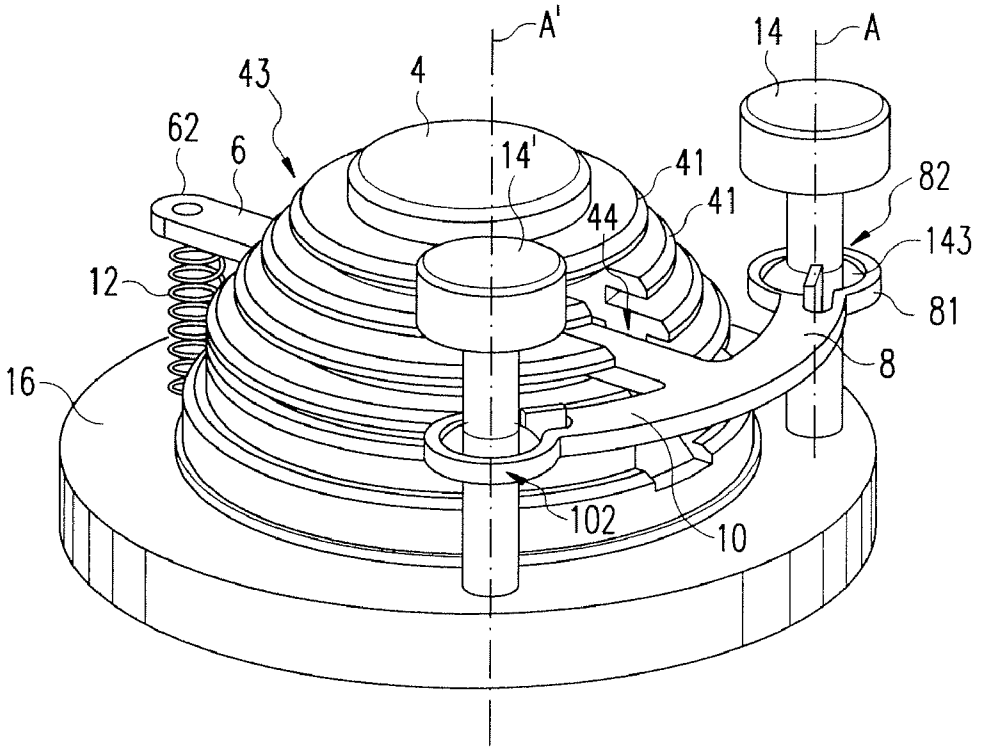
(57) **ABSTRACT**

In a luminaire, comprising a light source (**2**) having at least one LED and a heat sink (**4**) for cooling the LED, the light source (**2**) is arranged pivotably with respect to the heat sink (**4**), wherein three lever arms (**6**, **8**, **10**) that act on the light source (**2**) are provided and the luminaire is designed such that the light source (**2**) is pressed against the heat sink (**4**) by the three lever arms (**6**, **8**, **10**). Moreover, a spring element (**12**), which acts on a first (**6**) of the three lever arms (**6**, **8**, **10**), and an adjusting means (**14**) for adjusting a second (**8**) of the three lever arms (**6**, **8**, **10**) are provided.



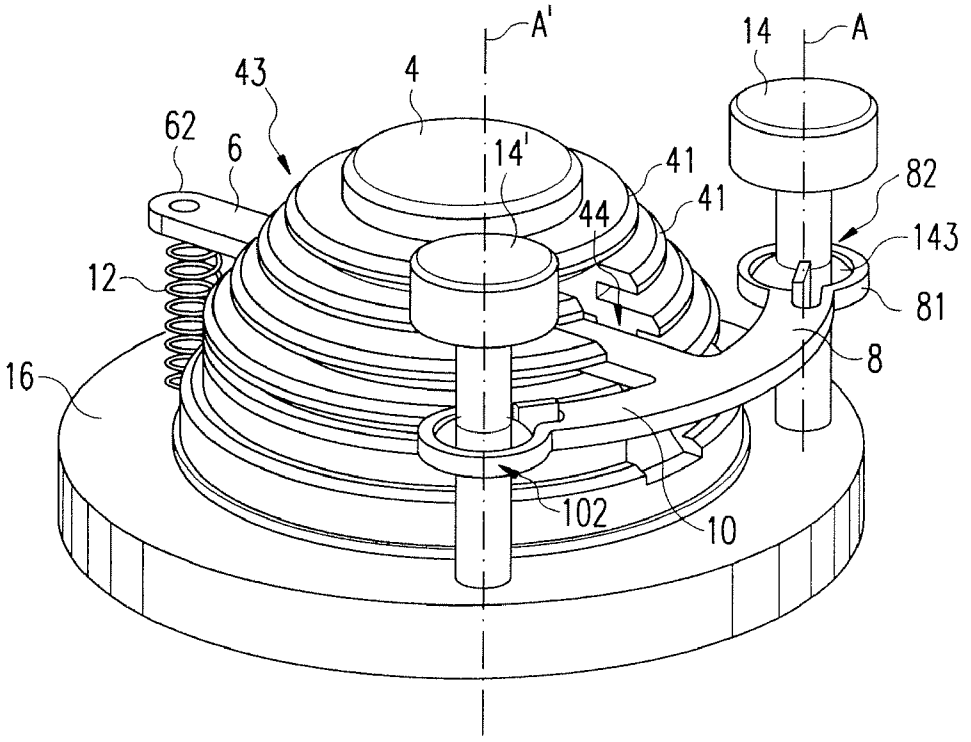

A'
14
A
43
4
62
6
14'
41
41
82
44
143
12
81
8
16
102
10

Fig. 1

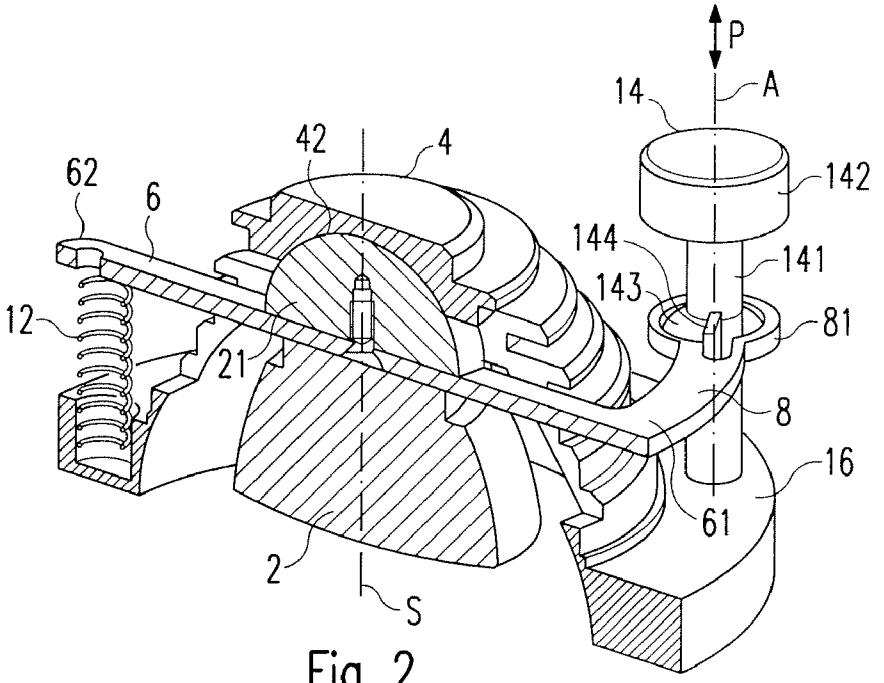

P
14
A
42
4
62
6
142
144
141
143
81
12
21
8
16
61
2
S

Fig. 2

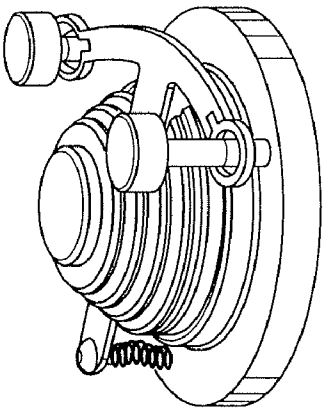


Fig. 3c

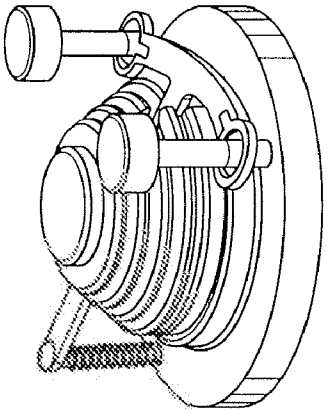


Fig. 3b

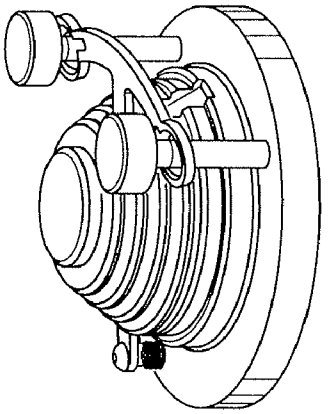


Fig. 3a

LUMINAIRE HAVING A PIVOTABLE LED

[0001] The invention relates to a luminaire having a light source, which has at least one LED (light-emitting diode), and also having a heat sink to cool the LED, in which the light source is pivotably arranged with respect to the heat sink.

[0002] Such a luminaire is known from DE 10 2008 007 647 A1. In the case of this luminaire the LED can be aligned differently with respect to the heat sink by pivoting; in this way it is possible to change the direction in which in the main light is radiated from the luminaire. In order to vary the direction of the emission of light in this way, manual adjustment of the LED is required. Manual adjustment can entail problems, for example if very small and precise changes in the main direction of radiation are desired or if the luminaire is arranged outside a user's usual manual reach for operation.

[0003] The underlying object of the invention is to specify a corresponding luminaire in which the possibilities for adjusting the main direction of radiation are improved.

[0004] This object is achieved in accordance with the invention by means of the subject matter mentioned in the independent claim. Special embodiments of the invention are specified in the dependent claims.

[0005] In accordance with the invention a luminaire is provided that has a light source with at least one LED and also has a heat sink for cooling the LED, wherein the light source is pivotably arranged with respect to the heat sink. Moreover, the luminaire has three lever arms that act on the light source, wherein the luminaire is formed in such a way that the light source is pressed by means of the three lever aims against the heat sink; furthermore, the luminaire has a spring element, which acts on a first lever arm of the three lever arms, and also an adjusting means to adjust a second lever arm of the three lever arms.

[0006] By actuating the adjusting means, the light source can be pivoted in a particularly precise manner with respect to the heat sink. A particularly exact or fine setting of the direction of radiation is thus facilitated.

[0007] The light source and the heat sink are preferably connected in an articulated manner by way of a ball joint. As a result, it is made possible for the main direction of radiation of the luminaire to be adjustable basically in all possible directions. Moreover, as a result particularly good heat transmission from the LED to the heat sink is rendered possible.

[0008] The adjusting means preferably has a threaded structure, for example in the form of an adjusting screw. As a result, particularly fine adjustment is rendered possible. In this connection, furthermore, advantageously the adjusting means has, moreover, a nut which is rotatably connected to the threaded structure, the nut having an area which is in the form of a spherical segment and on which the second lever arm rests directly. This, when the light source is pivoted, renders possible particularly good support of the second lever arm on the adjusting means at all times. Moreover, the luminaire expediently has a securing element to prevent a rotation of the nut with respect to the second lever aim about a longitudinal axis of the threaded structure. This renders possible particularly reliable adjustment of the second lever arm with the aid of the adjusting means. The securing element is then preferably fixedly arranged on the nut.

[0009] The luminaire preferably has, furthermore, a further adjusting means, that is, to adjust one of or rather the third of the three lever arms. As a result, it is made possible for the LED to be able to be adjusted in all directions by the adjusting means first mentioned and the further adjusting means. The further adjusting means is then preferably formed in a similar manner to that of the adjusting means first mentioned.

[0010] The three lever arms advantageously have altogether a T-shape or anchor shape.

[0011] Furthermore, the luminaire advantageously has a supporting element, wherein the spring element is arranged so as to be supported on the supporting element, and the adjusting means is arranged so as to be supported on the supporting element. This renders possible an all in all compact structural form of the luminaire. The supporting element is preferably annular; the supporting element is advantageously arranged so that it is immovable with respect to the heat sink or is configured as part of the heat sink.

[0012] The heat sink has two, preferably just two, through-openings for the three lever arms. As a result a compact structural form is rendered possible with at the same time a comparatively large surface of the heat sink.

[0013] Furthermore, the luminaire advantageously has a motor to adjust the adjusting means. This renders possible a particularly precise and at the same time remotely controllable setting of the direction of radiation of light of the luminaire.

[0014] The luminaire is particularly suitable as a built-in ceiling luminaire.

[0015] The invention is explained in greater detail in the following with the aid of an exemplary embodiment and with reference to the drawings, in which:

[0016] FIG. **1** shows a diagrammatic perspective sketch of a luminaire in accordance with the invention;

[0017] FIG. **2** shows a perspective sketch of a cross section, and

[0018] FIGS. **3***a* to **3***c* show three views of the luminaire in different positions of the light source with respect to the heat sink.

[0019] FIG. **1** shows a diagrammatic view of a luminaire in accordance with the invention; FIG. **2** shows a corresponding cross section. The luminaire comprises a light source **2**. The light source **2** has at least one LED, preferably a plurality of LEDs. In particular, it can be provided that the light source **2** has as an illuminant just one LED or a plurality of LEDs. The LED can be arranged on a printed circuit board.

[0020] The light source **2** can comprise, moreover, an optical element (not expressly shown in the figures) to influence a light produced by the LED or LEDs.

[0021] Furthermore, the luminaire has a heat sink **4** which is designed to cool the LED, preferably the light source **2**, during operation of the luminaire. The heat sink **4** can have a plurality of cooling ribs **41**. The heat sink **4** can, furthermore, be configured in such a way that with reference to a main axis S of the heat sink **4** it surrounds the light source **2** or the LED in an annular manner, preferably, as shown by way of example in FIG. **2**, in a pot-shaped manner.

[0022] The light source **2** is pivotably arranged with respect to the heat sink **4**. The light source **2** and the heat sink **4** are preferably connected together in an articulated manner by way of a ball joint. As a result, it is made possible for the light source **2** to be able to be pivoted in all directions relative to the heat sink **4**. The ball joint can in particular be configured in such a way that the heat sink **4** forms a joint socket **42** of the ball joint, and the light source **2** a joint head **21** that has the form of a spherical segment corresponding, in accordance with the articulated connection, to the form of the joint socket **42**.

[0023] The luminaire has three lever arms **6**, **8**, **10**, that is, a first lever arm **6**, a second lever arm **8** and a third lever arm **10**. The lever arms **6**, **8**, **10** are configured in such a way that they act on the light source **2**; in particular they are configured in such a way that in the event of a movement of the lever arms **6**, **8**, **10** the light source **2** is pivoted with respect to the heat sink **4**. In this connection, the luminaire is formed in particular in such a way that the light source **2** is pressed by the three lever arms **6**, **8**, **10** against the heat sink **4**, that is, for example into the joint socket **42**. Thus with reference to the representations of FIGS. **1** and **2** the light source **2** is pressed "upwards" against the heat sink **4** into the joint socket **41**. The three lever arms **6**, **8**, **10** are preferably formed in such a way that they point in three different radial directions with reference to the main axis S; for example, the configuration can be such that in each case two adjacent lever arms of the three lever arms **6**, **8**, **10** enclose an angle of between 100° and 140°, preferably an angle of 120°. A first end region **62** lying opposite the light source **2** can be formed on the first lever arm **6**, a corresponding second end region **82** can be formed on the second lever arm **82**, and a corresponding third end region **102** can be formed on the third lever arm **10**.

[0024] Furthermore, the luminaire has a spring element **12** which acts on the first lever arm **6**. In particular, the configuration can be such that on account of the action of the spring element **12** the light source **2** is pressed against the heat sink **4**. The spring element **12** can be for example—as shown in the figures—a compression spring or a leaf spring or the like. Advantageously, the spring element **12** acts on the first end region **62**.

[0025] The spring element **12** is preferably designed in such a way that the light source **2** is pressed against the heat sink **4** in a reliable manner for the duration of the whole of the expected lifetime of the luminaire. The design is preferably even such that the light source **2** rubs or fits into the joint socket **42** in the course of time.

[0026] Furthermore, the luminaire has an adjusting means **14** to adjust the second lever arm **8**. In particular, the adjusting means **14** can have a threaded structure **141** (which is not expressly shown in FIGS. **1** and **2** for the sake of clarity). The threaded structure **141** can be formed in particular about a longitudinal axis A which is preferably formed so as to be oriented parallel to the main axis S.

[0027] The adjusting means **14** can have, for example, an adjusting screw with an adjusting-screw head **142** and the thread **141**. The adjusting-screw head **142** is then preferably formed in such a way that it is at least also suitable for manual adjustment, that is, rotation.

[0028] In particular, the adjusting means **14** can thus be formed so as to act on the second lever arm **8** in such a way that the lever arm **8** or the second end region **82** is moved along the longitudinal axis A, that is, in accordance with the double arrow P sketched in FIG. **2**. The adjusting means **14** thus preferably acts in particular on the second end region **82**. In conjunction with the spring element **12** in this way the alignment of the light source **2** with respect to the heat sink **4** can be changed by adjusting the adjusting means **14**.

[0029] Furthermore, the adjusting means **14** preferably has a nut **143** which is rotatably connected to the threaded structure **141**, wherein the nut **143** has an area which is in the form of a spherical segment and on which the second lever arm **8** rests directly. In particular, the second lever arm **8** can have for this a ring element **81** which is formed so as to rest on the area of the nut **143** that is in the form of a spherical segment. As a result, particularly good support of the second lever arm **8** on the nut **143** is rendered possible, wherein by the spring element **12** the joint head **21** is pressed or forced against the joint socket **42** in a reliable manner and with good area contact. Moreover, by the spring element **12** the second lever arm **8** is pressed against the area of the nut **143** that is in the form of a spherical segment. The adjusting means **14** preferably has, furthermore, a securing element **144** to prevent rotation of the nut **143** with respect to the second lever aim **8** about the longitudinal axis A of the threaded structure **141**; in this connection, expediently the securing element **144** is fixedly arranged on the nut **143**. By means of the securing element **144** a situation can be avoided where in the event of a rotation of the adjusting means **14** to change the alignment of the light source **2** the nut **143** turns together with the threaded structure **141** and in this way the first lever arm **6** is moved in an undefined manner or not at all.

[0030] The luminaire preferably has, moreover, a further adjusting means **14'** to adjust the third lever arm **10**, wherein the further adjusting means **14'** is preferably formed in a similar manner to that of the adjusting means **14** first mentioned.

[0031] Alternatively, a further spring element could be provided that acts on the third lever arm **10** in the way that the spring element **12** first mentioned acts on the first lever arm **6**. However, the possibilities for adjustment are reduced with this alternative.

[0032] As is the case with the exemplary embodiment shown, the three lever arms **6**, **8**, **10** advantageously altogether have a T-shape or an anchor shape, in particular in a plane perpendicularly to the main axis S.

[0033] Furthermore, the luminaire preferably has a supporting element **16**, wherein the spring element **12** is arranged so as to be supported on the supporting element **16**, and the adjusting means **14** is also arranged so as to be supported on the supporting element **16**. The adjusting means **14** can in this connection be rotatably mounted in the supporting element **16**.

[0034] The supporting element **16** is preferably formed in an annular manner. For example, it can be formed so that it is annular about the main axis S. In particular, it can be formed so that it is immovable with respect to the heat sink **4**; it can be arranged so that it is directly adjacent to the heat sink **4**; it can form, for example, an edge closure of the heat sink **4** formed in a pot-shaped manner. The supporting element **16** can, however, also be formed in a space-saving manner as part of the heat sink **4**.

[0035] Of course, the further adjusting means **14'** can also be arranged so that it is supported on the supporting element **16**, in particular in a manner similar to that of the configuration with reference to the adjusting means **14** first mentioned.

[0036] The heat sink **4** preferably has two through-openings **43**, **44** for the three lever arms **6**, **8**, **10**. In particular, this is advantageous if the heat sink **4** is formed in a pot-shaped manner around the light source **2**, and the lever arms **6**, **8**, **10** altogether have the T-shape or anchor shape mentioned, as is the case in the exemplary embodiment shown. In particular, the configuration can be such that the second lever arm **8** and the third lever arm **10** extend from the level of the light source **2** in the first instance together or in parallel as far as a branch point **61** and diverge from the branch point **61** towards their respective end regions **62** and **82**. The branch point **61** then preferably lies, with reference to the light source **2**, outside the heat sink **4** and in this connection, for example, diametri-

cally opposite the end region **62** of the first lever arm **6**. Thus the two through-openings **43**, **44** are quite sufficient for a movement of the lever arms **6**, **8**, **10** or of the light source **2** respectively relative to the heat sink **4** so that in this way a surface of the heat sink **4** that is as large as possible and thus particularly effective cooling are rendered possible.

[0037] The luminaire preferably has, furthermore, a motor (not shown in the figures) that is formed to adjust the adjusting means **14** and in this way to change the alignment of the light source **2** with respect to the heat sink **4**. As a result, a basis for intelligent light-application is formed. In particular, two electric motors can be provided, wherein the longitudinal axis A of the adjusting element **14** and the corresponding longitudinal axis A' of the further adjusting element **14'** form adjusting axes of the electric motors. The adjusting means **14** can, as an alternative to the above-mentioned adjusting screw, also be formed as a linear drive or the like; the same also applies of course in a corresponding manner to the further adjusting means **14'**.

[0038] Particularly advantageously, the luminaire is a built-in ceiling luminaire, for example an LED spotlight.

[0039] Three different positions of the light source **2** with respect to the heat sink **4** are shown in FIGS. **3***a* to **3***c* for the purposes of supplementary illustration. In FIG. **3***a* the case is shown in which the adjusting element **14** and the further adjusting element **14'** are set in such a way that the second lever arm **8** and the third lever arm **10** are in each case at a maximum distance away from the supporting element **16**; in FIG. **3***b* the second lever arm **8** and the third lever arm **10** are brought as close as possible to the supporting element **16**; in FIG. **3***c* the second lever arm **8** is at a distance from the supporting element **16**, and the third lever arm **10** is brought close to the supporting element **16**.

1. A luminaire, having

a light source (**2**) with at least one LED, and

a heat sink (**4**) for cooling the LED,

wherein the light source (**2**) is pivotably arranged with respect to the heat sink (**4**).

characterised by

three lever arms (**6**, **8**, **10**) that act on the light source (**2**),

wherein the luminaire is formed in such a way that the light source (**2**) is pressed by means of the three lever arms (**6**, **8**, **10**) against the heat sink (**4**);

a spring element (**12**), which acts on a first lever arm (**6**) of the three lever arms (**6**, **8**, **10**), and

an adjusting means (**14**) to adjust a second lever arm (**8**) of the three lever arms (**6**, **8**, **10**).

2. A luminaire according to claim **1**,

in which the light source (**2**) and the heat sink (**4**) are connected in an articulated manner by way of a ball joint.

3. A luminaire according to claim **1**,

in which the adjusting means (**14**) has a threaded structure (**141**).

4. A luminaire according to claim **3**,

in which the adjusting means (**14**) has, furthermore, a nut (**143**) which is rotatably connected to the threaded structure (**141**), wherein the nut (**143**) has an area which is in the form of a spherical segment and on which the second lever arm (**8**) rests directly.

5. A luminaire according to claim **4**,

in which the adjusting means (**14**) has, furthermore, a securing element (**144**) to prevent a rotation of the nut (**143**) with respect to the second lever arm (**8**) about a longitudinal axis (A) of the threaded structure (**141**), wherein the securing element (**144**) is preferably fixedly arranged on the nut (**143**).

6. A luminaire according to claim **1**, having, furthermore,

a further adjusting means (**14'**) to adjust a third lever arm (**10**) of the three lever arms (**6**, **8**, **10**), wherein the further adjusting means (**14'**) is preferably formed in a similar manner to that of the adjusting means (**14**) first mentioned.

7. A luminaire according to claim **1**, in which the three lever arms (**6**, **8**, **10**) altogether have a T-shape or anchor shape.

8. A luminaire according to claim **1**, having, furthermore,

a supporting element (**16**), which is preferably annular, wherein the spring element (**12**) is arranged so as to be supported on the supporting element (**16**), and the adjusting means (**14**) is arranged so as to be supported on the supporting element (**16**).

9. A luminaire according to claim **8**,

in which the supporting element (**16**) is arranged so that it is immovable with respect to the heat sink (**4**) or is formed as part of the heat sink (**4**).

10. A luminaire according to claim **1**,

in which the heat sink (**4**) has at least two through-openings (**43**, **44**) for the three lever arms (**6**, **8**, **10**).

11. A luminaire according to claim **1**, having, furthermore,

a motor to adjust the adjusting means (**14**).

12. A luminaire according to claim **1** in the form of a built-in ceiling luminaire.

13. A luminaire according to claim **3**, wherein the threaded structure (**141**) comprises an adjusting screw.

14. A luminaire according to claim **10**, wherein the heat sink (**4**) consists of two through-openings (**43**, **44**) for the three lever arms (**6**, **8**, **10**).

* * * * *