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(74) Representative: **Lohr, Georg**
Lohr, Jöstingmeier & Partner
Patent- und Rechtsanwälte
Junkersstraße 3
82178 Puchheim (DE)

(71) Applicant: **Hella KGaA Hueck & Co.**
59552 Lippstadt (DE)

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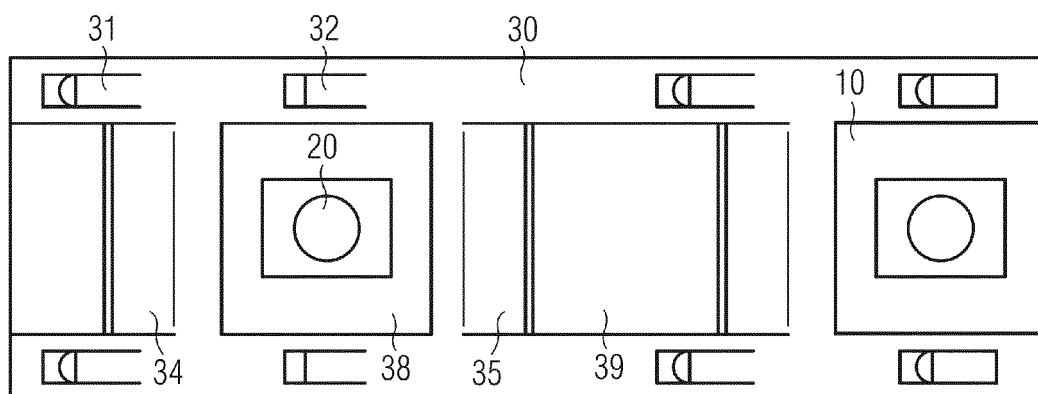
(72) Inventor: **Kerpe, Alexander**
59555 Lippstadt (DE)

(54) **Lighting component with LED reflector strip**

(57) A LED-based lighting component is disclosed. It comprises of a plurality of LEDs (20) mounted to a printed circuit board (10). Furthermore, a reflector strip (30) of a metal sheet with punched out reflectors (34,35,36,37) is located on the printed circuit board (10).

The reflector strip (30) forms at least two reflectors (34,35) at opposing sides of each LED, reflecting and/or shading light from the LED (20). The reflector strip (30) and the printed circuit board (10) are held together within a frame (40).

Fig. 1



Description

Field of the invention

[0001] The invention relates to a LED-based lighting component and to an assembly method of such a component. It specifically relates to a reflector mounted to a printed circuit board holding LEDs.

Description of the related art

[0002] LED lighting systems offer significant advantages over traditional incandescent, HID and fluorescent lamps. LEDs are of smaller size, offer higher reliability, longer operational life and lower energy consumption. However, there are specific requirements when using LEDs. As increased operating temperature significantly reduces lifetime, cooling is of high importance. Furthermore, most LED chips are approximately isotropic light sources with a lambertian light distribution, which must be adapted to specific requirements of a lighting system.

[0003] The US patent application publication 2008/027894181 A1 discloses a printed circuit board with LEDs soldered thereon. For adapting the light distribution, injection molded reflectors are positioned above each individual LED. The disadvantage is that the reflectors must be manually assembled to the printed circuit board. This is a complex and time-consuming step. Furthermore, the reflectors are comparatively complex and expensive. Changing of light distribution requires modifying the reflectors, including redesigning, making new tools and producing new reflectors.

Summary of the invention

[0004] The problem to be solved by the invention is to provide means for cooling and adapting the light distribution of LEDs mounted to a carrier like a printed circuit board.

[0005] Solutions of the problem are described in the independent claims. The dependent claims relate to further improvements of the invention.

[0006] A preferred embodiment relates to a LED-based lighting component comprising a strip shaped printed circuit board and a plurality of LEDs mounted thereon. Preferably, a reflector strip is placed on the printed circuit board. The reflector strip is of sheet metal with punched reflectors. The reflectors extend over the surface of the printed circuit board. They guide the light of the LED chips, which often have an approximated lambertian light distribution. The reflector strip can easily be manufactured from sheet metal by a simple process of punching and bending the reflectors of the main plane, which is defined by the metal sheet. This allows for a precise and inexpensive manufacturing process of high volumes of the reflector strip. The reflector strip may comprise reflectors for any number of LEDs.

[0007] Furthermore, the reflector strip preferably has

guides for aligning the reflector strip to the printed circuit board. During assembly, the guides are positioned within holes of the printed circuit board. Alignment of the reflector strip in relation to the LEDs by means of the guides is an easy procedure, as the reflector strip simply has to be placed on the printed circuit board and then to be moved over the surface of the printed circuit board until the guides snap into the holes of the printed circuit board. This further prevents damaging of LEDs or other electronic components on the printed circuit board by touching these with the reflector strip.

[0008] There are various methods for firmly attaching the reflector strip to the printed circuit board. For example, the guides may be bent back from the rear side of the printed circuit board to hold the reflector strip down to the printed circuit board. The reflector strip may also be glued or soldered to the printed circuit board. It is preferred to insert the printed circuit board together with the reflector strip into a frame. For this purpose, the frame may have one or two braces. The frame may also serve as mechanical support, a heat sink or as an insulator of the assembly. The frame may be a strand casted, pultruded or extruded profile. It preferably has overhangs to hold the reflector strip down to the printed circuit board and further to fix the reflector strip and the printed circuit board within the frame. To improve the fixation within the frame, the reflector strip may have springs. These assert a predetermined force to the reflector strip. For easy assembly the printed circuit board with attached reflector strip is pushed into an opening at the end of the profile. Slipping of the printed circuit board within the profile may be prevented by end caps or by a lug or a screw.

[0009] According to a further preferred embodiment, a reflector strip comprises at least one reflector. The reflector strip is preferably made of metal, which may be aluminum or brass, or any other material, which has a light reflecting surface. Most preferably the reflector strip is a metal sheet and the at least one reflector is punched from this metal sheet. The at least one reflector may be part of the surface of the reflector strip which is bent into an angle from a main plane of the reflector strip.

[0010] It is further preferred, if the reflector strip has at least one blanking or opening for the at least one LED, thus surrounding the LED on the printed circuit board. The reflector strip may have further blankings leaving space for further electronic components on the printed circuit board. The reflector strip may further have at least one guide for precisely locating the reflector strip in relation to the printed circuit board. Furthermore, the reflector strip may have at least one spring and/or an elastic element for pressing the reflector strip to the printed circuit board.

[0011] Preferably, the reflector strip is placed on a printed circuit board, the printed circuit board holding at least one LED, preferably a plurality of LEDs in predetermined distances. Most preferably these predetermined distances are constant.

[0012] In a further embodiment, a frame may be pro-

vided for fastening the reflector strip to the printed circuit board. The frame may furthermore act as at least one of a mechanical support, a heat sink, an insulator. Preferably, the frame is a profile, which may be manufactured by strand casting, pultrusion or extrusion. The frame is preferably made of metal or ceramics, most preferably of aluminum.

[0013] In a preferred embodiment, the reflector strip has a first reflector and a second reflector, being located at opposing sides of a LED. In another embodiment, the reflector strip has four reflectors being located at or four sides of a rectangular LED. There may be any other number or any other shape of the reflectors.

[0014] Although it is preferred, that the reflectors reflect light from the LED into a different direction than it was emitted from the LED, the reflectors may also and/or alternatively shade light from the LED, thus preventing light radiating into unwanted directions.

[0015] In a further embodiment, the reflector strip may be mounted at the opposite side of the LEDs of the printed circuit board. In this case, the printed circuit board may have at least one opening or slot, through which the individual reflectors can penetrate the printed circuit board.

[0016] Mounting the strip to the printed circuit board is a very simple procedure. The first step the reflector strip is positioned on the printed circuit board. Alignment may be simplified by inserting at least one bent guide of the strip into at least one hole of the printed circuit board. In the next step, the strip and the printed circuit board are inserted into the frame by pushing them into a slot opening at one end of the frame. The frame may further support alignment of the strip and the printed circuit board. By means of a flat spring, the printed circuit board and the strip are held in a predetermined position relative to the frame.

[0017] This arrangement results in a defined pressure of the printed circuit board (PCB) to the frame without any additional elements (e.g. screws, glue...). Due to the permanent elastic deformation of the flat spring, the thermal resistance between the PCB and the frame will not change over lifetime.

[0018] A further advantage of the embodiment is that the light distribution can easily be adapted to individual needs by simply changing the angle between a reflector and the reflector strip. This can even be done manually in a fine adjusting procedure after assembly. It is not necessary to manufacture a different strip for each modified reflector setting.

Description of Drawings

[0019] In the following, the invention will be described by way of example, without limitation of the general inventive concept, on examples of embodiment with reference to the drawings.

Figure 1 shows a preferred embodiment of the invention.

Figure 2 shows the preferred embodiment in a side view.

Figure 3 shows the preferred embodiment assembled into a frame.

Figure 4 shows alignment details.

Figure 5 shows a second embodiment of the invention.

Figure 6 shows a second embodiment assembled into a frame.

Figure 7 shows the second embodiment assembled into a frame.

[0020] In figure 1, a preferred embodiment according to the invention is shown. At least one LED 20 is mounted to a printed circuit board 10. Furthermore, a reflector strip 30 is located on the printed circuit board. This reflector strip has at least one blanking or opening 38 for a LED. It further has at least one reflector 34. Preferably, there is at least a second reflector 35, preferably at the opposite side of the LED in relation to the first reflector 34. Preferably, the reflectors 34, 35 are punched out and bent upwards from the reflector strip. This may result in at least one additional blanking 39. There may be further electronic components like LED drivers placed on the printed circuit board within the at least one additional blanking 39. For aligning the reflector strip to the printed circuit board there may be at least one guide 31. Preferably the at least one guide 31 is punched out of the reflector strip. Furthermore, it is preferred, if there is at least one flat spring 32, which preferably is also punched out of the reflector strip. The length of the reflector strip is preferably adapted to the number of LEDs on the printed circuit board. It may have a length from 10 mm up to 1 meter or more. The reflector strip may alternatively have a length adapted to one LED. It may comprise only one blanking or opening 38 for a LED and the reflectors required for the LED, e.g. two or four reflectors.

[0021] Figure 2 shows the preferred embodiment in a side view. Here the first reflector 34 and the second reflector 35 are shown from their sides in an angle and bent upwards from the surface of reflector strip 30, which is located on the printed circuit board 10.

[0022] In figure 3, a fully assembled embodiment is shown. Reflector strip 30 on top of the printed circuit board 10 is assembled with a frame 40. The frame has at least one overhang 41 to hold the reflector strip 30 down to the printed circuit board 10. It preferably interacts with the at least one flat spring 32 to assert a predetermined force to the reflector strip. Frame 40 may be designed to act as a mechanical support structure and/or a heat sink and/or electrical insulator for the assembly. It is preferred if the reflector strip has approximately the same width as the printed circuit board.

[0023] Figure 4 shows in detail the alignment of reflector strip 30 with printed circuit board 10. A bent guide tip 33 of reflector strip 30 is inserted into a hole 11 of the printed circuit board 10 thereby allowing precise positioning of the reflector strip 30 in relationship to printed circuit board 10. In a further embodiment the bent guide tip 33 with the extent through printed circuit board 10 to its side opposing the reflector strip. It may further be bent to a U- shape to fix the reflector strip to the printed circuit board.

[0024] Figure 5 shows another embodiment, where four reflectors enclose LED 20. A first reflector 34, second reflector 35, third reflector 36 and fourth reflector 37 enclose the LED at four sides.

[0025] Figure 6 shows the previous embodiment in a side view. Here the first reflector 34 and the second reflector 35 are shown from their sides in an angle and bent upwards from the surface of reflector strip 30, which is located on the printed circuit board 10. Furthermore, reflector 37 is shown from its rear side.

[0026] In figure 7, the embodiment with four reflectors is shown in a state assembled together with a frame 40. Here reflectors 36 and 37 are shown from their sides.

[0027] List of reference numerals

10	printed circuit board
11	hole
20	LED
30	reflector strip
31	guide
32	flat spring
33	bent guide tip
34	first reflector
35	second reflector
36	third reflector
37	forth reflector
38	blanking for LED
39	blanking from reflectors
40	frame
41	overhang

Claims

1. LED-based lighting component comprising at least:

- at least one LED (20) mounted to a printed circuit board (10)
- a reflector strip (30) located on the printed circuit board, the reflector strip comprising a metal sheet defining a main plane, and having at least one reflector (34, 35, 36, 37) being inclined against the main plane to deflect light and/or to shade light from the at least one LED.

2. LED-based lighting component according to claim 1, **characterized in, that**

the reflector strip (30) has a first reflector (34) and a second reflector (35) located at opposing sides of the at least one LED (20).

3. LED-based lighting component according to claim 1, **characterized in, that**

the reflector strip (30) has four reflectors (34, 35, 36, 37) located at four sides of the at least one LED (20).

4. LED-based lighting component according to any one of the preceding claims, **characterized in, that**

the reflector strip (30) has at least one guide (33) which is inserted into a hole (11) of the printed circuit board (10) and thereby defines the position of the reflector strip (30) relative to the printed circuit board (10).

5. LED-based lighting component according to any one of the preceding claims, **characterized in, that**

the component comprises a frame (40) for holding the reflector strip (30) to the printed circuit board (10).

6. LED-based lighting component according to claim 5, **characterized in, that**

the reflector strip (30) has at least one spring (32) to interact with the frame (40) to hold the reflector strip (30) down to the printed circuit board (10).

7. Method for manufacturing a LED-based lighting component according to claim 1, comprising the steps of:

- a) positioning and aligning a reflector strip (30) on a printed circuit board (10), and
- b) inserting the reflector strip (30) together with the printed circuit board (10) into a frame (40).

**Amended claims in accordance with Rule 137(2)
EPC.**

1. LED-based lighting component comprising at least: 5

- at least one LED (20) mounted to a printed circuit board (10)
- a reflector strip (30) located on the printed circuit board, the reflector strip comprising a metal sheet defining a main plane, and having at least one reflector (34, 35, 36, 37) being inclined against the main plane to deflect light and/or to shade light from the at least one LED, 10

characterized in, that

the component comprises a frame (40) for holding the reflector strip (30) to the printed circuit board (10). 15

2. LED-based lighting component according to claim 1, 20

characterized in, that

the reflector strip (30) has a first reflector (34) and a second reflector (35) located at opposing sides of the at least one LED (20). 25

3. LED-based lighting component according to claim 1, 30

characterized in, that

the reflector strip (30) has four reflectors (34, 35, 36, 37) located at four sides of the at least one LED (20). 35

4. LED-based lighting component according to any one of the preceding claims, 40

characterized in, that

the reflector strip (30) has at least one guide (33) which is inserted into a hole (11) of the printed circuit board (10) and thereby defines the position of the reflector strip (30) relative to the printed circuit board (10). 45

5. LED-based lighting component according to claim 1, 50

characterized in, that

the reflector strip (30) has at least one spring (32) to interact with the frame (40) to hold the reflector strip (30) down to the printed circuit board (10). 55

6. Method for manufacturing a LED-based lighting component according to claim 1, comprising the steps of: 60

- a) positioning and aligning a reflector strip (30) on a printed circuit board (10), and
- b) inserting the reflector strip (30) together with the printed circuit board (10) into a frame (40), the frame (40) holding the reflector strip (30) to the printed circuit board (10). 65

Fig. 1

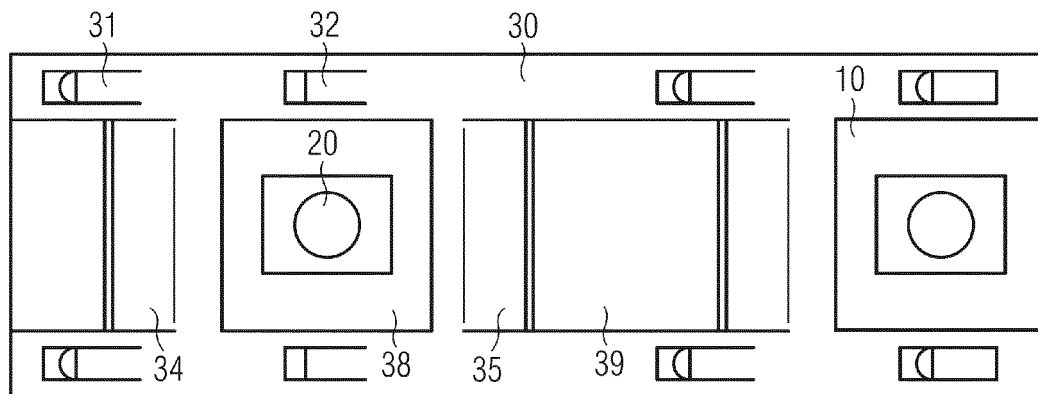


Fig. 2

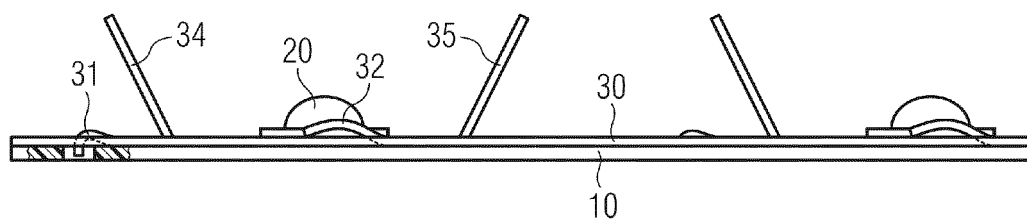


Fig. 3

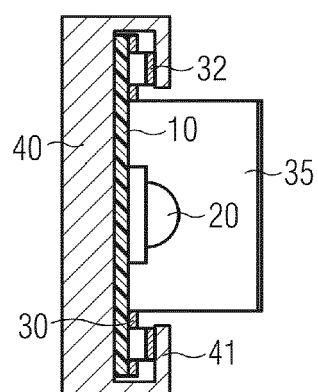


Fig. 4

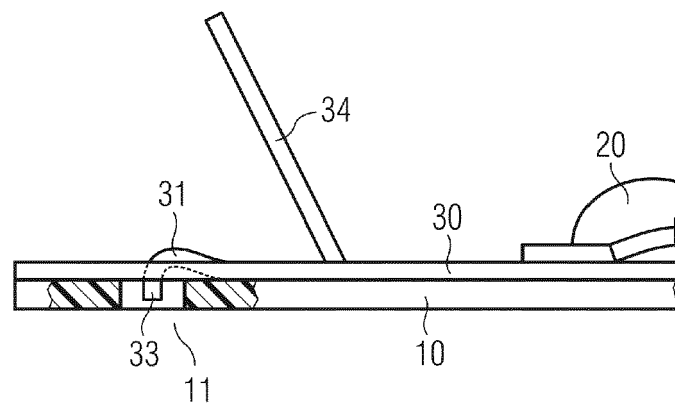


Fig. 5

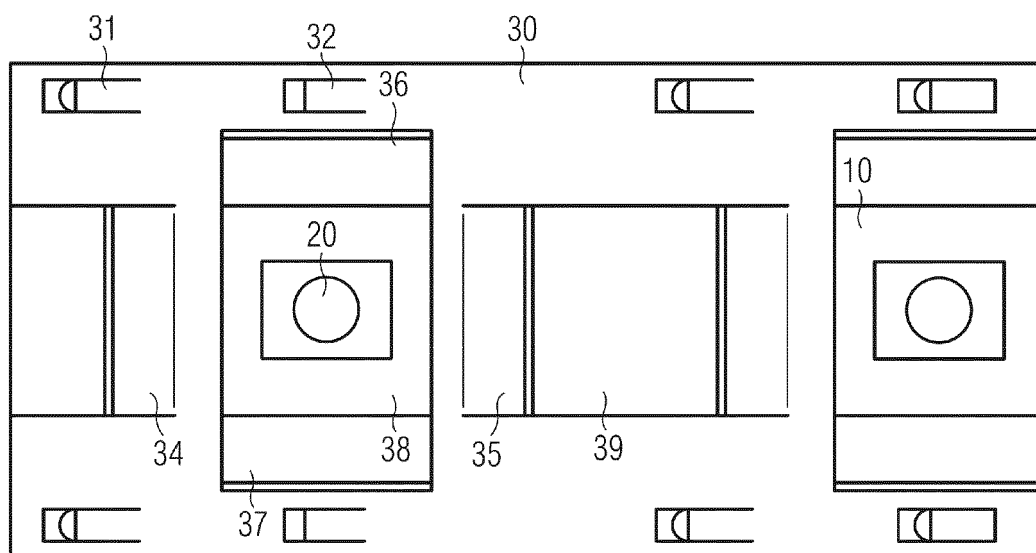


Fig. 6

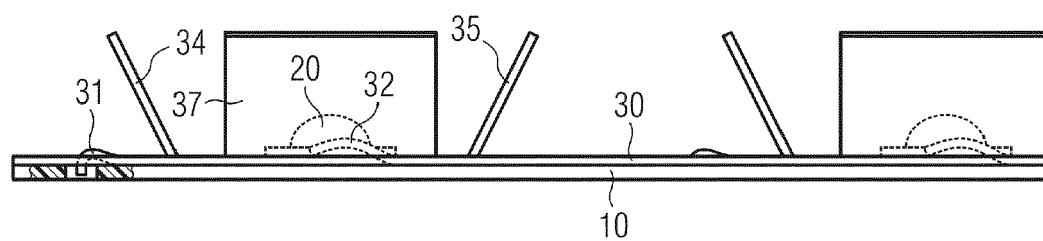
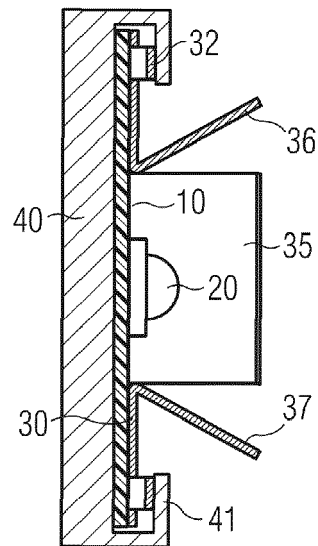


Fig. 7





EUROPEAN SEARCH REPORT

Application Number
EP 11 18 7042

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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