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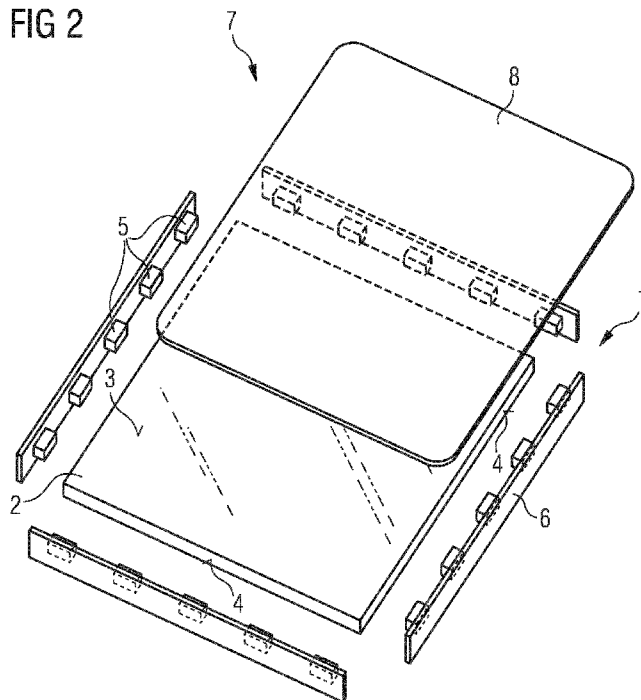
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(54) Title: LIGHTING DEVICE FOR A SUN ROOF OF A VEHICLE AND SUN ROOF FOR A VEHICLE

FIG 2



(57) Abstract: A lighting device (1) for a sun roof (7) of a vehicle is provided. The lighting device comprises a light guide (2) with at least one light input surface (4), and a plurality of light emitting diodes (5) arranged such that the light of the light emitting diodes (5) is coupled in the light guide (2) via the light input surface (4). Furthermore, a sun roof (7) with such a lighting device (1) is provided.

Description

LIGHTING DEVICE FOR A SUN ROOF OF A VEHICLE AND SUN ROOF FOR
A VEHICLE

5

A lighting device for a sun roof of a vehicle and a sun roof
for a vehicle are provided.

One object of the present invention is to provide a lighting
10 device for a sun roof of a vehicle, such that the sun roof
can be used for lighting purposes. According to a further
aspect of the present invention a sun roof with such a
lighting device should be provided.

15 A lighting device for a sun roof is given by present claim 1.
A sun roof for a vehicle is further given by present claim 7.

Advantageous embodiments and developments of the lighting
device and the sun roof are subject of the dependent claims.

20

A lighting device for a sun roof of a vehicle comprises in
particular:

- a light guide with at least one light input surface, and
 - a plurality of light emitting diodes arranged such that
- 25 the light of the light emitting diodes is coupled in the
light guide via the light input surface.

The light guide is preferably intended to form a window of
the sun roof, in order to transmit light from the exterior of
30 the vehicle into the interior. Since the lighting device is
further equipped with a plurality of light emitting diodes,
the lighting device preferably has the function of an
illumination device for the interior of the vehicle.

Preferably, a main surface of the light guide forms a light throughput surface of the lighting device.

5 According to an embodiment of the lighting device, the light input surface is represented by a side face of the light guide. Preferably, the side faces of the light guide are arranged substantially perpendicular to the light throughput surface.

10

According to an embodiment of the lighting device, the light throughput surface of the light guide has a rectangular shape and two side faces of the light guide are intended as light input surfaces. Each light input surface is provided with a plurality of light emitting diodes arranged such that their light is coupled in the light guide via the light input surface. The light is then distributed within the light guide and irradiated from the light throughput surface of the light guide in a preferably nearly homogeneous manner.

20

According to a further embodiment of the lighting device, the plurality of light emitting diodes is mounted on a printed circuit board. If more than one light input surface is provided by the light guide, each plurality of light emitting diodes corresponding to one light input surface is preferably mounted on a separate printed circuit board.

25

Preferably, the light emitting diodes emit white light during operation.

30

According to an embodiment of the lighting device, the light emitting diodes are arranged in an equally spaced manner. For example, it is possible that each plurality of light emitting

diodes corresponding to one light input surface of the light guide is arranged for example on a printed circuit board in an equally spaced manner.

- 5 According to a further embodiment of the lighting device, the light guide is a plastic board permeable for visible light. Further, the light guide can be formed of a glass. Preferably, the light guide is transparent for visible light.
- 10 The lighting device is particularly suited for a sun roof for a vehicle.

According to an embodiment of the sun roof, it comprises a movable cover. Preferably, the movable cover is arranged such
15 that in a closed state of the cover the light throughput surface of the lighting device is covered, while in an open state of the cover, the light throughput surface is at least partially free of the cover. In the open state of the cover, light from the exterior can get into the interior of the
20 vehicle through the light guide of the lighting device.

The cover, for example, can be slid in a lateral direction with respect to the light throughput surface in order to open the cover.
25

According to a further embodiment of the sun roof, the lighting device or a part of the lighting device, such as the light guide is movable such that in an open state of the sun roof, the interior of the vehicle is open to the exterior.
30

The lighting device or the movable part of the lighting device, such as the light guide, can be intended to be slid in a lateral direction or can be intended to be lifted in a

vertical direction in order to open the sun roof. Further, the lighting device or the movable part of the lighting device might be tilted with respect to the roof of the vehicle in order to open the sun roof.

5

According to a further embodiment of the sun roof, the light emitting diodes of the lighting device can be turned on, for example by the help of a separate switch, such that the inside of the vehicle is illuminated.

10

According to a further embodiment of the sun roof, the light emitting diodes are intended to be electrically connected to the battery of the car, for example by the help of squeezable contacts.

15

Further preferred embodiments and developments of the invention are described in the following in connection with the Figures.

20 Figure 1 shows a schematic perspective view of a lighting device according to an embodiment.

Figure 2 shows a schematic perspective view of a sun roof according to an embodiment.

25

Figure 3 shows a schematic top view on a vehicle with a sun roof according to an embodiment.

30 Equal or similar elements as well as elements of equal function are designated with the same reference signs in the figures. The figures and the proportions of the elements shown in the figures are not regarded as being shown to scale. Rather, single elements, in particular layers, can be

shown exaggerated in magnitude for the sake of better representation.

The lighting device 1 according to the embodiment of Figure 1
5 comprises a light guide 2 with a main surface 3. The main surface 3 of the light guide 2 forms the light throughput surface of the lighting device 1. The main surface 3 of the light guide has a rectangular shape. The light guide 2 has further four side faces 4, wherein each side face 4 is
10 intended to be a light input surface.

According to the embodiment of Figure 1, the light guide 2 is formed by a plastic board, which is transparent for visible light.

15

Parallel to each light input surface 4 a plurality of light emitting diodes 5 is arranged. Each plurality of light emitting diodes 5 corresponding to a light input surface 4 is mounted on a separate printed circuit board 6. Preferably,
20 the light emitting diodes 5 are mounted in an equally spaced manner on the printed circuit board 6.

In Figure 1, the light emitting diodes 5 are depicted in a certain distance to the light input surface 4 in order to
25 ensure a better understanding of the figure. However, in reality, the light emitting diodes 5 are preferably as near as possible mounted to the light input surfaces 4, in order to avoid loss of light.

30 Preferably, the light emitting diodes 5 emit white light during operation.

The sun roof 7 according to the embodiment of Figure 2 comprises a lighting device 1 as for example already explained in further detail in connection with Figure 1.

5 The sun roof comprises a cover 8, which is moveable in order to provide an open state and a closed state of the cover 8. According to the embodiment of Figure 2, the cover 8 can be slid in a direction parallel to the main surface 3 of the light guide.

10

In a closed state of the cover 8, the cover 8 blankets in particular the light throughput surface 3 of the light guide 2. In an open state of the sun roof 7, the cover 8 is arranged such that light from the exterior can shine through
15 the light guide 2.

Furthermore, at least a part of the lighting device 1, preferably the light guide 2, is movable in order to provide an open state of the sun roof 7.

20

For example, the light guide 2 can be slanted in a laterally direction with respect to its light throughput surface 3 or lifted in a vertical direction with respect to its light throughput surface 3 or tilted in an angle with respect to
25 its light throughput surface 3. Preferably, the cover 8 is in an open state, if the light guide 2 is moved.

Figure 3 shows exemplarily a sun roof 7 as for example described in connection with Figure 2 in further detail, the
30 sun roof being positioned in the roof of a passenger car.

The light emitting diodes 5 of the sun roof 7 are for example electrically connected to the battery of the car.

Furthermore, preferably a switch (not shown) is provided in order to turn the light emitting diodes 5 on.

This application claims priority of the Chinese application
5 CN 201110036044.6. The content of this application is herein incorporated by references in its entirety.

The invention is not limited to the description of the
embodiments. Rather, the invention comprises each new feature
10 as well as each combination of features, particularly each combination of features of the claims, even if the feature or the combination of features itself is not explicitly given in the claims or embodiments.

Claims:

1. Lighting device (1) for a sun roof (7) of a vehicle comprising:

- 5 - a light guide (2) with at least one light input surface (4), and
- a plurality of light emitting diodes (5) arranged such that the light of the light emitting diodes (5) is coupled in the light guide (2) via the light input surface (4).

10

2. The lighting device (1) of claim 1, wherein

- a main surface (3) of the light guide (2) is a light throughput surface of lighting device (1),
- at least one side face (4) of the light guide (2) is the
15 light input surface.

3. The lighting device (1) of claim 2, wherein the light throughput surface (3) has a rectangular shape and two side faces (4) of the light guide (2) are intended as light input
20 surfaces, wherein each light input surface (2) is provided with a plurality of light emitting diodes (5) arranged such that their light is coupled in the light guide (2) via the light input surface (4).

25 4. The lighting device (1) of one of claims 1 to 3, wherein the plurality of light emitting diodes (5) is mounted on a printed circuit board (6).

5. The lighting device (1) of one of claims 1 to 4, wherein
30 the light emitting diodes (5) emit white light during operation.

6. The lighting device (1) of one of claims 1 to 5, wherein the light emitting diodes (5) are arranged in an equally spaced manner.

5 7. The lighting device (1) of one of claims 1 to 6, wherein the light guide (2) is a plastic board permeable for visible light.

8. Sun roof for (7) a vehicle comprising a lighting device
10 (1) of one of claim 1 to 7.

9. The sun roof (7) of claim 8, further comprises a cover (8), which can be moved in order to let light from the exterior into the vehicle through the lighting device (1).

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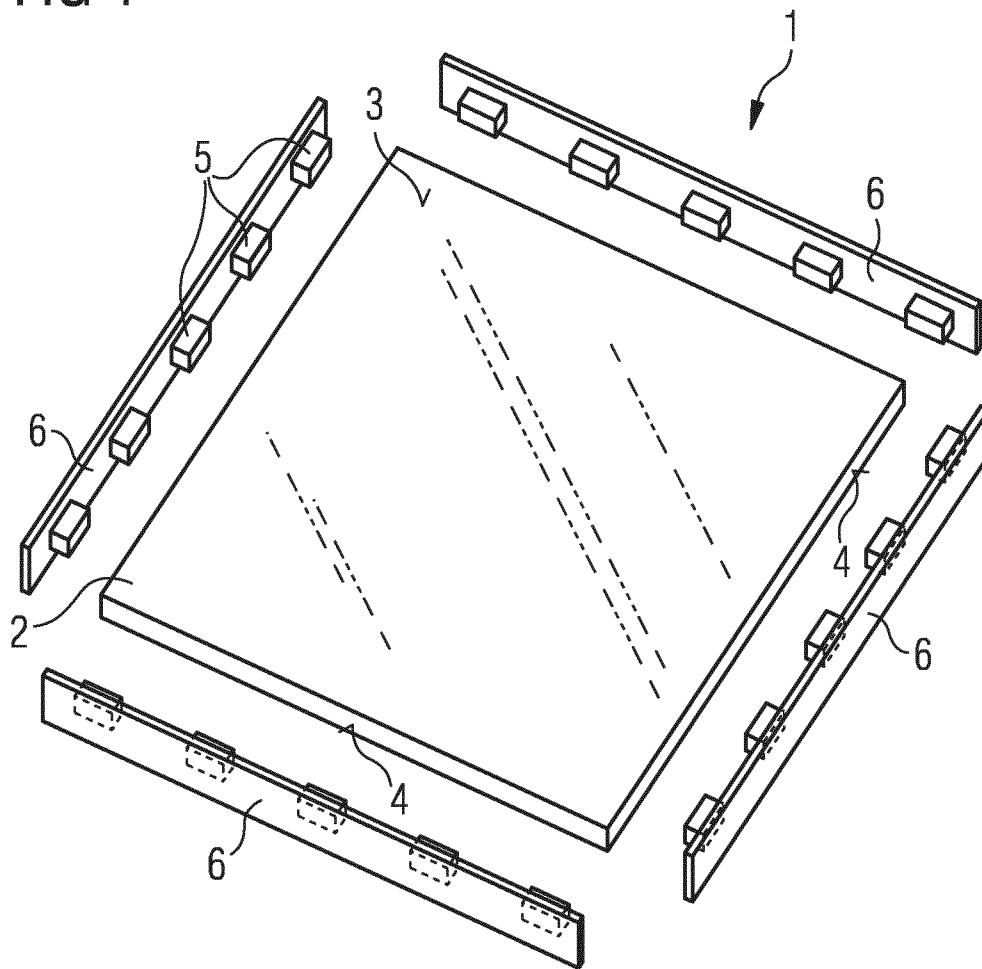
10. The sun roof (7) of one of claims 7 to 9, wherein at least a part of the lighting device (1) is movable such that the sun roof (7) is in an opened state.

20 11. The sun roof (7) of claim 10, wherein the light guide (2) is movable such that the sun roof (7) is in an opened state.

12. The sun roof (7) of one of claims 7 to 11, wherein the light emitting diodes (5) of the lighting device (1) can be
25 turned on by the help of a separate switch such that the inside of the vehicle is illuminated.

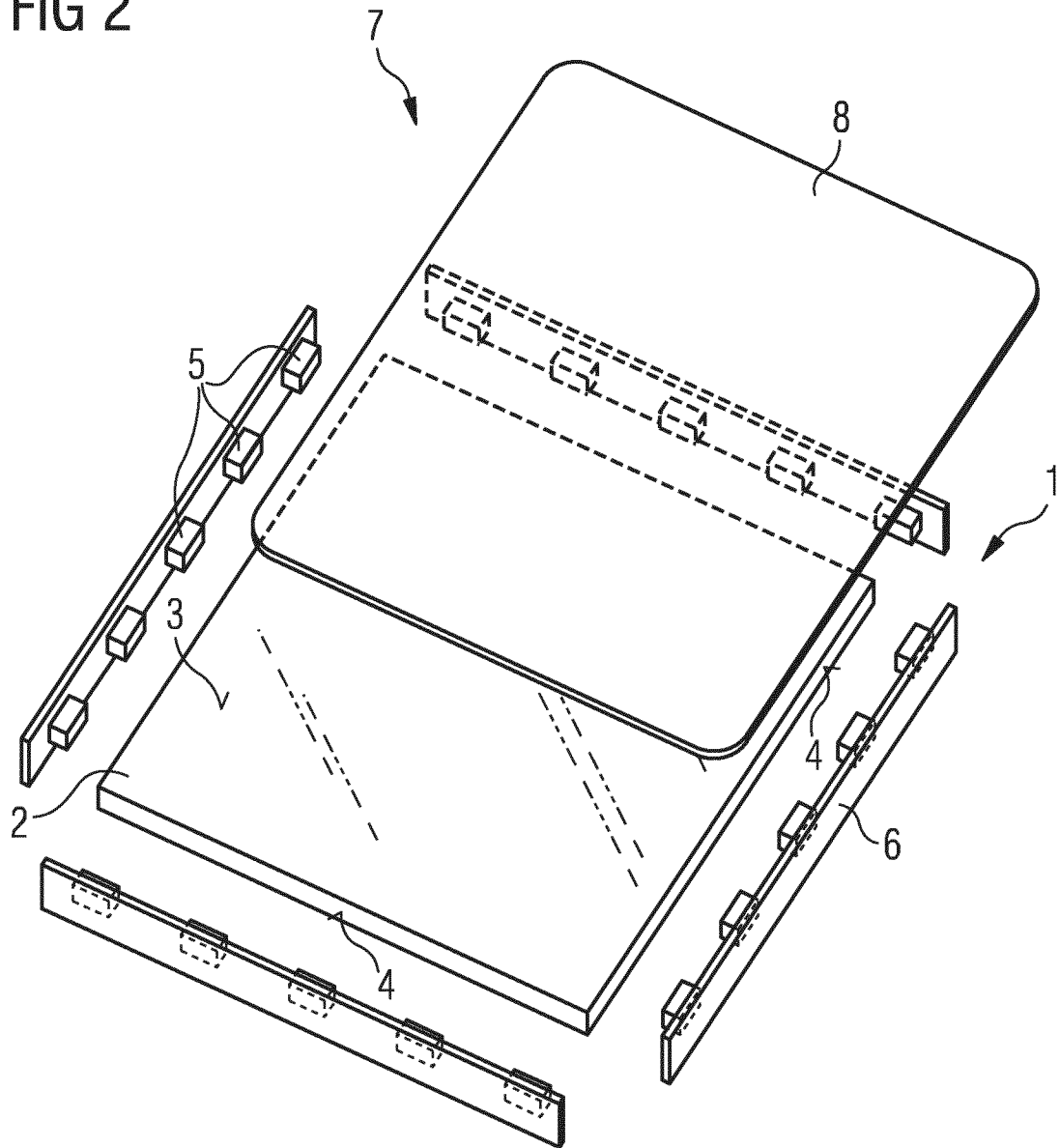
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FIG 1



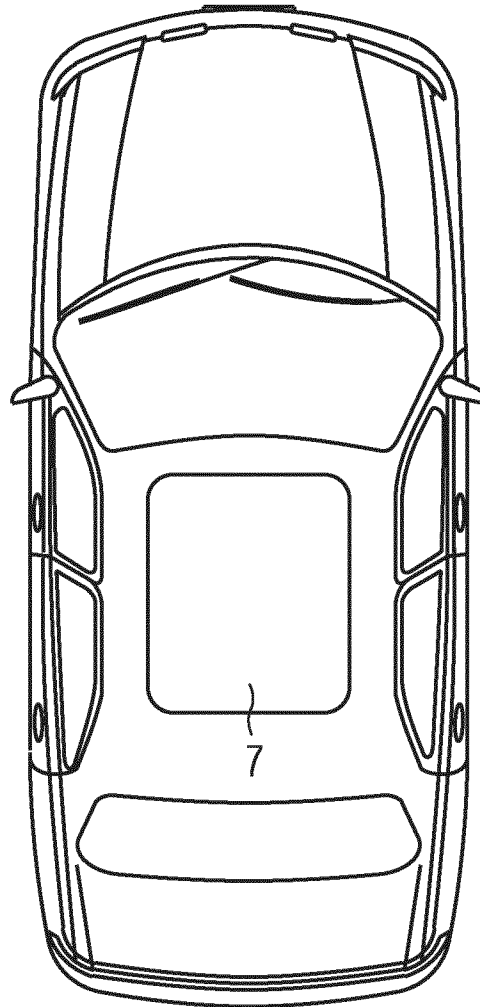
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FIG 2



3/3

FIG 3



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/072908

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60Q3/02

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)

B60Q B60J

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	paragraphs [0001], [0002], [0008] - [0010], [0028] - [0030], [0044], [0045]; figures 3-5,9-11 -----	12
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X	EP 1 903 359 A2 (ANTOLIN GRUPO ING SA [ES]) 26 March 2008 (2008-03-26) paragraphs [0001] - [0003], [0042], [0063], [0065], [0074] - [0077], [0080], [0084]; figures 1-9 ----- -/-	1,2,4, 6-8,10, 11



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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