(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 405 183 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.01.2012 Bulletin 2012/02

(51) Int Cl.:
F21S 8/02 *(2006.01)* ***F21V 29/00*** *(2006.01)*

(21) Application number: **11173360.6**

(22) Date of filing: **08.07.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **08.07.2010 NL 2005061**

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(54) Lighting fixture

(57) The invention relates to a lighting fixture, comprising a substantially planar carrier which on a first side is provided with at least one light source and on a second side opposite the first side is provided with a cooling body for dissipating heat generated by the light source. The cooling body comprises cooling elements which extend from the planar carrier in a direction away from the carrier. Further, the cooling body comprises a flow path for a convection flow, which extends from the periphery of the carrier to a central part of the cooling body which is free from cooling elements.

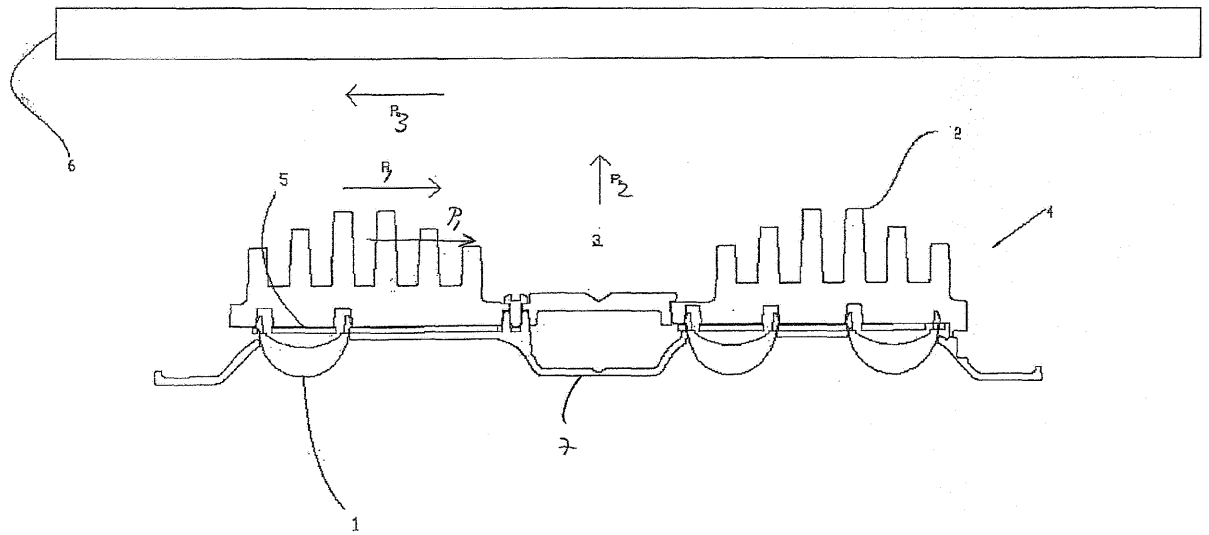

Fig. 2

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Description

[0001] The invention relates to a lighting fixture with a heat generating light source, such as, for example, an LED. The lighting fixture further comprises a substantially planar carrier which on a first side is provided with at least one light source and on a second side opposite the first side is provided with a cooling body for dissipating heat generated by the light source, wherein the cooling body comprises cooling elements which extend from the planar carrier in a direction away from the carrier.

[0002] Such a lighting fixture module is generally known, for lighting, for example, offices, corridors, receptions, hotels, residences. Such a lighting fixture can be, for example, a circular downlight fixture.

[0003] Today, LEDs still produce more than half of their power in heat, which needs to be dissipated to have an optimum light output and not to curtail the life span.

[0004] These lighting fixtures are often built into a false ceiling. A drawback of the known embodiments is that an insufficient free height above the cooling body may strongly curtail the operation of the cooling body, which will raise the temperature in the LEDs and reduce their efficiency. In the art, reference is made to a thermal stop when the free height above the cooling body is so small that no convection flow can develop anymore through the cooling fins.

[0005] A known solution to this problem is providing perforations in the cooling body, so that there is a connection between the local space and the space in the false ceiling. A drawback of this embodiment is that there is a reduced acoustic separation between the technical space in the ceiling and the local space. This can give rise to problems of crosstalk. Another disadvantage is that these perforations need to have a considerable diameter, which does not always fit within the design of the fixture.

[0006] Another known solution as an alternative to this passive cooling is active cooling. This will always have the disadvantage that the power consumption of the lighting fixture will increase and there will always be a slight sound increase.

[0007] The invention envisages providing a lighting fixture which counteracts at least one of the above-mentioned disadvantages.

[0008] To this end, the invention provides a lighting fixture according to the opening paragraph hereof, wherein the cooling body defines a flow path for a convection flow which extends from the periphery of the carrier to a central part of the cooling body which is free from cooling elements.

[0009] By arranging for the convection flow to flow into the central part of the cooling body, more effective cooling can take place, especially of cooling elements that are arranged close to the central part.

[0010] The lighting fixture has its use in a fixture that is mounted in a ceiling. And where the free height between the fixture and the ceiling is smaller than half the width of the cooling body.

[0011] By providing a good coupling between the LED and the cooling body, the heat of the LED can be properly dissipated to the cooling body.

[0012] The design of the cooling element is such that an air flow can develop, through the cooling element, in both horizontal and vertical direction. This can be done by making the cooling element not solid but in the form of ribs, rods or a solid element with holes.

[0013] By reducing the height of the cooling elements of the cooling body in the central portion, centrally a relatively colder zone is created. Through the reduced boundary layer buildup in horizontal direction, a radial convection air flow can get going, from the radial outer side, to the radial inner side of the cooling body. This results, in the horizontal plane, parallel to the carrier of the fixture, in a multidirectional convection flow in the cooling body and a vertical flow-through possibility in the central portion. As a result, in case of a limited free space above the cooling body, there will be a reduced boundary layer buildup in the cooling body and hence a better effective cooling.

[0014] In an optional embodiment in accordance with the invention the fixture is mounted not in a false ceiling, but as a surface-mounted appliance against the ceiling. The same advantageous form will provide that the space needed for a good cooling is reduced, as a result of which the fixture in itself becomes less high.

[0015] The invention will be further elucidated on the basis of an exemplary embodiment which is represented in a drawing.

[0016] In the drawing:

Fig. 1 shows a schematic perspective view of a downlight fixture in accordance with the invention with lens optic, where the LEDs are positioned behind the lens, and against the back of the LED the cooling body is attached.

Fig. 2 shows a schematic section of a downlight fixture in accordance with the invention.

[0017] It is noted that the figures are only schematic representations of advantageous embodiments which are represented by way of non-limiting exemplary embodiments.

[0018] In the figures, the same or corresponding parts are indicated with the same reference numerals.

[0019] Figure 1 shows a schematic perspective view of the lens optic 1 behind which are the LEDs 1 which are connected with the cooling body 4.

[0020] Figure 2 shows a schematic cross section of a downlight fixture in accordance with the invention. In this mode of implementation there are no LEDs 1 positioned under the central portion 7 of the fixture. Cooling pins 2 of the cooling body are connected with the carrier 5 on which the LEDs 1 are mounted. The shape of the cooling pins 2 is such that a central part 3 is not provided with cooling pins. As a result, a central part 3 is provided where

the air temperature is lower than at the cooling pins 2. The cooling body comprises an annular segment which surrounds the central part 3. As a result, not merely the usual vertical, upward air flow will arise, but a virtually circular air flow is created via a first path P_1 from the radial outer side of the lighting fixture, horizontally over or alongside/through the cooling pins 2 to the central portion 3 where the air rises via a second path P_2 and against the ceiling 6, flowing back via a third path P_3 to the radial outer side of the fixture. Owing to the central space / created opening 3, even at small distances from the ceiling 6 to the cooling pins 2, still a circular air flow will get going, which provides for a better cooling.

[0021] Thus the lighting fixture according to the invention comprises a substantially planar carrier which on a first side is provided with at least one light source and on a second side which is opposite the first side is provided with a cooling body for dissipating heat generated by the light source, wherein the cooling body comprises cooling elements which extend from the planar carrier in a direction away from the carrier, and wherein the cooling body defines a flow path for a convection flow which extends from the periphery of the carrier to a central part of the cooling body which is free from cooling elements. Preferably, the flow path extends between the cooling elements, more preferably substantially parallel to the substantially planar carrier.

[0022] Preferably, the substantially planar carrier is substantially rotation symmetrical.

[0023] A plurality of cooling elements may be set up along a substantially radial path. The height of the cooling elements may be chosen variably, for example, such that the height on the radial inner side and/or on the radial outer side is less than in a more centrally located part of the ring segment-shaped cooling body.

[0024] The invention is not limited to the exemplary embodiments represented here.

[0025] Thus, the pin bed may be designed as free-standing cooling ribs or a solid cooling body with holes.

[0026] Furthermore, the shape of the lighting fixture may vary.

[0027] Furthermore, in the central portion with limited cooling, ribs may yet be added, as long as there remains sufficient free space for a good convection flow.

[0028] Furthermore, it is possible that the central portion does have LEDs provided in it.

[0029] Furthermore, the lighting fixture may be equipped only with a single LED.

[0030] Thus, the lighting fixture comprises a heat generating light source and a cooling body therefor, for realizing a substantially radial convection flow by counteracting a radial thermal boundary layer buildup. Also, provision is made for a central vertical flow-through possibility.

[0031] In cross section the cooling body can have a U-profile.

[0032] By providing the lighting fixture in a central middle part thereof with a surface that cools less, a concave shape may be created..

[0033] Most preferably, the lighting fixture has no cooling ribs in the central part. Optionally, at the central portion no lighting sources are placed.

[0034] The cooling body can take the form of a pin bed. However, the cooling elements may also, as cooling ribs, be made of ring-shaped design, around the central portion. Optionally, the cooling elements are provided with flow-through openings for a radial convection flow. Furthermore, cooling ribs may be placed radially, so that between the radial cooling ribs radial channels are formed for passing a radial convection flow to the central portion of the cooling body.

Claims

1. A lighting fixture, comprising a substantially planar carrier which on a first side is provided with at least one light source and on a second side opposite the first side is provided with a cooling body for dissipating heat generated by the light source, wherein the cooling body comprises cooling elements which extend from the planar carrier in a direction away from the carrier, wherein the cooling body defines a flow path for a convection flow which extends from the periphery of the carrier to a central part of the cooling body which is free from cooling elements.

2. A lighting fixture according to claim 1, wherein the substantially planar carrier is substantially rotation symmetrical.

3. A lighting fixture according to claim 1 or 2, wherein a plurality of cooling elements are arranged in a substantially circular pattern.

4. A lighting fixture according to any one of the preceding claims, wherein the flow path extends at least partly between the cooling elements.

5. A lighting fixture according to any one of the preceding claims, wherein the flow path extends at least partly parallel to the substantially planar carrier.

6. A lighting fixture according to any one of the preceding claims, wherein a plurality of cooling elements are arranged along a substantially radial path.

7. A lighting fixture according to claim 6, wherein the distance over which the plurality of cooling elements extend in the direction away from the carrier first increases and then decreases, as a function of increasing radius.

8. A lighting fixture according to claim 6 or 7, wherein the cooling element that is closest to the central part of the cooling body extends less far from the carrier

than a neighboring cooling element which is located further away from the central part.

9. A lighting fixture according to any one of claims 6-8, wherein the cooling element that is farthest removed from the central part of the cooling body extends less far from the carrier than a neighboring cooling element which is closer to the central part.

10. A lighting fixture according to any one of the preceding claims, wherein a cooling element is pin-shaped.

11. A lighting fixture according to any one of the preceding claims, wherein the substantially planar carrier comprises a central, lowered part.

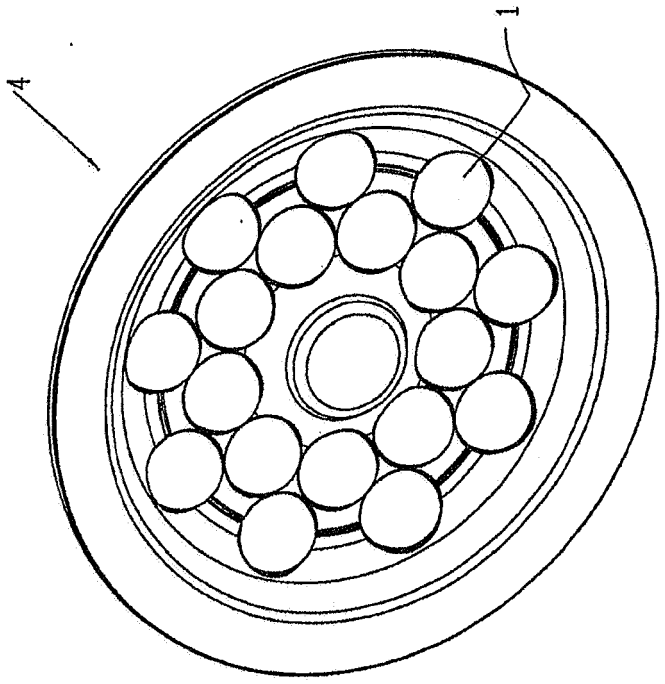
12. A lighting fixture according to any one of the preceding claims, wherein the cooling body comprises a ring segment-shaped part which, viewed in a direction transverse to the plane in which the carrier extends, surrounds the central part of the carrier.

13. A lighting fixture according to any one of the preceding claims, wherein the carrier is provided with an opening for physically contacting the light source with the cooling body.

14. A lighting fixture according to any one of the preceding claims, wherein the light source comprises a singular LED or a cluster of LEDs.

15. A lighting fixture according to any one of the preceding claims, in the embodiment of a downlight.

Fig. 1



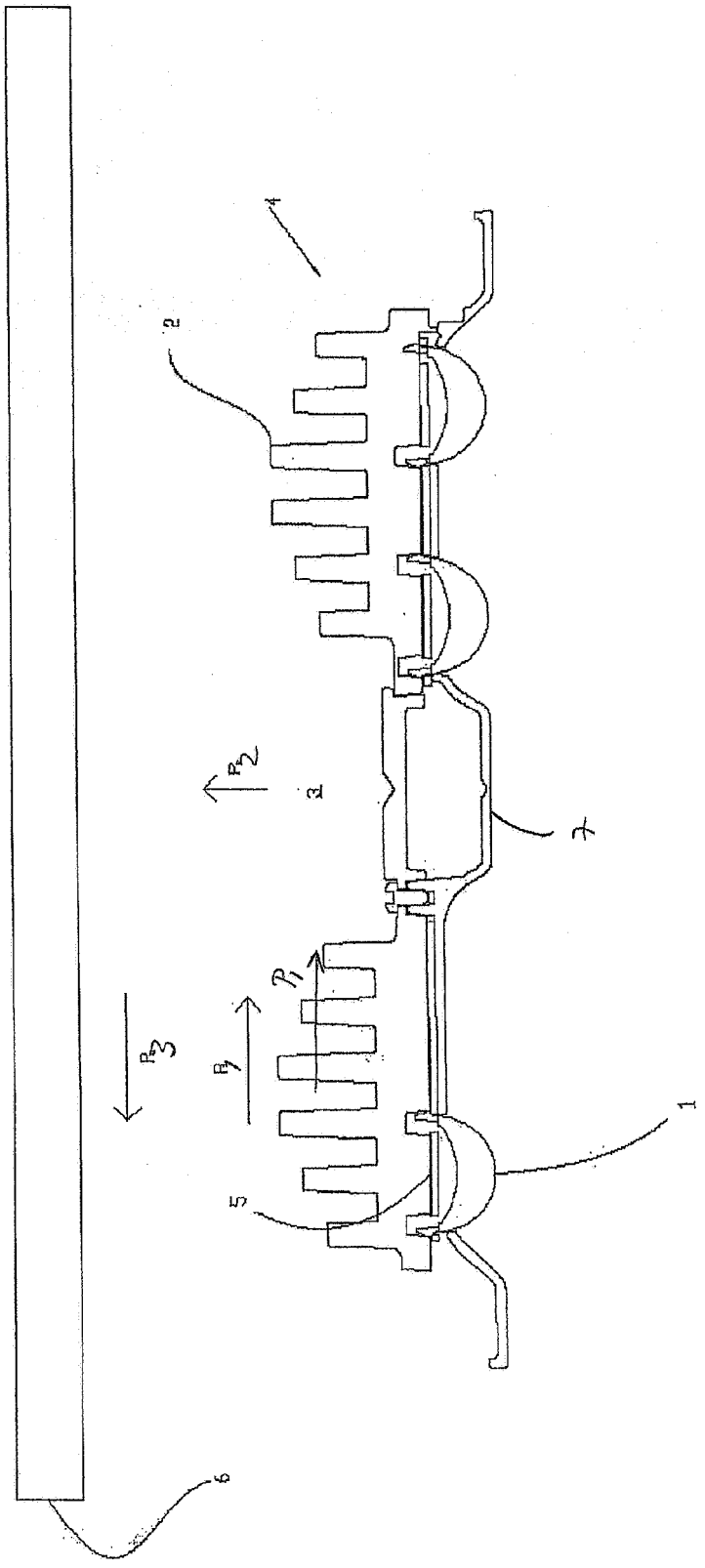


Fig. 2