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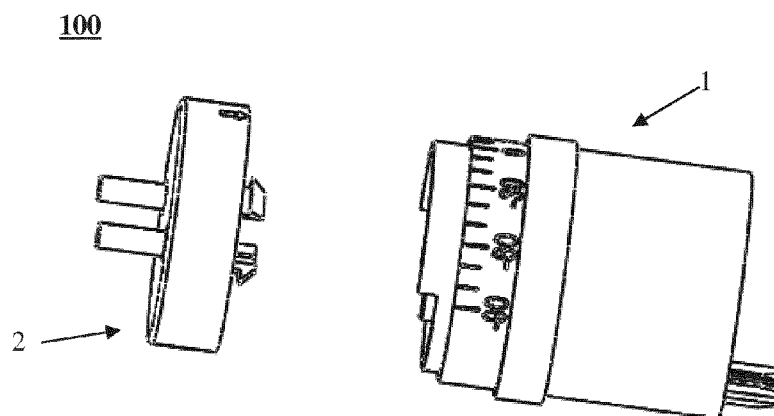
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(54) Title: ELECTRICAL CONNECTOR AND ILLUMINATION DEVICE

**Figure 1**

(57) Abstract: The present invention relates to an electrical connector for an illumination device and an illumination device comprising this electrical connector, wherein the electrical connector comprises a first part and a second part mounted on the first part, the electrical connector further comprises a first locking structure, wherein the first locking structure comprises first partial structure provided on the first part and second partial structure provided on the second part, wherein the first part and the second part are locked to each other in a first position, and the first part and the second part are separated by a predetermined distance in a second position, the locking of the first and second partial structure is released in the second position such that the first part and the second part are allowed to be rotatable relative to each other.

Description**Electrical Connector and Illumination Device****Technical Field**

5 The present invention relates to an electrical connector for an illumination device and an illumination device comprising this electrical connector.

Background Art

10 For the illumination devices commonly used at present, for example, for a tubular illumination device having light engine with a conventional light source, the light engine should be electrically connected to the power source through a connector device, and the position and illumination direction of the light engine is then determined. However, upon the known connector device being connected to the light engine, the illumination direction of the light engine cannot be adjusted, that is, the connection between the light engine and the connector device is mechanically fixed and cannot be varied, and it cannot achieve for example rotation of the light engine relative to the connector device so as to change the illumination direction of the light engine.

15 Besides, according to the currently known designs of the connector devices of other types, only when the user removes the connector device from the light engine, i.e. separates the connector device from the light engine, can he adjust the illumination direction of the light engine, and the light engine should be re-connected with the connector device after the adjustment is completed. The above designs of the connector device are quite unfavorable to the flexible utilization of the illumination device, and the user cannot flexibly and conveniently adjust the illumination direction or the illumination angle of the light engine to make the illumination of the illumination device adapted to particular application environments. Such designs of the illumination device inevitably limit the circumstances where the illumination device is applicable, and the user has to look for a lamp holder matching the light engine to ensure that the lamp light can irradiate on the correct direction, and such illumination device is not user friendly, either.

30 Summary of the Invention

In order to solve the above-mentioned technical problems, the present invention

provides a novel electrical connector for an illumination device and an illumination device comprising this electrical connector. For the illumination device using the electrical connector according to the present invention, the illumination direction and the illumination angle of the illumination device can be adjusted without removal of this electrical connector. Besides, the electrical connector according to the present invention has a simple structure, is easy to manufacture and assemble, facilitates practical operation of the user, and has good user friendliness.

The first object of the present invention is achieved via such an electrical connector which comprises a first part and a second part mounted on the first part, characterized in that the electrical connector further comprises a first locking structure, wherein the first locking structure comprises a first partial structure provided on the first part and a second partial structure provided on the second part, wherein the first part and the second part are locked to each other in a first position, and the first part and the second part are separated by a predetermined distance in a second position, the locking of the first partial structure and the second partial structure is released in the second position such that the first part and the second part are allowed to be rotatable relative to each other.

The electrical connector according to the present invention is designed to comprise two parts. In a locking state, i.e., in the first position, the two parts are locked to each other, while after the two parts are separated by a predetermined distance, one part thereof is allowed to move away from the other part preferably in the axial direction, and the two parts then enter into the second position, such that the locking of two parts is released, that is, one part thereof is rotatable relative to the other part. Besides, according to the solution of the present invention, one part of the two parts can rotate continuously relative to the other part, and after rotation by an angle, the two parts are locked again as they get close to each other again.

The electrical connector according to the present invention is further preferably designed such that the first partial structure can move out of the second partial structure when the second part moves from the first position to the second position, and the first partial structure can enter the second partial structure again when the second part moves from the second position back to the first position. This thereby provides a reusable electrical connector, the user can randomly adjust the rotation angle between the first part and the second part according to the specific use requirement and after the adjustment is completed, the first part and the second part can always be allowed to restore the locking state.

According to a preferred embodiment of the present invention, the first partial structure can be in contact with the second partial structure in the first position in a form-fitted manner. The first partial structure can have a particular shape in the manufacturing according to the process requirement, and the second partial structure further can have a structure matching with the first partial structure, such that the first partial structure, when entering into the second partial structure to be at least partially received in the second partial structure, can lock the first part and the second part of the electrical connector.

Preferably, the second partial structure is arranged circumferentially on inner surface of a side wall of the second part. By particularly providing the locking structure inside the first part and the second part, the locking structure would not be seen from the outside of the electrical connector, and a favorable appearance is thus provided. Besides, the second partial structure provided on inner surface of the side wall of the second part can interact with the first partial structure provided on the first part and facing the side wall of the second part.

Preferably, the first partial structure is configured as protrusion and the second partial structure is configured as groove, or the first partial structure is configured as groove and the second partial structure is configured as protrusion. Therefore, in the locking state, the first partial structure can enter the second partial structure and is at least partially received in the second partial structure, or the second partial structure can enter the first partial structure and at least partially received in the first partial structure.

Preferably, a plurality of grooves is uniformly arranged on the inner surface of the side wall. In the situation that the groove are uniformly arranged on the side wall inner surface, after the first part continuously rotates relative to the second part by any angle or a predetermined angle, the first part can be successfully locked again with the second part.

The electrical connector according to the present invention is further preferably designed such that the second part further comprises a second locking structure, wherein the second locking structure can define the predetermined distance by which the first part and the second part are separated. The second locking structure can prevent the first part from completely escaping from the second part during the process of its separation from the second part. In other words, the travelling distance of the first partial structure on the first part relative to the second

partial structure on the second part is defined by the distance by which the first part is separated from the second part as allowed by the second locking structure.

5 Preferably, the second part comprises a cover body, wherein the second locking structure extends from a plane of the cover body and is connected with the first part after the second part is mounted on the first part. The second locking structure thus can be manufactured to be integral with the cover body of the second part, which facilitates the assembling of the electrical connector and the subsequent operation.

10 Further preferably, the second locking structure is coaxially arranged with the first part and the second part. Both the first part and the second part can have a cylindrical shape, the second locking structure can be provided in the center area of the second part, therefore, after the first part is mounted on the second part, the second locking structure can simultaneously aligned and connected with the
15 locking structure will not hinder this rotation, instead, it rotates relative to the first part coaxially along with the second part.

The other object of the present invention is achieved by such an illumination device, wherein the illumination device according to the present invention comprises the electrical connector as described above. The illumination device according to the
20 present invention has the electrical connected designed according to the present invention. This electrical connector has a simple structure, is easy to manufacture and assemble, and can make it easy for the use to conveniently adjust the illumination direction and angle of the illumination device.

Brief Description of the Drawings

25 The accompanying drawings constitute a part of the present description and are used to provide further understanding of the present invention. Such accompanying drawings illustrate the embodiments of the present invention and are used to describe the principles of the present invention together with the description. In the accompanying drawings the same components are represented by the same
30 reference numbers. As shown in the drawings:

Figure 1 shows an exploded schematic diagram of an electrical connector according to the present invention;

Figure 2 shows a partial enlarged view of a first part of the electrical connector according to the present invention;

Figure 3 shows a partial enlarged view of a second part of the electrical connector according to the present invention;

5 Figure 4 shows a side view of a first locking structure of the electrical connector according to the present invention;

Figure 5 shows a sectional view when a second locking structure of the electrical connector according to the present invention is in a first position;

10 Figure 6 shows a sectional view when the second locking structure of the electrical connector according to the present invention is in a second position.

Detailed Description of the Embodiments

Figure 1 shows an exploded schematic diagram of an electrical connector 100 according to the present invention. The electrical connector 100 according to the present invention comprises a first part 1 and a second part 2, wherein the second part 2 is rotatably mounted on the first part 1. In particular, the second part 2 can be mounted on the first part 1 around a rotation axis. The second part 2 cannot rotate relative to the first part 1 when the first part 1 and the second part 2 are locked. However, the second part 2 can rotate relative to the first part 1 after the first part 1 is separated from the second part 2, and the first part 1 and the second part 2 are locked again after the second part 2 is rejoined with the first part 1.

Figure 2 shows a partial enlarged view of the first part 1 of the electrical connector 100 according to the present invention. The first part 1 of the electrical connector 100 according to the present invention has bosses 11 protruding from the bottom. Extending portions 12 extend from edges of the bosses 11. However, the extending portions 12 will not be in direct contact with the second part 2 when the first part 1 is connected with the second part 2. Protrusion, as first partial structure 31 of a first locking structure 3, is provided on the extending portions 12. The first partial structure 31 can be in direct contact with second partial structure 32 provided on the second part 2 when the first part 1 is connected with the second part 2, so as to form locking of the first part 1 and the second part 2. The protrusion as the first partial structure 31 is formed to be fixed relative to the first part 1, that is, the

protrusion will not move relative to the first part 1 when the second part 2 or the first part 1 is rotated. In addition, the number of the protrusion may be two or more, wherein when there is provided two protrusions, the protrusions are provided symmetrically about the rotation axis.

5 Figure 3 shows a partial enlarged view of the second part 2 of the electrical connector 100 according to the present invention. The second part 2 of the electrical connector 100 according to the present invention has groove. A plurality of grooves in the present embodiment can be preferably designed to be uniformly distributed in circumferential direction on inner surface of a side wall of the second
10 part 2. The groove acts as the second partial structure 32 of the first locking structure 3 interacting with the first partial structure 31. Besides, the groove also can be preferably designed to be spaced from each other, or spaced from each other at different distances. The protrusion on the first part 1 enters into the groove on the second part 2 when the first part 1 and the second part 2 of the
15 electrical connector 100 are connected. The groove is particularly designed to have a shape matching with the protrusion, that is, for example, the protrusion can be designed to have a circular cross section as illustrated in the figure, and then the groove can correspondingly have a circular cross section, alternatively, the protrusion can be designed to have a polygonal cross section which is not
20 illustrated in the figures, and then the groove can correspondingly have a polygonal cross section. The shape of the protrusion and the groove can be chosen according to the actual situations where manufacturing the electrical connector 100 is facilitated.

Figure 4 shows a side view of the first locking structure 3 of the electrical connector
25 100 according to the present invention. Figure 4 illustratively shows a side view when the protrusion on the first part 1 moves out of the groove on the second part 2. After the first part 1 is separated from the second part 2 by a predetermined distance, the protrusion can move out of the groove, that is, the state in which the protrusion is at least partially received in the groove is changed into the state in
30 which the protrusion is not received in the groove. In this situation, the first partial structure 31 and the second partial structure 32 are unlocked, and then the first part 1 can become to be capable of rotating around the rotation axis relative to the second part 2, so as to for example rotate the light engine of the illumination device such that the illumination direction of the illumination device is adjusted.

35 Figure 5 shows a sectional view when the second locking structure 4 of the

electrical connector 100 according to the present invention is in a first position. The protrusion as the first partial structure 31 on the first part 1 is at least partially received in the groove as the second partial structure 32 on the second part 2 after the first part 1 of the electrical connector 100 is mounted on the second part 2, thereby the first part 1 and the second part 2 are locked. In this situation, the second locking structure 4 extending from a cover body 5 of the second part 2 extends into the second part 2, but is not locked with the second part 2, that is, the second locking structure 4 in this situation allows the second part 2 to be separated from the first part 1, that is, the second part 2 can move away from the first part 1 in the direction of the rotation axis, but the distance by which the second part 2 is separated from the first part 1 is limited by the depth in which the second locking structure 4 extends in the second part 2.

Figure 6 shows a sectional view when the second locking structure 4 of the electrical connector 100 according to the present invention is in a second position. Compared with situation illustrated in Figure 5, in figure 6, after the first part 1 is separated from the second part 2 by a predetermined distance, barbs of the second locking structure 4 are engaged with the second part 2, such that the second part 2 cannot continue to be separated from the first part 1. Nevertheless, the travelling distance of the second part 2 defined by the second locking structure 4 allows the protrusion on the second part 2 to sufficiently move out of the groove on the first part 1, and further the locking of the first part 1 and the second part 2 is released.

The above is merely preferred embodiments of the present invention but not to limit the present invention. For the person skilled in the art, the present invention may have various alterations and changes. Any alterations, equivalent substitutions, improvements, within the spirit and principle of the present invention, should be covered in the protection scope of the present invention.

List of reference signs

	1	first part
	2	second part
5	3	first locking structure
	4	second locking structure
	5	cover body
	11	boss
	12	extending portion
10	31	first sub-structure
	32	second sub-structure
	100	electrical connector.

What is claimed is:

1. An electrical connector (100) for an illumination device, comprising a first part (1) and a second part (2) mounted on the first part (1), characterized in that the electrical connector (100) further comprises a first locking structure (3), wherein the first locking structure (3) comprises a first partial structure (31) provided on the first part (1) and a second partial structure (32) provided on the second part (2), wherein the first part (1) and the second part (2) are locked to each other in a first position, and the first part (1) and the second part (2) are separated by a predetermined distance in a second position, the locking of the first partial structure (31) and the second partial structure (32) is released in the second position such that the first part (1) and the second part (2) are allowed to be rotatable relative to each other.
2. The electrical connector (100) according to claim 1, characterized in that the first partial structure (31) can move out of the second partial structure (32) when the second part (2) moves from the first position to the second position, and the first partial structure (31) can enter the second partial structure (32) again when the second part (2) moves from the second position back to the first position.
3. The electrical connector (100) according to claim 2, characterized in that the first partial structure (31) can be in contact with the second partial structure (32) in the first position in a form-fitted manner.
4. The electrical connector (100) according to claim 3, characterized in that the second partial structure (32) is arranged circumferentially on inner surface of a side wall of the second part (2).
5. The electrical connector (100) according to claim 4, characterized in that the first partial structure (31) is configured as protrusion and the second partial structure (32) is configured as groove, or the first partial structure (31) is configured as groove and the second partial structure (32) is configured as protrusion.
6. The electrical connector (100) according to claim 5, characterized in that a plurality of grooves is uniformly arranged on the inner surface of the side wall.
7. The electrical connector (100) according to claim 1, characterized in that the second part (2) further comprises a second locking structure (4), wherein the second locking structure (4) can define the predetermined distance by which the

first part (1) and the second part (2) are separated.

8. The electrical connector (100) according to claim 7, characterized in that the second part (2) comprises a cover body (5), wherein the second locking structure (4) extends from a plane of the cover body (5) and is connected with the first part (1) after the second part (2) is mounted on the first part (1).

9. The electrical connector (100) according to claim 7 or 8, characterized in that the second locking structure (4) is coaxially arranged with the first part (1) and the second part (2).

10. An illumination device, characterized in that the illumination device comprises the electrical connector (100) according any one of claims 1-9.

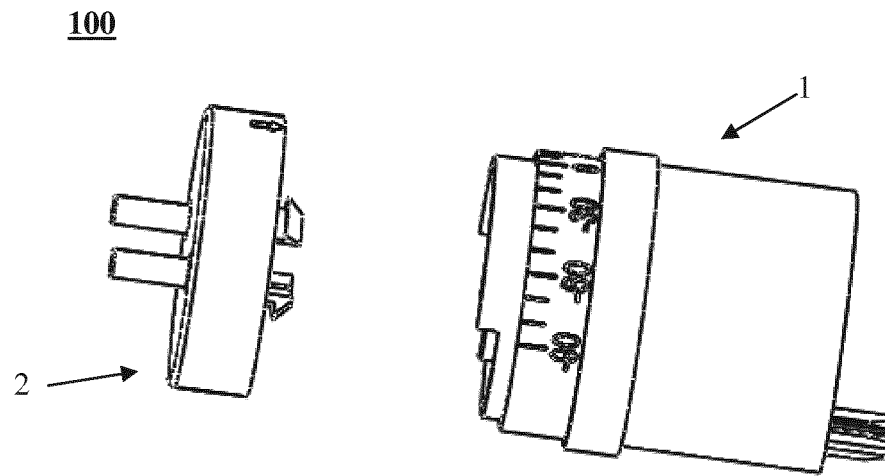


Figure 1

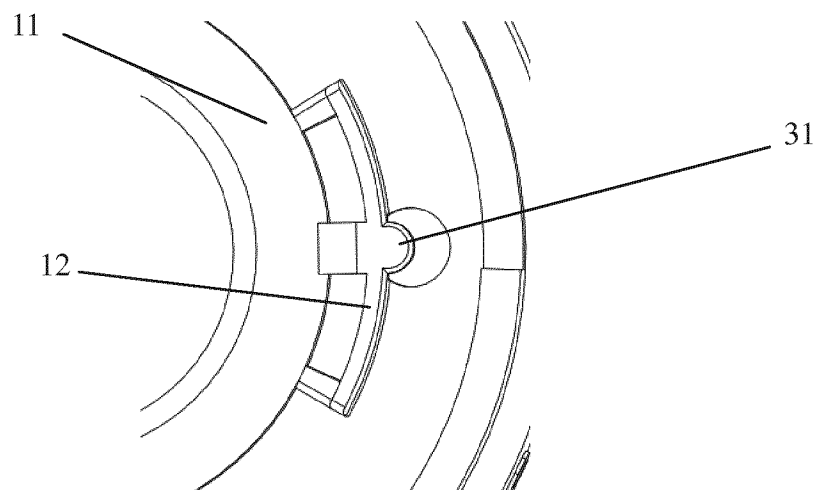


Figure 2

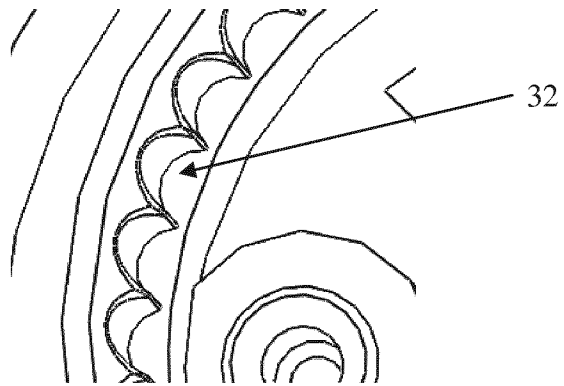


Figure 3

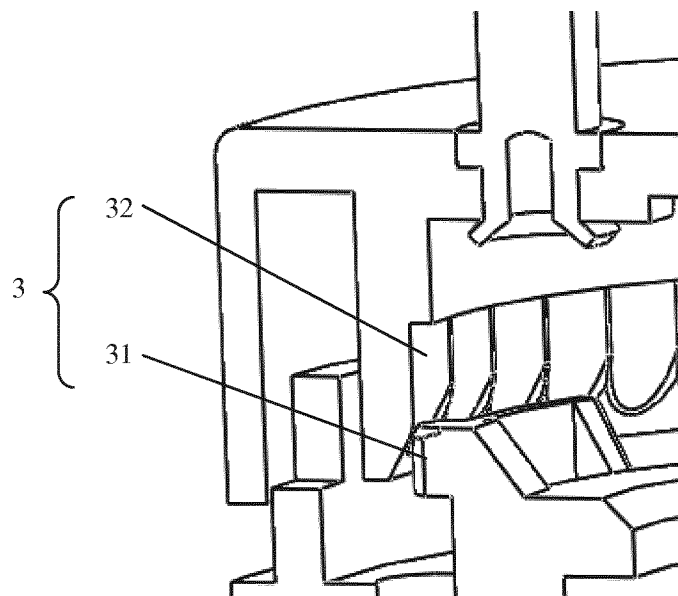


Figure 4

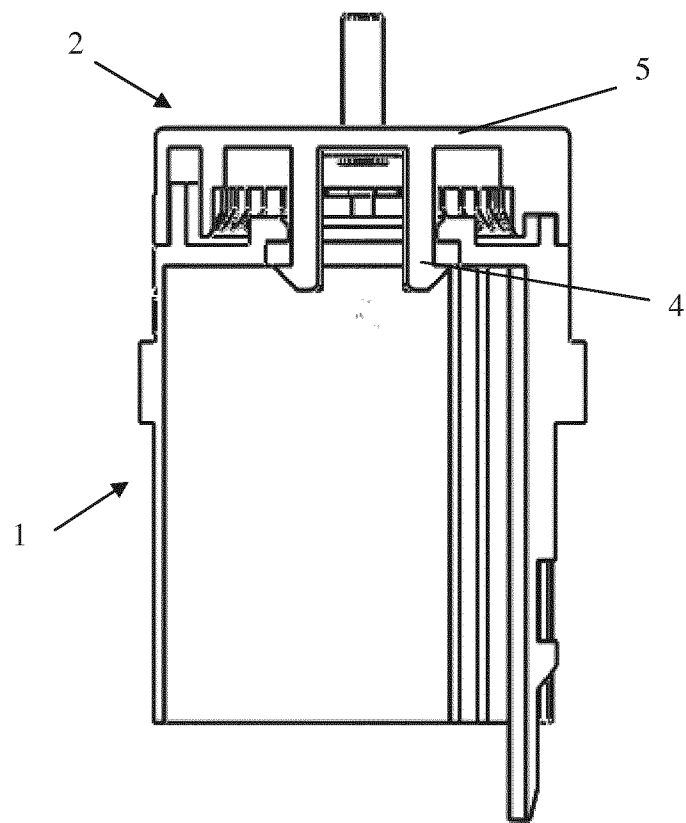


Figure 5

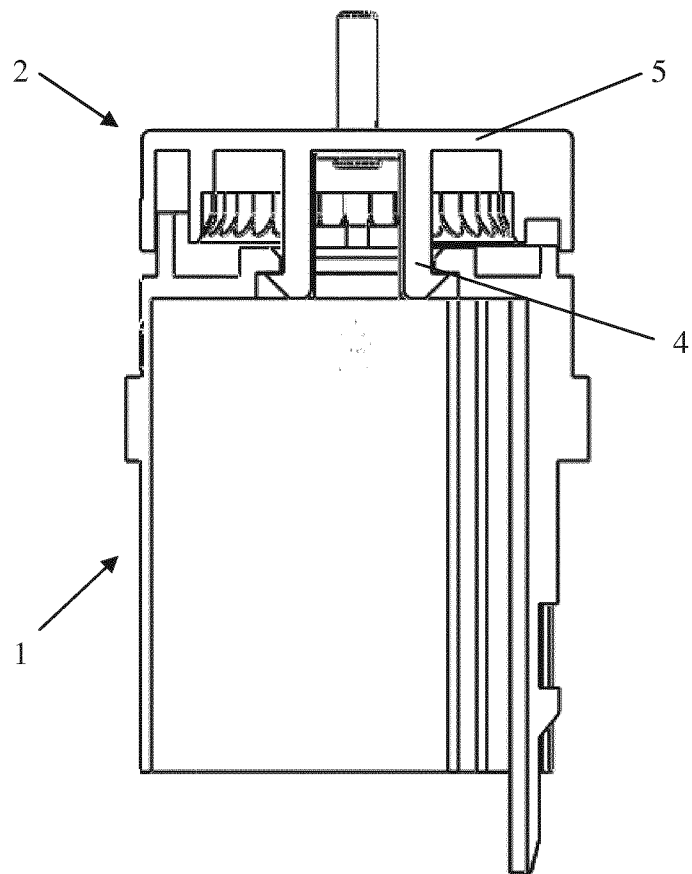


Figure 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/054394

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R13/627 F21K99/00 H01R35/04
ADD. H01R13/639

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)
H01R F21K

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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8 282 408 B1 (CHOU CHIA-TE [TW] ET AL) 9 October 2012 (2012-10-09) column 3, line 15 - column 4, line 59; figures 1-9	1-10
X	US 2013/107537 A1 (LEE CHIEN-KUO [TW] ET AL) 2 May 2013 (2013-05-02) paragraph [0021] - paragraph [0034]; figures 1-11	1-6
X	EP 2 354 650 A2 (LEXTAR ELECTRONICS CORP [TW]) 10 August 2011 (2011-08-10) paragraph [0023] - paragraph [0031]; figures 1A-2E	1-6
L	WO 2015/176828 A1 (OSRAM GMBH [DE]) 26 November 2015 (2015-11-26) page 10, line 10 - page 17, line 17; figures 1-5b	



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

Information on patent family members

International application No

PCT/EP2016/054394

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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