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(71) Applicant: **OSRAM GmbH**
80807 München (DE)

(72) Inventors:
- **Lu, Huanghui**
518053 Shenzhen (CN)
- **Zhang, Yunsong**
518053 Shenzhen (CN)

(54) **ILLUMINATION UNIT AND ILLUMINATION DEVICE COMPRISING THE ILLUMINATION UNIT**

(57) The present invention relates to an illumination unit (100) and an illumination device comprising the illumination unit, wherein the illumination unit (100) comprises a housing (3), and a first connector (1) and a second connector (2) which are arranged at both ends of the housing (3), respectively, wherein the first connector (1) is configured to be movable between a first position and a second position, and wherein the first connector (1) is received inside the housing in the first position, and the first connector (1) extends out of the housing in the second position and is configured to be adapted for forming an electrical connection with the second connector (2) of a further illumination unit.

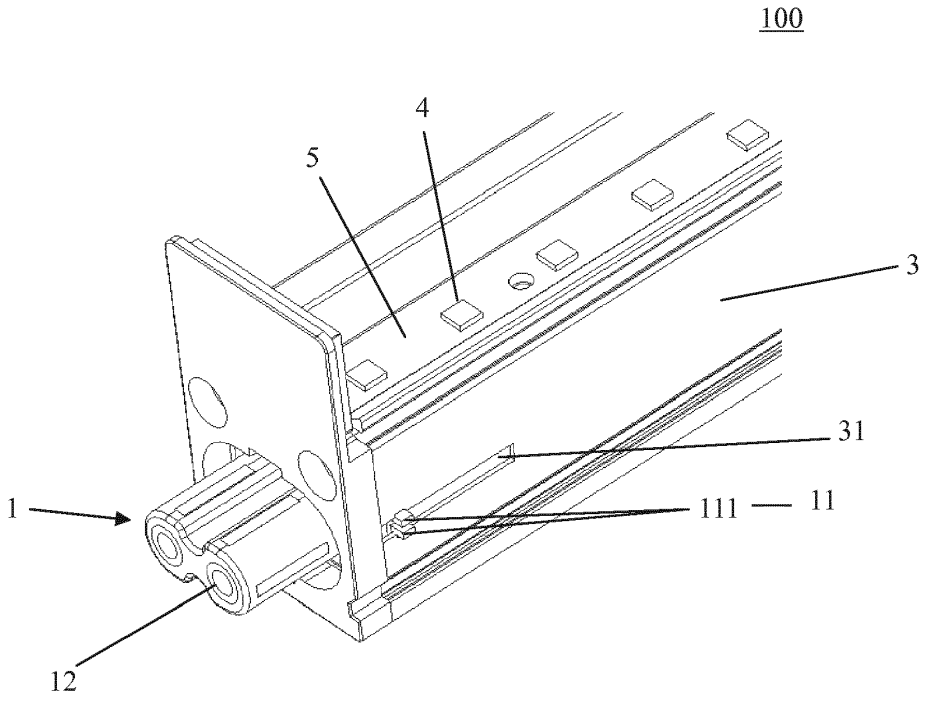

Figure 2

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Description

Technical Field

[0001] The present invention relates to an illumination unit and an illumination device comprising the illumination unit.

Background Art

[0002] Battens are widely used in the lighting application, such as in the shop, office, factory, and parking lot. The battens used in these applications usually need to meet such actual application requirements that the mounted battens have a light strip which looks like being continuous and that there is no dark area without lighting at joints of the battens. However, for the existing conventional T5 or T8 type battens, such requirements cannot be satisfied because the end-cap of the batten is configured for structure support and electrical connection of the T5 or T8 tube. One prior LED batten has the same structure as that of the conventional battens. A fixed connector is arranged at each of both ends of each illumination unit, upon a plurality of illumination units being connected to form a batten, there is a dark area without lighting at joints of the batten, and this greatly affects the continuous lighting result of the batten after the connection. Besides, since these illumination units are connected together and the connectors of the illumination units are also securely connected, once one of the illumination units of the batten fails or is damaged, it is difficult for an operator to replace the failed or damaged illumination unit.

Summary of the Invention

[0003] In order to solve the above technical problems, the present invention provides a novel illumination unit and an illumination device comprising the illumination unit. The illumination unit according to the present invention has a simple mechanical structure and user-friendly operation, an operator can assemble multiple such illumination units to form an illumination device simply through a few operating steps, and the illumination device has reduced joint intervals such that the assembled illumination device has a seamless connection, in this way, the illumination device can generate a continuous illumination lighting without dark areas. Besides, an operator can replace the illumination unit simply through a few operating steps when this illumination unit of the illumination device fails and needs to be replaced.

[0004] One object of the present invention is accomplished via an illumination unit that comprises a housing, a first connector and a second connector respectively arranged at both ends of the housing, wherein the first connector is configured to be movable between a first position and a second position, and wherein the first connector is received in the housing in the first position, and the first connector moves out from the housing in the second position and is configured to be adapted for forming an electrical connection with a second connector of a further illumination unit.

[0005] The first connector which is configured to be movable relative to the housing can be received in the housing when it does not need to form electrical connection between the illumination unit and a further illumination unit, and can extend out from the housing when the electrical connection is needed. Herein, it should be understood that the first connector and the second connector could be respectively adapted for an electrical connection with an external power supply, and wherein the first connector could be adapted for connection with an external power supply either when it is received in the housing in the first position or when it moves out from the housing in the second position. According to such configuration, an operator can directly and easily connect multiple illumination units into one illumination device, and even when a plurality of illumination units are already assembled and formed into an illumination device, the operator still can easily replace one of the illumination units. The illumination unit according to the present invention has a structure occupying a small spatial volume such that a distance between light sources of the illumination units close to the joint is as small as possible after two illumination units are connected. Furthermore, the end-cap for the illumination units which is provided at both ends of each of the illumination unit may be made of diffuser polycarbonate which is the same material for the lamp shade used for the illumination units. Therefore, there is no dark area, i.e., area without lighting, at joints of the formed illumination device.

[0006] According to a preferred example of the present invention, the first connector comprises an operating part, wherein the operating part is configured to extend out from the housing for operating the first connector from outside the housing to move between the first position and the second position. Thus, the operator can easily control the first connector to extend out from or return to the housing by the operating part outside the illumination unit.

[0007] Further preferably, an opening is arranged on a side wall of the housing, wherein the operating part extends out of the housing through the opening, so as to operate the first connector in a manner such that the operating part slides in the opening. In a case where the operating part extends out from the opening, the operator can operate the sliding of the first connector from outside of the housing. Besides, the opening effectively defines a moving direction, a moving path, and a possible moving distance of the first connector.

[0008] Advantageously, a locking structure is arranged on the opening close to one end of the housing, wherein the operating part can be locked to the locking structure so as to lock the first connector in the second position. This locking structure is configured on the housing in order to secure the position of the first connector in a case

where the first connector already extends out of the housing, such that the first connector can be positionally secured with the housing when sliding to the second position. In this way, when the illumination unit is connected with a further illumination unit, the first connector is held at the second position and is not moved back to the first position because of external force.

[0009] Preferably, the operating part comprises two operating sub-elements, wherein the two operating sub-elements are configured such that they can be locked to the locking structure and unlocked from the locking structure by means of elastic deformation. In a situation that the operator applies external force to the operating sub-elements to cause deformation of the operating sub-elements, the operating sub-elements are locked to or unlocked from the locking structure. This therefore provides a quite simple and direct manner of operating the operating part.

[0010] According to a preferred example of the present invention, the housing is configured in an elongated shape and the first connector is configured to be movable in a longitudinal direction of extending of the housing. The housing can be preferably configured in a strip shape, thus, a moving direction of the first connector can be consistent with a moving direction when the illumination unit is connected with a further illumination unit. Therefore, for instance, when multiple illumination units are already connected to form an illumination device, the moving direction of the first connector advantageously renders it unnecessary to move the housing of the illumination unit, while it only needs to operate the operating part of the first connector to move the first connector.

[0011] Preferably according to the present invention, the second connector is fixedly arranged in the housing. It only needs to move the first connector but not to move the second connector when forming or disconnect the electrical connection between, for instance, two illumination units.

[0012] Further preferably, the first connector is configured as a plug and the second connector is configured as a socket. The plug is adaptable to direct insertion in the socket when the first connector is moved from the first position to the second position, and the plug is adaptable to direct retreat from the socket when the first connector is moved from the second position to the first position.

[0013] The other object of the present invention is accomplished via an illumination device that comprises at least two illumination units as described above in electrical connection, wherein the first connector of one of illumination units in the second position is inserted in the second connector of the adjacent illumination unit.

Brief Description of the Drawings

[0014] 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 reference numbers. As shown in the drawings:

Fig. 1 shows a regional schematic diagram of an illumination unit according to the present invention when a first connector is in a first position;

Fig. 2 shows a regional schematic diagram of the illumination unit according to the present invention when the first connector is in a second position;

Fig. 3 shows a regional schematic diagram of a second connector of the illumination unit according to the present invention; and

Fig. 4 shows a schematic diagram of connection between one illumination unit and a further illumination unit according to the present invention.

Detailed Description of the Embodiments

[0015] Fig. 1 shows a local schematic diagram of an illumination unit 100 according to the present invention when a first connector 1 is in a first position. As shown in Fig. 1, the illumination unit 100 comprises a housing 3, a circuit board 5 arranged to be secured in the housing 3, LED chips 4 arranged on the circuit board 5, and the first connector 1 configured for connection with an external power supply or a further illumination unit 100. This couple is preferably configured as a plug having two holes 12 for connection with pins 21 of a socket as shown in Fig. 1. In Fig. 1, the first connector 1 is located at the first position where the first connector 1 for instance can be completely received in the housing 3 and is spatially separated from the circuit board 5 bearing the LED chips 4 such that, for instance, with respect to the circuit board 5, the first connector 1 is located below the circuit board 5. An opening 31 is opened on the housing 3, for example, near to an end of the illumination unit 100. An operating part 11 of the first connector 1 sticks out of the housing 3 through the opening 31, wherein the operating part 11 is arranged to be located at a side of the first connector 1 and has two operating sub-elements 111 preferably configured in a form of clip. The operating part 11 is operated to control its sliding in the opening 31, for example, the operating part 11 is applied with a force towards one end of the illumination unit 100, thus the operating part 11 can drive the first connector 1 to move, and then the first connector 1 moves in the housing 3 along a longitudinal direction of the illumination unit 100 so as to, e.g. leave the first position. Besides, a locking structure 311 is provided on the opening 21 close to the end of the illumination unit 1, wherein the locking structure 311 for instance has notches facing away from each other on

the opening 31. The notches can receive the operating sub-elements 111, respectively, and the operating part 11 and the locking structure 311 can be locked.

[0016] Fig. 2 shows a local schematic diagram of the illumination unit 100 according to the present invention when the first connector 1 is in a second position. In the second position, the first connector 1 extends out from the housing 3 and is positionally secured with the housing 3 with the aid of locking between the operating part 11 and the locking structure 311. Upon the first connector 1 extends beyond the housing 3, the illumination unit 100 can be inserted in a further illumination unit using the first connector 1 and form mechanical connection and electric connection with the further illumination unit. The two operating sub-elements 111 are configured to face each other but generally press against an inner wall of the opening 31 away from each other, an when the two operating sub-elements 111 are applied with forces in opposite directions, the two operating sub-elements 111 can be deformed towards each other so as to reduce a distance therebetween. Thus, when the operating part 11 is operated to control the first connector 1 to move towards the locking structure 311 and when the two operating sub-elements 111 are located in the locking structure 311, the two operating sub-elements 111 deform in a direction away from each other, and they are received in the notches of the locking structure 311, respectively, so as to be locked to the locking structure 311. Here, the first connector 1 and the housing 3 are positionally secured.

[0017] Fig. 3 shows a local schematic diagram of a second connector 2 of the illumination unit 100 according to the present invention. The second connector 2 of the illumination unit 100 is preferably configured in a form of socket. The second connector 2 and the first connector 1 match with each other. When the pins 21 of the second connector 2 are inserted in the holes 12 of the first connector 1, respectively, two illumination units 100 connected with each other can form reliable connection and electric connection therebetween.

[0018] Fig. 4 shows a schematic diagram of connection of one illumination unit 100 with a further illumination unit 100 according to the present invention. Prior to connecting, for instance, two illumination units 100 to form an illumination device, by operating the operating part 11 of one of the illumination units 100 to move the first connector 1 with respect to the housing 3, the first connector 1 can move from the first position to the second position, extend beyond the housing 3, and lock the operating part 11 to the locking structure 311 of the housing 3. Subsequently, the extended first connector 1 of the illumination unit 100 is inserted in the second connector 2 of the further illumination unit 100 such that the pins of the second connector 2 are inserted in the holes of the first connector 1, respectively, forming mechanical connection and electrical connection of the two illumination units 100.

[0019] Furthermore, as to the two illumination units 100 which are already connected as mentioned above, in cases where one of the illumination units 100 needs to be removed, it only needs to release the lock between the operating part 11 and the locking structure 311 of the extended first connector 1. Thereafter, the operating part 11 is operated to move the first connector 1 towards a direction opposite to the direction in which the first connector 1 is moved for connecting the two illumination units 100, consequently, the connection between the illumination unit 100 and the further illumination unit 100 is released.

[0020] 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

[0021]

1	first connector
2	second connector
3	housing
4	LED chip
5	circuit board
11	operating part
12	hole
21	pin
31	opening
100	illumination unit
111	sub operation element
311	locking structure

Claims

1. An illumination unit (100), comprising a housing (3), a first connector (1) and a second connector (2) which are arranged at both ends of the housing (3), respectively, **characterized in that** the first connector (1) is configured to be movable between a first position and a second position, wherein the first connector (1) is received in the housing (3) in the first position, and the first connector (1) moves out from the housing (3) in the second position and is configured to be adapted for forming an electrical connection with the second connector (2) of a further illumination unit (100).

2. The illumination unit (100) according to claim 1, **characterized in that** the first connector (1) comprises an operating part (11) which is configured to extend out from the housing (3) for operating the first connector (1) from outside the housing (3) to move between the first position and the second position.

3. The illumination unit (100) according to claim 2, **characterized in that** an opening (31) is arranged on a side wall of the housing (3), wherein the operating part (11) extends out of the housing (3) through the opening (31), so as to operate the first connector (1) in a manner such that the operating part (11) slides in the opening (31).

4. The illumination unit (100) according to claim 3, **characterized in that** a locking structure (311) is arranged on the opening (31) close to one end of the housing (3), wherein the operating part (11) can be locked to the locking structure (311) so as to lock the first connector (1) in the second position.

5. The illumination unit (100) according to claim 4, **characterized in that** the operating part (11) comprises two operating sub-elements (111), wherein the two operating sub-elements (111) are configured such that they can be locked to the locking structure (311) and unlocked from the locking structure (311) by means of elastic deformation.

6. The illumination unit (100) according to claim 1, **characterized in that** the housing (3) is configured in an elongated shape and the first connector (1) is configured to be movable in a longitudinal direction of extending of the housing (3).

7. The illumination unit (100) according to claim 1, **characterized in that** the second connector (2) is fixedly arranged in the housing (3).

8. The illumination unit (100) according to claim 7, **characterized in that** the first connector (1) is configured as a plug, and the second connector (2) is configured as a socket.

9. An illumination device, **characterized in that** the illumination device comprises at least two illumination units (100) according to any one of claims 1-8 in electrical connection, wherein the first connector (1) of one of the illumination units (100) in the second position is inserted in the second connector (2) of the adjacent illumination unit (100).

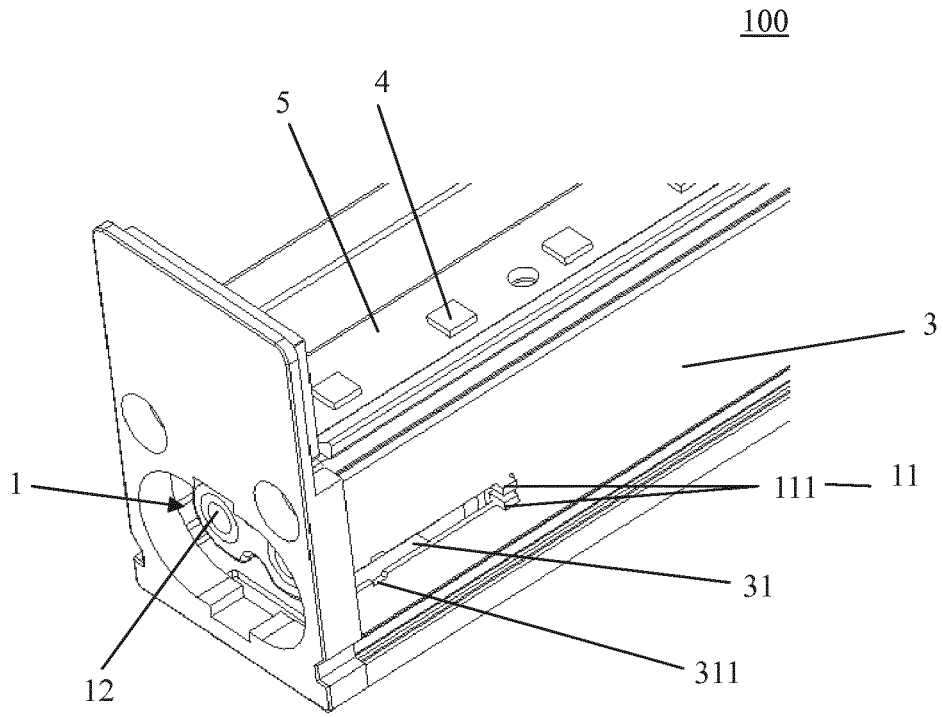

Figure 1

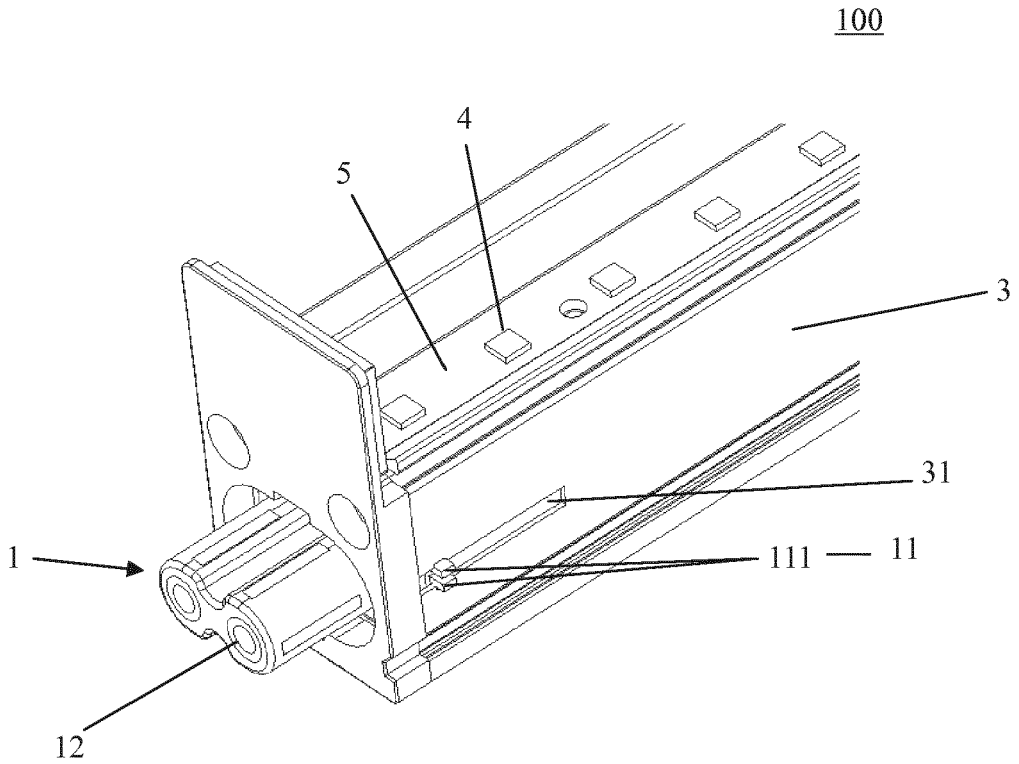

Figure 2

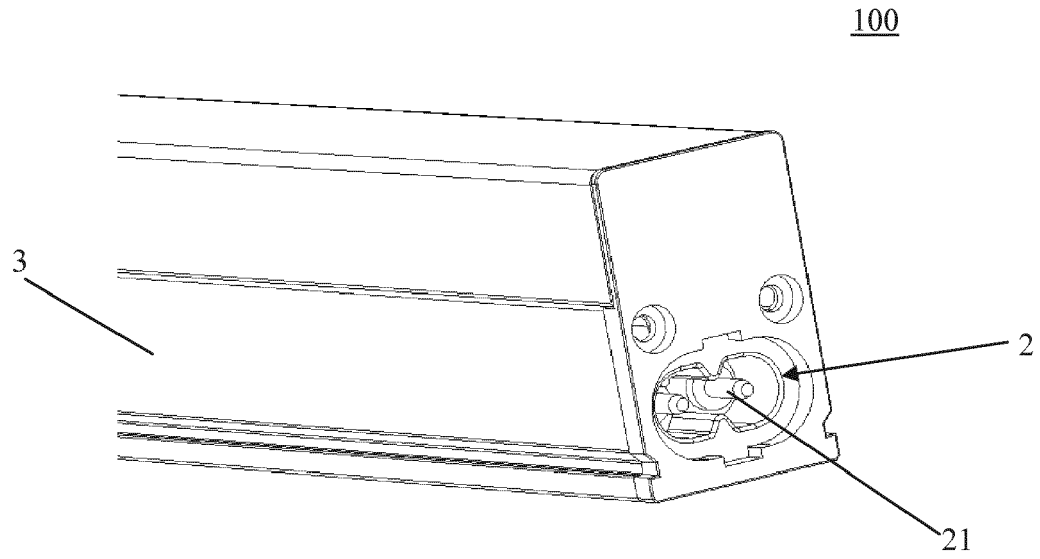

Figure 3

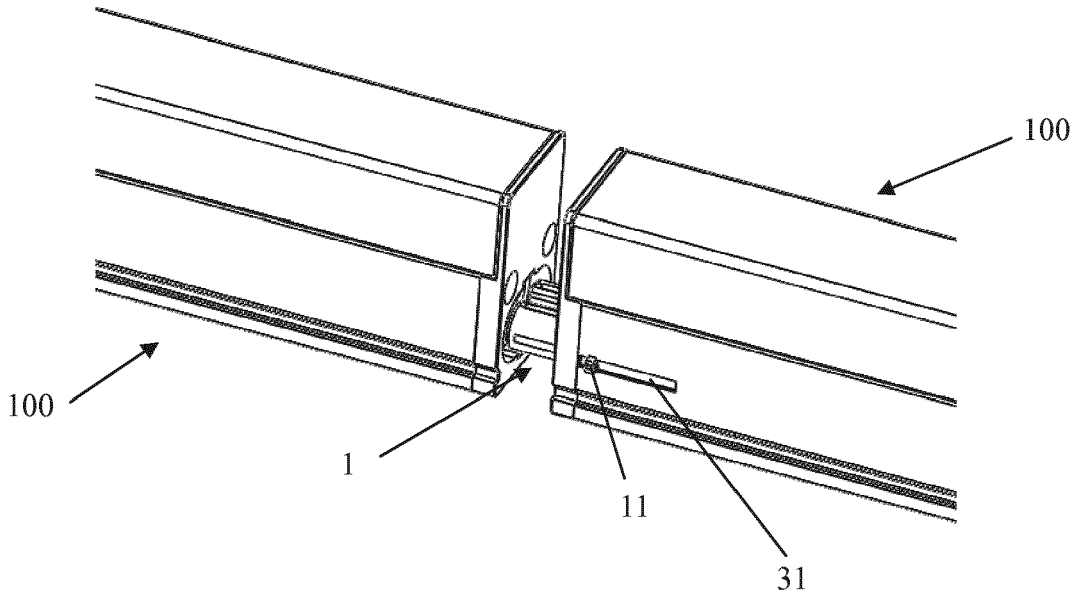

Figure 4

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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 4941

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 October 2015	Soto Salvador, Jesús

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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