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- (71) Applicant: **OSRAM OPTO SEMICONDUCTORS GMBH** [DE/DE]; Leibnizstr. 4, 93055 Regensburg (DE).
- (72) Inventor: **MAEKAWA, Keisuke**; Aizawa 7-33-4, Seya-ku Yokohama, Kanagawa 246-0013 (JP).
- (74) Agent: **PATENT ATTORNEY'S OFFICE WILHELM & BECK**; Prinzenstr. 13, 80639 Munich (DE).
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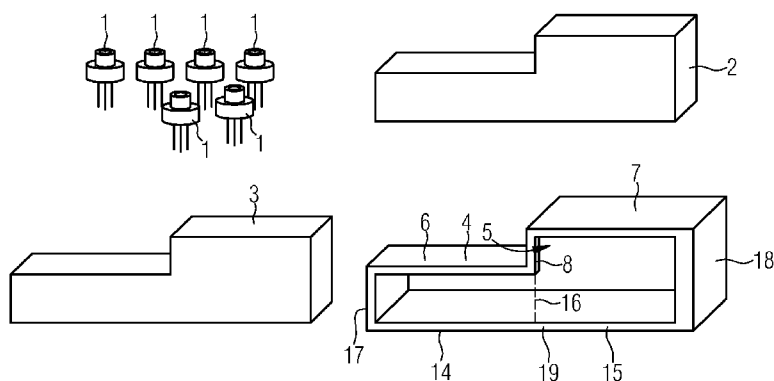
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(54) Title: APPARATUS FOR PROVIDING A LIGHT BEAM

FIG 1



(57) Abstract: The apparatus provides a light beam, with a light source emitting a light, with a first layer and with a second layer, wherein the first layer comprises scattering material, wherein the scattering material scatters the light, wherein the second layer comprises conversion material, wherein the conversion material converts a wavelength of the light to another wavelength, wherein the first layer and the second layer are arranged in that way that the light goes successively through the two layers, wherein after the two layers a light beam leaves the apparatus via an emitting face, wherein a rim body is arranged that defines at least a part of a rim of the emitting face defining a sharp beam cutting line.



Description

Apparatus for providing a light beam

5 The invention refers to an apparatus for providing a light beam according to claim 1.

It is known in the state of the art to use an apparatus for providing a light beam, wherein the light beam is generated
10 by a light emitting diode or a laser diode.

An object of the proposed invention is to provide an apparatus with an improved light beam.

15 The object of the invention is achieved by the apparatus according to claim 1.

Further embodiments of the apparatus are disclosed in the dependent claims.
20

An advantage of the apparatus is to define a sharp beam cutting line for the light beam. This advantage is generated by a rim body that defines a part of a rim of the emitting face of the apparatus. Therefore the light beam that is
25 emitted via the emitting face of the apparatus defines a sharp beam cutting line. This is of advantage for an application that should provide at least partly a sharp beam cutting line. This can be advantageous for a head lamp of a motor car or a motor bike. Because of the sharp beam cutting
30 line the light beam illuminates a precise defined area.

An embodiment of the apparatus comprises a rim body that defines a circumferential rim around the emitting face. This apparatus provides a light beam with a circumferential sharp
35 beam cutting line. This means that the light beam illuminates a precise defined area.

In a further embodiment, the apparatus uses a light emitting diode or a laser diode as a light source. The light emitting diode and the laser diode have the advantage to provide a high light flux and to generate less heat.

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A further embodiment of the apparatus comprises a rim body made of metal. The use of metal as material for the rim body has the advantage that the rim body can be formed with a sharp edge.

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In a further embodiment of the apparatus a second light source is arranged. This provides the advantage that a higher light flux can be provided.

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A further embodiment of the apparatus comprises an emitting face that has at least at one side a stepped rim body that defines a stepped beam cutting line of the emitting face. This embodiment provides the advantage that a precise shape of the illuminated area can be attained by a correspondingly shaped emitting face using the rim body.

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In a further embodiment, the first layer and the second layer are in contact at a contact face. Furthermore, the first and the second layer can be circumvented by the rim body. This embodiment provides a compact apparatus that is robust against damage.

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In a further embodiment, the first layer is made of glass. Glass can easily be processed and provides a sufficient scattering function.

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In a further embodiment, the light source is connected to a heat sink, wherein the heat sink is in particular a printed circuit board. The connection between the light source and the heat sink has the advantage that generated heat can be easily passed to the heat sink without warming up the apparatus too much. Lower temperature in the apparatus preserves the light source.

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In a further embodiment, the rim body is fixed to the first and/or the second layer by a glue, for example a silicone-type glue. The use of a glue for fixing means between the rim
5 body and the first and the second layer provides a simple and cheap production of the apparatus.

The apparatus can for example be used as a head lamp of a motor car, a motor bike, a train or a bike. These
10 applications can use the precise shape of the illuminated area of the light beam.

Fig. 1 shows main parts of an apparatus for providing a light beam. There are some light sources 1 which may be embodied as
15 light emitting diodes and/or laser diodes. Furthermore, there is a first layer 2 that is a homogeneity block. The first layer 2 may for example be embodied as a glass layer. Furthermore, the first layer 2 may be embodied as a silicone layer comprising scattering material. Scattering material may
20 for example be particles of titanium dioxide (TiO_2). The function of the first layer 2 is to spread a light beam and to homogenize the light beam. Furthermore, there is a second layer 3 comprising conversion material. The second layer 3 is disposed to convert a wavelength of a light to another
25 wavelength. Usually the conversion material is embodied to convert a wavelength of light to a longer wavelength of light. For example the second layer 3 may comprise ceramics and a conversion material for example phosphor. For example phosphors based on the $(\text{Gd}, \text{Y})_3(\text{Al}, \text{Ga})_5\text{O}_{12}:\text{Ce}$ system, such as
30 the $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}$ (YAG) may be used. Furthermore EU doped Silicate or TAG CE ($\text{Tb}_3\text{Al}_5\text{O}_{12}:\text{Ce}$).

Additionally Fig. 1 shows a rim body 4 that is disposed for confining a light emitting face 5 of an apparatus for
35 providing a light beam. The light emitting face 5 is confined by the circular rim body 4. As shown in Fig. 1, the rim body 4 may be embodied as a circular frame comprising an upper section, a lower section and two side sections.

Depending on the used embodiment, the rim body 4 may have different shapes. For example the rim body 4 may be embodied as a staged section as shown in Fig. 2. In this embodiment,
5 the rim body 4 confines only an upper rim of the light emitting face 5. The other rims of the light emitting face 5 may be confined by other material as indicated by a dashed line is shown in Fig. 2.

10 Furthermore, depending on the used embodiment, the rim body 4 may also be embodied as a straight stripe. Additionally the rim body 4 may confine two sides of the emitting face 5 of the apparatus or three sides or four sides of the emitting face of the apparatus as shown in Fig. 1. A main function of
15 the rim body is to define a sharp beam cutting line of the emitting face 5. Therefore a precise confinement of the light emitting face 5 is attained. The sharp beam cutting line generates a sharp beam area at least at a section of the rim area. As a result, it is possible to confine precisely an
20 illuminated area for example of a street that is illuminated by the apparatus that provides the light beam, for example the apparatus may be embodied as a head lamp of a motor car or of a motor bike.

25 Depending on the used embodiment, the rim body is made of metal or made of ceramic or other material. In further embodiments, also other material may be used to fabricate the rim body 4. As shown in Fig. 2, the rim body 4 defines at least a part of a rim section of the emitting face. In the
30 shown embodiment, the rim body 4 defines an upper rim section of the emitting face 5. Furthermore, the depicted embodiment of fig. 1 or fig. 2 shows a rim section that comprises a left rim section 6 and a right rim section 7. The left and the right rim section 6, 7 are connected by a middle section 8.
35 In the shown embodiment, the left rim section 6 and the right rim section 7 are arranged in parallel. The middle rim section 8 is arranged perpendicular to the right and left rim section 7, 6.

Fig. 3 depicts a schematics top view of the apparatus 9. The apparatus 9 comprises the light emitting face 5 that is encased by the rim body 4. The second layer 3 is arranged adjacent to the light emitting face 5. At an inner face of the second layer 3 the first layer 2 is arranged. In the shown embodiment, the first layer 2 abuts to the second layer 3 at a contact face 10. The contact face 10 is arranged in parallel to the light emitting face 5 that is defined by an outer face of the second layer 3. Also the first layer 2 is encased by the rim body 4. Additionally a free space 11 is arranged within the rim body 4 at a backside 12 of the first layer 2. Several light sources 1 are arranged in the free space 11. The light sources 1 may be fixed on a heat sink 13. The heat sink 13 may be embodied as a printed circuit board.

The light emitting face 5 comprises in the shown embodiment a first part 14 and a second part 15. The first part 14 has a smaller height than the second part 15 as can be seen in fig. 1. A line 16 that separates the first part 14 from the second part 15 is arranged in parallel to the middle rim section 8 that can be seen in fig.1. Depending on the used embodiment, the rim body 4 may be fixed to the first and/or the second layer for example by a glue 20 i.e. a silicone-type glue.

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Fig. 4 depicts a side view of the apparatus 9. There are light sources 1 which are arranged on different heights.

Depending on the used embodiment, the first layer 2 may also be arranged adjacent to the light emitting face 5 and the second layer 3 may be arranged between the first layer 2 and the light sources 1. The apparatus 9 may be a head lamp of a motor car, a motor bike, a train or a bike.

Furthermore, depending on the used embodiment, there may be optics i.e. lenses or not that can be additionally used to concentrate the light beam. The light beam that is emitted by the light sources beams through the free space 11, the first

layer 2 and the second layer 3. The light emitting beam area is formed by the rim body 4. Because of the sharp beam cutting line that is generated by the rim body 4 there may be no further need for complex optical design to produce a
5 desired illuminated area for example on a street.

Reference numerals

	1	light source
	2	first layer
5	3	second layer
	4	rim body
	5	emitting face
	6	left rim section
	7	right rim section
10	8	middle rim section
	9	apparatus
	10	contact face
	11	free space
	12	backside
15	13	heat sink
	14	first part
	15	second part
	16	line
	17	first side
20	18	second side
	19	bottom side
	20	glue

25

Patent claims

1. Apparatus (9) for providing a light beam, with a light
source (1) emitting a light, with a first layer (2) and
5 with a second layer (3), wherein the first layer (2)
comprises scattering material, wherein the scattering
material scatters light, wherein the second layer (3)
comprises conversion material, wherein the conversion
material converts a wavelength of light to another
10 wavelength, wherein the first layer (2) and the second
layer (3) are arranged in that way in the apparatus (9)
that the light goes successively through the two layers
(2, 3), wherein after the two layers (2, 3) a light beam
leaves the apparatus via an emitting face (5), wherein a
15 rim body (4) is arranged that defines at least a part of
a rim of the emitting face (5) defining a sharp beam
cutting line.
2. Apparatus of claim 1, wherein the rim body (4) defines a
20 circumferential rim of the emitting face (5).
3. Apparatus of one of the preceding claims, wherein the
light source is a light emitting diode or a laser diode.
- 25 4. Apparatus of any one of the preceding claims, wherein
the rim body is made of metal.
5. Apparatus of any one of the preceding claims, wherein a
second light source (1) is arranged beside the light
30 source (1).
6. Apparatus of any one of the preceding claims, wherein
the rim body (4) defines an upper rim section of the
emitting face (5), and wherein the upper rim section
35 comprises a left and a right rim section (6, 7), wherein
the left and the right rim sections (6, 7) are arranged
in parallel and at different heights, wherein the left
and the right rim sections (6, 7) are connected by a

middle rim section (8), wherein the middle rim section (8) is in particular arranged vertical to the left and right rim section (6, 7).

- 5 7. Apparatus of any one of the preceding claims, wherein the first and the second layer (2, 3) are in contact at a contact face (10), wherein the first and second layer are circumvented by the rim body (4).
- 10 8. Apparatus of any one of the preceding claims, wherein the first layer (2) is made of glass.
9. Apparatus of any one of the preceding claims, wherein the second layer (3) is made of ceramic with phosphor.
- 15 10. Apparatus of any one of the preceding claims, wherein the at least one light source (1) is connected to a heat sink, wherein the heat sink is in particular a printed circuit board.
- 20 11. Apparatus of any one of the preceding claims, wherein between the light source (1) and the first layer (2) a free space layer (11) is arranged.
- 25 12. Apparatus of claim 11, wherein the free space (11), the first layer (2) and the second layer (3) are circumvented by the rim body (4).
- 30 13. Apparatus of any one of the preceding claims, wherein the rim body (4) is fixed to the first and/or the second layer by a glue (20), for example a silicone type glue.
- 35 14. Apparatus of any one of the preceding claims, wherein the apparatus (9) is a head lamp of a motor-car, a motor-bike, a train or a bike.

FIG 1

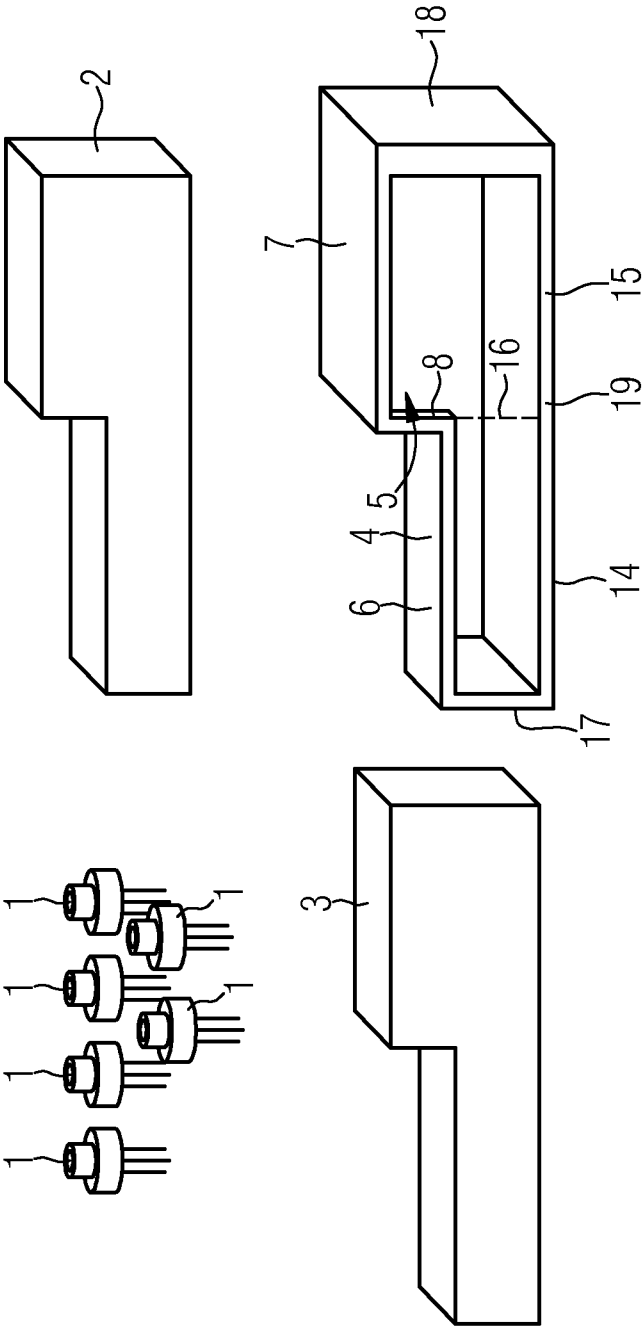
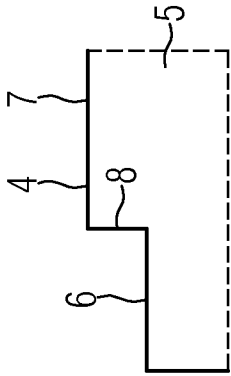


FIG 2



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. F21S8/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F21S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 2005/057917 A1 (YATSUDA YASUSHI [JP] ET AL) 17 March 2005 (2005-03-17) the whole document	1-4,7, 9-11,13, 14
A	US 2014/301098 A1 (LAI CHIH-CHEN [TW]) 9 October 2014 (2014-10-09) the whole document	1-14
A	DE 10 2013 107227 A1 (OSRAM OPTO SEMICONDUCTORS GMBH [DE]) 15 January 2015 (2015-01-15) abstract; figures	1-14
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Further documents are listed in the continuation of Box C.



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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Berthommé, Emmanuel

INTERNATIONAL SEARCH REPORT

International application No
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Information on patent family members

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