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(54) ELECTRIC CONNECTING DEVICE BETWEEN LIGHT EMITTING COMPONENTS AND LAMP COMPRISING ELECTRIC CONNECTING DEVICE

(57) The present invention relates to an electric connector device connecting adjacent light-emitting assemblies, the electric connector device comprising at least one first retractable connector element and at least one second connector element that can be electrically connected to the first retractable connector element and can be disengaged therefrom. The electric connector device is able to conveniently electrically connect a plurality of light-emitting assemblies of a light fixture without any space reserved for mounting and dismounting the light-emitting assemblies of a light fixture, thereby eliminating the dark zones of the light fixture and increasing flexibility in the light fixture design. The present invention also provides a light fixture comprising a plurality of light-emitting assemblies connected by the electric connector devices.

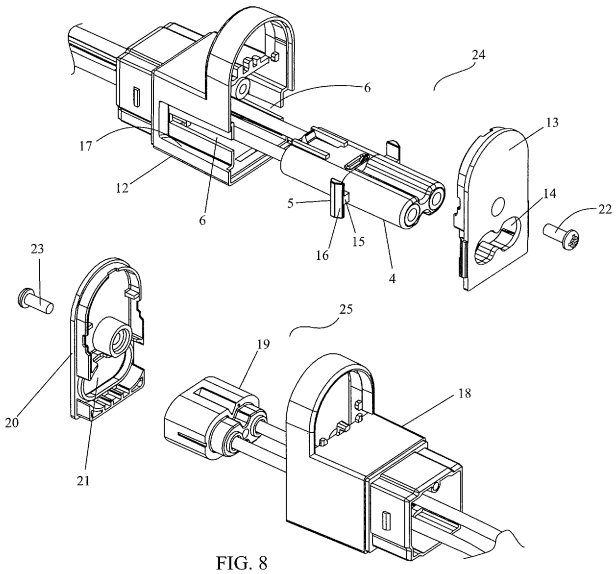

FIG. 8

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Description

Technical Field of the Invention

[0001] This invention relates to an electric connector device connecting adjacent light-emitting assemblies, and a light fixture comprising a plurality of light-emitting assemblies connected together by the electric connector devices.

Background of the Invention

[0002] In various scenarios, LED light fixtures, as a flexible and efficient light source, are replacing conventional light fixtures. It is often that a plurality of linear LED light-emitting assemblies are end-to-end mounted to form a chain. This mounting method can simplify wiring and the installation of an intelligent control system.

[0003] German patent application no. DE201110008898 discloses a method of electrically connecting a plurality of LED light-emitting assemblies housed and supported in an elongate housing. Each LED light-emitting assembly has two ends provided with respective connector elements cooperating with each other. The connection of the connector elements results in an electric connection between the LED light-emitting assemblies to allow power supply to the light-emitting assemblies.

[0004] However, since the connector element is fixedly arranged at the end of the LED light-emitting assembly, in order to mount or dismount the LED light-emitting assembly, an adequate space has to be reserved between two opposite ends of the adjacent elongate housings so that the LED light-emitting assemblies can longitudinally move to connect or disconnect the connector elements with each other. Such reserved space in which no lighting element is arranged would create a dark zone which would affect the lighting effect and constitute restrictions and limitations to the light fixture.

[0005] Thus, there is a need for an electric connector device that is able to conveniently electrically connect a plurality of light-emitting assemblies of a light fixture without formation of any dark zone, and for a light-fixture comprising a plurality of light-emitting assemblies connected by the electric connector devices.

Summary of the Invention

[0006] An object of the present invention is to provide an electric connector device for connecting a plurality of light-emitting assemblies that is able to conveniently electrically connect a plurality of light-emitting assemblies of a light fixture without any space reserved for mounting and dismounting the light-emitting assemblies of a light fixture, thereby eliminating the dark zones of the light fixture and increasing flexibility in the light fixture design. The present invention also provides a light-fixture comprising a plurality of light-emitting assemblies connected by the electric connector devices.

[0007] The electric connector device of the present invention comprises a first connector means and a second connector means: the first connector means comprises a first connector housing, at least one first retractable connector element and an actuator, wherein the first retractable connector element is configured to move between an extended position beyond the first connector housing and a retracted position in the housing, and the actuator is configured to actuate the first retractable connector element to move to the extended position or to move to the retracted position; the second connector means comprises a second connector housing and at least one second connector element housed in the second connector housing, the first retractable connector element being able to engage with the second connector element to achieve electric connection when moving to the extended position, the first retractable connector element disengaging from the second connector element when moving to the retracted position; wherein the first connector means is mounted in a first light-emitting assembly and the second connector means is mounted in a second light-emitting assembly, electric connection of the first retractable connector element and the second connector element enabling the first and second light-emitting assemblies to achieve electric connection.

[0008] In an embodiment of the electric connector device of the present invention, the second connector element is fixed in the second connector housing.

[0009] In an embodiment of the electric connector device of the present invention, the first retractable connector element is a socket or a plug, and the second connector element is a corresponding plug or a corresponding socket.

[0010] In an embodiment of the electric connector device of the present invention, a cutout is provided on a side of the first connector housing, and the actuator is configured to be a handle provided on the first retractable connector element, the handle being arranged to extend through and be movable in the cutout, wherein the movement of the handle causes to actuate the first retractable connector element to extend out of the first connector housing to the extended position to be engageable with the second connector element, or to actuate the first retractable connector element to retract into the first connector housing to the retracted position to disengage from the second connector element. Preferably, the cutout is provided on each of two opposite sides of the first connector housing; the handle is provided on each of two opposite sides of the first retractable connector element.

[0011] The handle comprises a stem extending from the first retractable connector element and running through the cutout and a stalk extending from the stem at an end thereof away from the first retractable connector element. The first connector housing has a guiding slot in which the stalk of the handle is housed and guided to move, thereby driving the stem of the handle to move in the cutout.

[0012] Preferably, the first connector housing further comprises a first end cap cooperating with the first connector housing to define a space for housing the first retractable connector element, the first end cap having a first opening through which the first retractable connector element extends out of the first connector housing; the second connector means further comprises a second end cap cooperating with the second connector housing to define a space for housing the second connector element, the second end cap having a second opening through which the first retractable connector element extends into the second connector housing to engage with the second connector element. The first end cap and the second end cap are respectively screwed to the first connector housing and the second connector housing.

[0013] The light fixture of the present invention comprises a plurality of light-emitting assemblies and the electric connector device for electric connection for the light-emitting assemblies.

[0014] In an embodiment of the light fixture of the present invention, the light-emitting assemblies elongate, and the electric connector device connects butt ends of adjacent two of said elongate light-emitting assemblies.

[0015] In an embodiment of the light fixture of the present invention, the light-emitting assemblies are triangular cylinders, and the electric connector device connects butt side faces of adjacent two of said triangular cylinders. Preferably, in each of said light-emitting assemblies, said first connector element is arranged on one of the three adjacent side faces of the triangular cylinder, and said second connector element is arranged on each of the other two side faces.

[0016] In an embodiment of the light fixture of the present invention, the light-emitting assemblies are hexagonal cylinders, and the electric connector device connects butt side faces of adjacent two of said hexagonal cylinders. Preferably, in each of said light-emitting assemblies, said first connector element is arranged on each of three adjacent side faces of the hexagonal cylinder, and said second connector element is arranged on each of the other three adjacent side faces.

[0017] In an embodiment of the light fixture of the present invention, the light-emitting assembly is an LED light-emitting assembly, preferably an elongate LED light. Preferably, the first connector housing and the second connector housing of the electric connector device are insertable partially into two ends of the elongate LED light for mounting respectively at said two ends of the elongate LED light.

Brief Description of the Drawings

[0018]

FIG. 1A is a schematic view of the structure of a light fixture having a plurality of light-emitting assemblies known from the prior art.

FIG. 1B is a schematic sectional view of the light fixture shown in FIG. 1A in assembled state.

FIG. 1C is a schematic sectional view showing how to dismount the light fixture shown in FIG. 1A.

FIG. 2A - FIG. 2C are schematic views showing the structure of a light fixture constructed according to an embodiment of the present invention and how to dismount this light fixture.

FIG. 2D is a schematic view showing the structure of a light fixture constructed according to another embodiment of the present invention and how to dismount this light fixture.

FIG. 3 is an exploded schematic view of a light-emitting assembly comprising an electric connector device of the present invention.

FIG. 4A - FIG. 4E are schematic views of the structure of the second connector element shown in FIG. 3.

FIG. 5A - FIG. 5G are schematic views of the structure of the first connector element shown in FIG. 3.

FIG. 6A - FIG. 6H are schematic views of the structure of the first connector housing shown in FIG. 3.

FIG. 6I and FIG. 6J are schematic views of the structure of the second connector housing shown in FIG. 3.

FIG. 7A - FIG. 7G are schematic views of the structure of the first end cap shown in FIG. 3.

FIG. 8 is a schematic view of the structure of the electric connector device shown in FIG. 3.

FIG. 9A and FIG. 9B are perspective views of a light-emitting assembly comprising the electric connector device of the present invention with the first connector element in a retracted position.

FIG. 9C and FIG. 9D are perspective views of the light-emitting assembly shown in FIG. 9A and FIG. 9B with the first connector element in an extended position.

FIG. 10A is a perspective view of a light fixture according to an embodiment of the present invention.

FIG. 10B is a perspective view of the light fixture shown in FIG. 10A with its two light-emitting assemblies disengaged from each other and the first connector element in an extended position.

FIG. 10C is a perspective view of the light fixture shown in FIG. 10B with the first connector element in a retracted position.

FIG. 11A is a schematic view of a light-emitting assembly comprising the electric connector device constructed according to an embodiment of the present invention.

FIG. 11B is a schematic view of the structure of the light fixture having a plurality of light-emitting assemblies shown in FIG. 11A.

FIG. 12A is a schematic view of a light-emitting assembly comprising the electric connector device constructed according to another embodiment of the present invention.

FIG. 12B is a schematic view of the structure of the light fixture having a plurality of light-emitting assemblies shown in FIG. 12A.

Detailed Description of the Invention

[0019] FIG. 1A - FIG. 1C show a linear multi-assembly LED light fixture 100 of the prior art, comprising a support trough 101 and two LED light-emitting assemblies 102 mounted in the support trough 101. A plug 103 is fixedly arranged on an end face of one of the two LED light-emitting assemblies 102; a socket (not shown) is arranged on an end face of the other LED light-emitting assembly 102. Electric connection between the two LED light-emitting assemblies 102 can be achieved by inserting the plug 103 into the socket. When it is necessary to dismount one of the two LED light-emitting assemblies 102 (for example, to carry out cleaning, maintenance or replacement), the first step is that one of the LED light-emitting assemblies 102 must be longitudinally moved to unplug the plug 103 from the socket, then the LED light-emitting assembly needed to be dismounted can be taken away from the support trough 101. In order to carry out the longitudinal movement, a space 104 has to be reserved on the support trough 101. The length L of the space 104 in the longitudinal direction shall be equal to or greater than the length of the plug 103. The space 104 in which no light-emitting assembly is arranged would form a dark zone, which will affect the illumination and constitutes a restriction to the light fixture design.

[0020] FIG. 2A - FIG. 2C schematically show a multi-assembly LED light fixture 1 having an electric connector device constructed according to an embodiment of the present invention, comprising two LED light-emitting assemblies 2 mounted on a plurality of supports 3. On an end (left end viewed in FIG. 2A - FIG. 2C) of each LED light-emitting assembly 2 is mounted a retractable socket 4 having a handle 5. The handle 5 laterally extends through an elongate cutout 6 arranged on a side face of the LED light-emitting assembly 2. The elongate cutout 6 extends in the longitudinal direction of the LED light-emitting assembly 2. The handle 5 is movable longitudinally in the elongate cutout 6 so as to enable the retractable socket 4 to protrude beyond the LED light-emitting assembly 2 or retract into the LED light-emitting assembly 2. On the other end (right end viewed in FIG. 2A - FIG. 2C) of each LED light-emitting assembly 2 is mounted a plug (not shown) positioned to correspond to the retractable socket 4 and housed in the LED light-emitting assembly 2. For mouthing purpose, the two LED light-emitting assemblies 2 are electrically connected by moving the handle 5 to protrude the retractable socket 4 beyond the LED light-emitting assembly 2 to get tightly engaged with the plug of the other LED light-emitting assembly 2. When it is necessary to dismount one of the LED light-emitting assemblies 2 (e.g. the LED light-emitting assembly 2 shown on the right of FIG. 2A - FIG. 2C), that LED light-emitting assembly 2 can be taken away from the support 3 by moving the handle 5 (rightward in FIG. 2A - FIG. 2C) to cause retraction of the retractable socket 4 into the LED light-emitting assembly 2, without the need of displacing the LED light-emitting assembly 2 longitudinally. No space is required for dismounting the LED light-emitting assembly due to the elimination of the need for the longitudinal movement thereof, , therefore no dark zone found in the prior art light fixtures forms in the entire light fixture, with better lighting effect achieved and greater flexibility in light fixture design.

[0021] FIG. 3 is a perspective exploded view of a LED light-emitting assembly 2 comprising an electric connector device of the present invention. The LED light-emitting assembly 2 is elongate, comprising a housing 7, a circuit board 8, an LED light source 9, an upper cover 10 and a switch 11. The housing 7 is a cuboid with two ends open. The circuit board 8 is elongate and housed in the housing 7. The LED light source 9 is also elongate, mounted on one side of the housing 7 on which the upper cover 10 whose cross-section is a semi-circle is also mounted so as to encapsulate the LED light-source 9. The switch 11 is arranged on another side of the housing 7.

[0022] The electric connector device according to this embodiment is more clearly shown in FIG. 8. Referring to FIG. 3 and FIG. 8, a first connector means 24 is mounted at an end (the right end in FIG. 3) of the housing 7, the first connector means 24 comprising a first connector housing 12 with two ends open, the first connector housing 12 being configured to be partially insertable into the open end of the housing 7. The first connector housing 12 houses a first retractable connector element 4 in electrical connection with the circuit board 8. In this embodiment, the first retractable connector element 4 is constructed to be in the form of a socket (see FIG. 5A - FIG. 5G). An elongate cutout 6 extending in the longitudinal direction of the housing 7 (see FIG. 6A - FIG. 6H) is provided on each of two opposite sides of the first connector housing 12. Accordingly, an actuator for actuating the first retractable connector element 4 is provided on each

of two opposite sides of the first retractable connector element 4. In this embodiment, the actuator is provided as a handle 5 extending through the cutout 6 and movable longitudinally in the cutout 6. It would be appreciated in the art that only one cutout 6 on one side of the first connector housing 12 cooperating with one corresponding handle 5 on one side of the first retractable connector element 4 is possible. The first connector means 24 further comprises a first end cap 13 for closing the open end of the first connector housing 12 that is away from the housing 7. A first opening 14 is provided on the first end cap 13, and has a shape adapted for the profile of the first retractable connector element 4, allowing the first retractable connector element 4 to extend out of the first connector housing 12 through the first opening 14 (see FIG. 7A- FIG. 7G) at a maximum to the extended position. The first end cap 13 is fixedly connected to the first connector housing 12 by means of a screw 22. The handle 5 comprises a stem 15 extending from the first retractable connector element 4 and running through the cutout 6, and a stalk 16 extending from the stem 15 at an end thereof away from the connector element 4. A longitudinally extending guiding slot 17 is positioned on each of two opposite sides of the first connector housing 12 to correspond to the cutout 6. The stalk 16 of the handle 5 is housed and guided to longitudinally move in the guiding slot 17 to drive the movement of the stem 15 of the handle 5 in the cutout 6, thereby enabling the first retractable connector element 4 to extend out of the first connector housing 12 at the maximum to the extended position (as shown in FIG. 9C and FIG. 9D) or to retract into the retracted position in the first connector housing 12 (as shown in FIG. 9A and FIG. 9B).

[0023] A second connector means 25 is mounted at the other end (the left end in FIG. 3) of the housing 7, the second connector means 25 comprising a second connector housing 18 with two ends open. The second connector housing 18 has a structure similar to that of the first connector housing 12, but does not have the cutouts and the guiding slots (see FIG. 6I and FIG. 6J). A second connector element 19 cooperating with the first retractable connector element 4 is fixedly mounted in the second connector housing 18. In this embodiment, the second connector element 19 is constructed to be in the form of a plug (see FIG. 4A - FIG. 4E). The second connector means 25 further comprises a second end cap 20 for closing the open end of the second connector housing 18 that is away from the housing 7, the structure and the shape of the second end cap 20 being similar to those of the first end cap 13. A second opening 21 is provided on the second end cap 20, and has a shape adapted for the profile of the first retractable connector element 4, allowing for passage of the first retractable connector element 4 mounted on the other LED light-emitting assembly into the second connector housing 18 to get tightly engaged with the second connector element 19, thereby electrically connecting the two LED light-emitting assemblies. The second end cap 20 is fixedly connected to the second connector housing 18 by means of a screw 23.

[0024] FIG. 11A and FIG. 11B respectively show an LED light-emitting assembly 2 constructed according to another embodiment of the present invention and a light fixture 1 comprising a plurality of the LED light-emitting assemblies 2. As shown in FIG. 11A, the LED light-emitting assembly 2 in this embodiment has a triangular cross section, i.e. the LED light-emitting assembly is a triangular cylinder. The light fixture 1 comprises a plurality of the LED light-emitting assemblies 2. The electric connector device connects butt side faces of adjacent two of the triangular cylinders to achieve electric connection therebetween. More precisely, the electric connector device is arranged on the side face of the LED light-emitting assembly 2 at the junction of said side face and a top face or a bottom face of the LED light-emitting assembly 2 in a way such that the handle 5 of the first retractable connector element 4 (not shown) can move on the top face or the bottom face of the triangular cylinder. This would enable the first retractable connector element 4 to extend out of the first connector housing 12 to get engaged with the second connector element 19 to electrically connect the two LED light-emitting assemblies 2, or to disengage and disconnect the first retractable connector element 4 from the second connector element 19 to retract into the first connector housing 12, allowing for dismounting of the LED light-emitting assemblies 2. In this embodiment, one first connector means 24 is arranged on one of three adjacent side faces of the triangular cylinder, and one second connector means 25 is arranged on each of the other two side faces. It would be within the ability of a person skilled in the art that other arrangements are possible.

[0025] FIG. 12A and FIG. 12B respectively show an LED light-emitting assembly 2 constructed according to another embodiment according to the present invention and a light fixture 1 comprising a plurality of the LED light-emitting assemblies 2. As shown in FIG. 12A, the LED light-emitting assembly 2 in this embodiment has a hexagonal cross section, i.e. the LED light-emitting assembly is a hexagonal cylinder. The light fixture 1 comprises a plurality of the LED light-emitting assemblies 2. The electric connector connects butt side faces of adjacent two of said hexagonal cylinder to achieve electric connection therebetween. More precisely, the electric connector device is arranged on the side face the LED light-emitting assembly 2 at the junction of said side face and a top face or a bottom face of the LED light-emitting assembly 2 in a way such that the handle 5 of the first retractable connector element 4 (not shown) can move on the top face or the bottom face of the hexagonal cylinder. This would enable the first retractable connector element 4 to extend out of the first connector housing 12 and to get engaged with the second connector element 19 to electrically connect the two LED light-emitting assemblies 2, or to disengage and disconnect the first retractable connector element 4 from the second connector element 19 to retract into the first connector housing 12, allowing for

dismounting of the LED light-emitting assemblies 2. In this embodiment, one first connector means 24 is arranged on each of three adjacent side faces of each LED light-emitting assembly; one second connector means 25 is arranged on each of the other three adjacent side faces. It would be within the ability of a person skilled in the art that other arrangements are possible.

Claims

1. An electric connector device for connecting light-emitting assemblies, comprising:

   a first connector means (24) comprising a first connector housing (12), at least one first retractable connector element (4) and an actuator (5), the first retractable connector element (4) configured to be displaceable between an extended position where the first retractable connector element protrudes beyond the first connector housing (12), and a retracted position where the first retractable connector element retracts back into the first connector housing (12); and the actuator (5) configured to actuate the displacement of the first retractable connector element (4) between the extended position and the retractable position;

   a second connector means (25) comprising a second connector housing (18) and at least one second connector element (19) housed in the second connector housing (18), the second connector element (19) configured to engage with the first retractable connector element (4) in the extended position for electrical connection therebetween, and to disengage from the first retractable connector element (4) in the retracted position;

   wherein the first connector means (24) is mounted in a first light-emitting assembly and the second connector means (25) is mounted in a second light-emitting assembly, the first and second light-emitting assemblies are connected electrically through the electrical connection between the first and second connector means (24, 25).

2. The electric connector device of claim 1, wherein the second connector element (19) is fixed in the second connector housing (18).

3. The electric connector device of claim 1, wherein the first retractable connector element (4) is a socket or a plug and the second connector element (19) is a corresponding plug or a corresponding socket.

4. The electric connector device of any one of claims 1 to 3, wherein a corresponding cutout (6) is provided on one or each of two opposite sides of the first connector housing (12), and the actuator is configured to be a handle (5) provided on one or each of two opposite sides of the first retractable connector element (4), the handle (5) being arranged to extend through and be movable in the respective cutout (6), wherein the movement of the handle (5) causes to actuate the first retractable connector element (4) to extend out of the first connector housing (12) to the extended position to be engageable with the second connector element (19), or to actuate the first retractable connector element (4) to retract into the first connector housing (12) to the retracted position to disengage from the second connector element (19).

5. The electric connector device of claim 4, wherein the handle (5) comprises a stem (15) extending from the first retractable connector element (4) and running through the cutout (6) and a stalk (16) extending from the stem (15) at an end thereof away from the first retractable connector element (4).

6. The electric connector device of claim 5, wherein the first connector housing (12) has on one side thereof a guiding slot (17) in which the stalk (16) of the handle (5) is housed and guided to move, thereby driving the stem (15) of the handle (5) to move in the cutout (6).

7. The electric connector device of any one of claims 1 to 3, wherein the first connector housing (24) further comprises a first end cap (13) cooperating with the first connector housing (12) to define a space for housing the first retractable connector element (4), the first end cap (13) having a first opening (14) through which the first retractable connector element (4) extends out of the first connector housing (12); the second connector means (25) further comprises a second end cap (20) cooperating with the second connector housing (18) to define a space for housing the second connector element (19), the second end cap (20) having a second opening (21)through which the first retractable connector element (4) extends into the second connector housing (18) to engage with the second connector element (19).

8. The electric connector device of claim 7, wherein the first end cap (13) and the second end cap (20) are respectively screwed to the first connector housing (12) and the second connector housing (18).

9. A light fixture comprising one or more light-emitting assemblies and the electric connector device of any one of claims 1 to 8 for electric connection of the light-emitting assemblies.

10. The light fixture of claim 9, wherein the light-emitting assemblies are elongate, and the electric connector device connects butt ends of adjacent two of said

elongate light-emitting assemblies.

11. The light fixture of claim 9, wherein the light-emitting assemblies are triangular cylinders, and the electric connector device connects butt side faces of adjacent two of said triangular cylinders.

12. The light fixture of claim 11, wherein in each of said light-emitting assemblies, said first connector means (24) is arranged on one of the three adjacent side faces of the triangular cylinder, and said second connector means (25) is arranged on each of the other two side faces.

13. The light fixture of claim 9, wherein the light-emitting assemblies are hexagonal cylinders, and the electric connector device connects butt side faces of adjacent two of said hexagonal cylinder.

14. The light fixture of claim 13, wherein in each of said light-emitting assemblies, said first connector means (24) is arranged on each of three adjacent side faces of the hexagonal cylinder, and said second connector means (25) is arranged on each of the other three adjacent side faces.

15. The light fixture of any one of claims 9 to 14, wherein the light-emitting assembly is an LED light-emitting assembly.

16. The light fixture of claim 15, wherein the LED light-emitting assembly is elongate.

17. The light fixture of claim 16, wherein the first connector housing (12) and the second connector housing (18) of the electric connector device are insertable partially into two ends of the elongate LED light-emitting assembly for mounting in place.

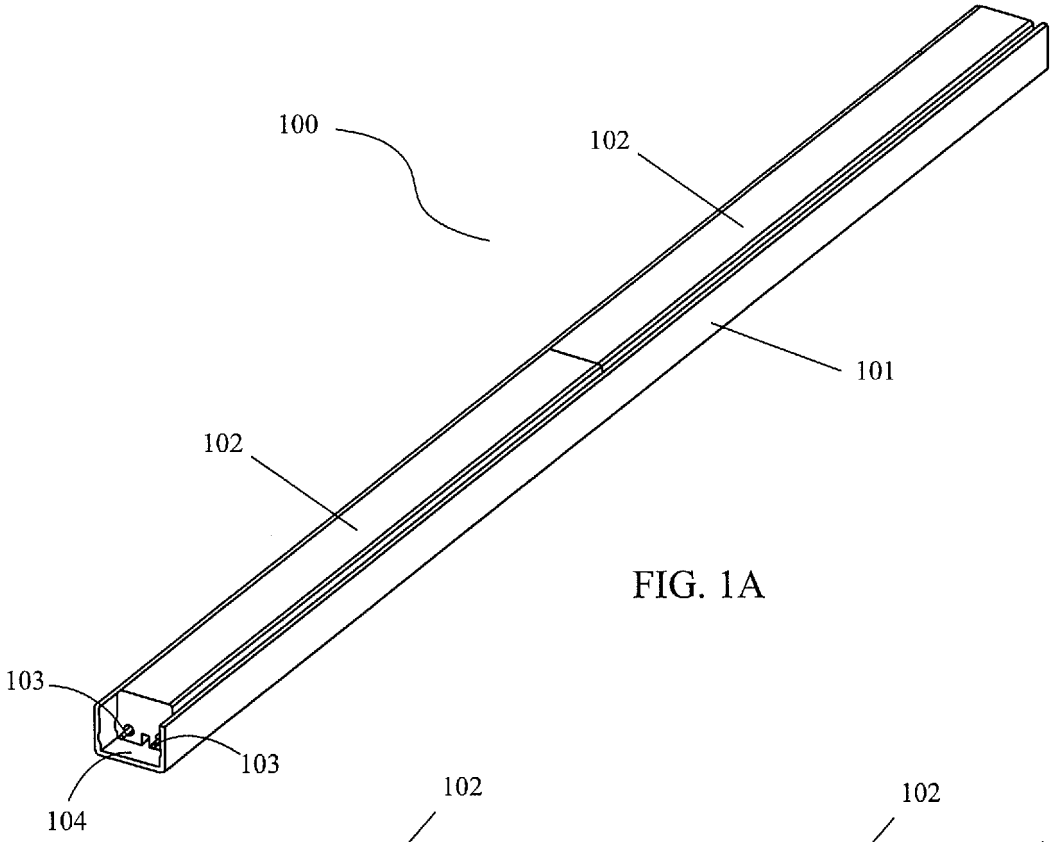

FIG. 1A

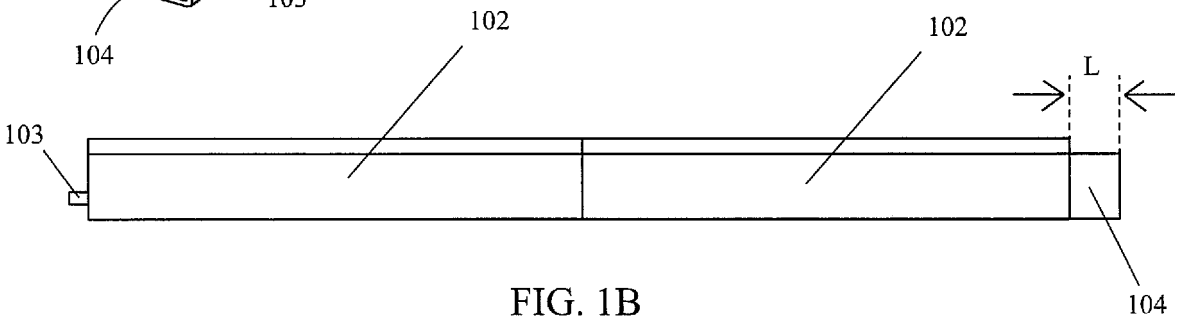

FIG. 1B

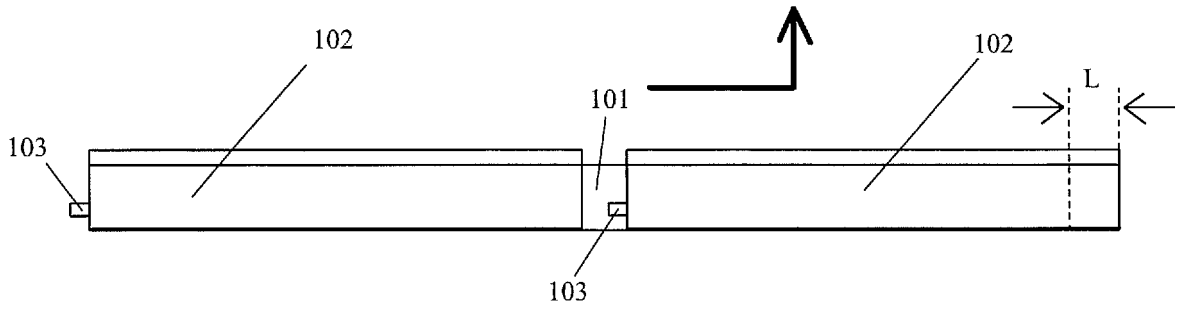

FIG. 1C

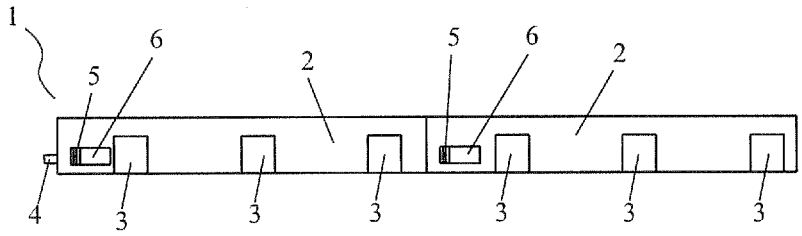

FIG. 2A

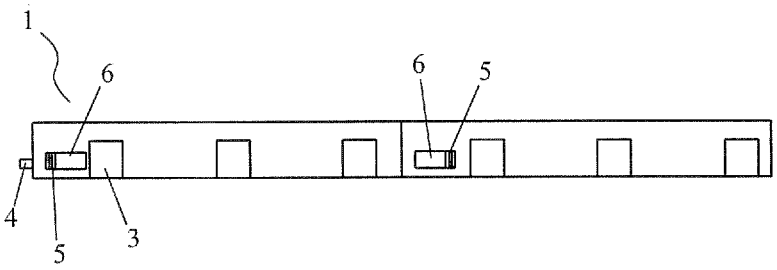

FIG. 2B

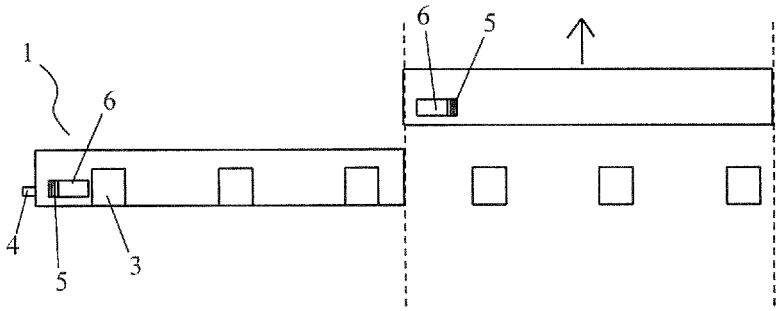

FIG. 2C

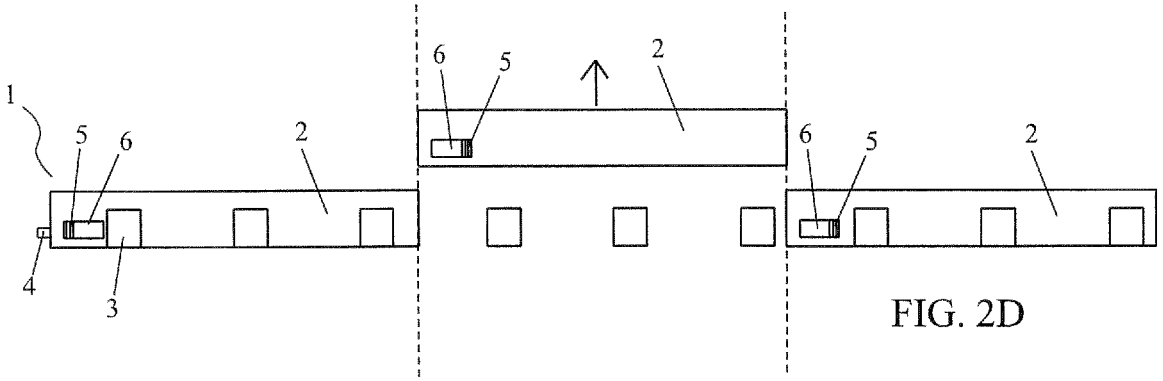

FIG. 2D

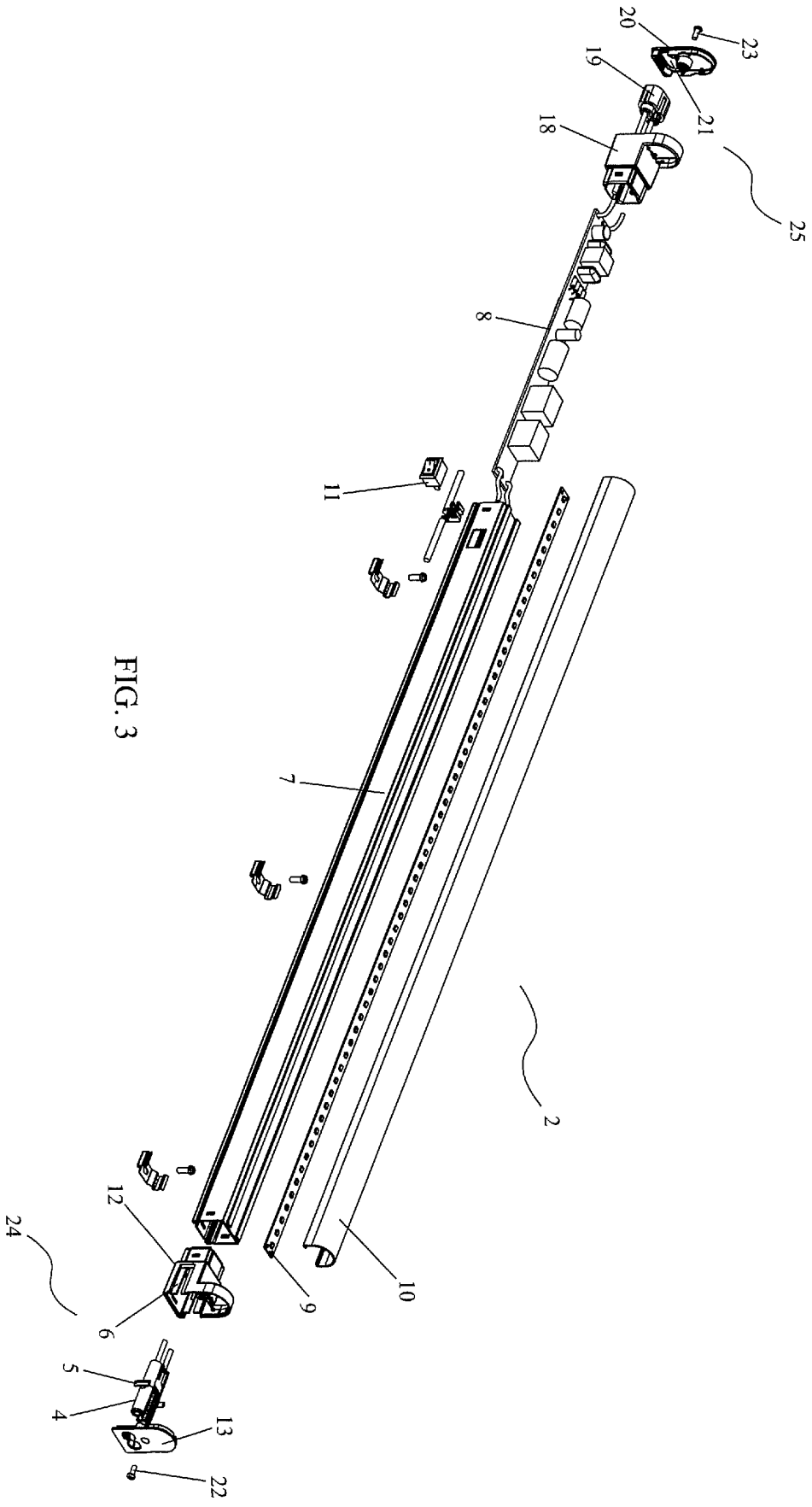

FIG. 3

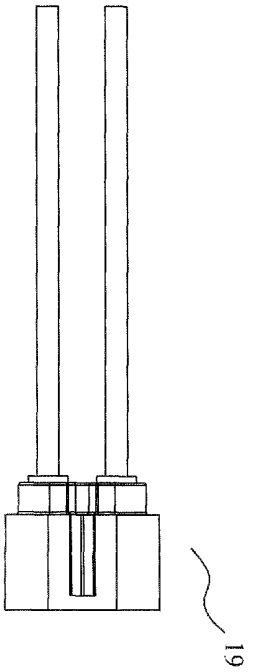

FIG. 4C

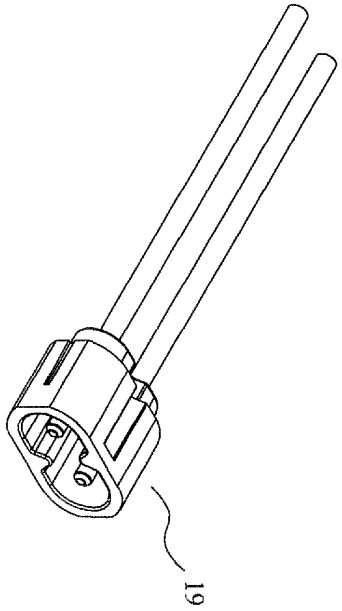

FIG. 4A

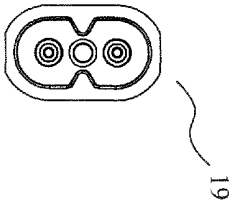

FIG.4D

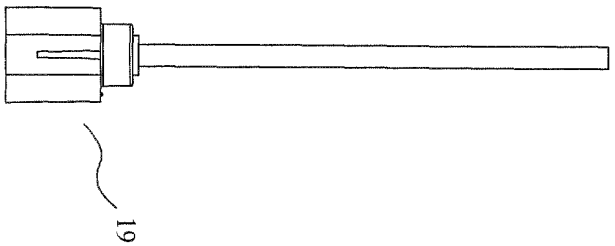

FIG. 4B

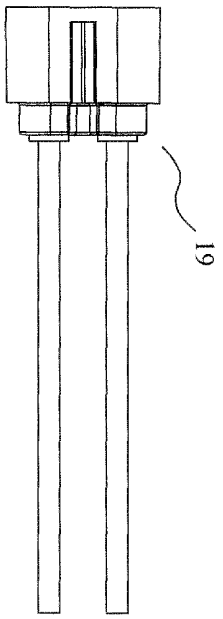

FIG. 4E

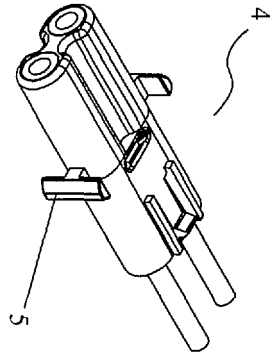

FIG. 5A

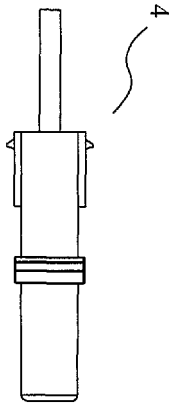

FIG. 5B

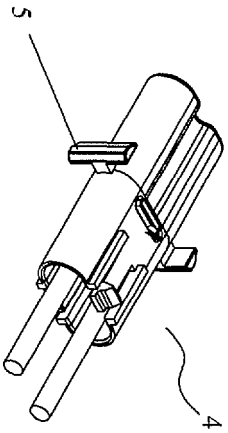

FIG. 5C

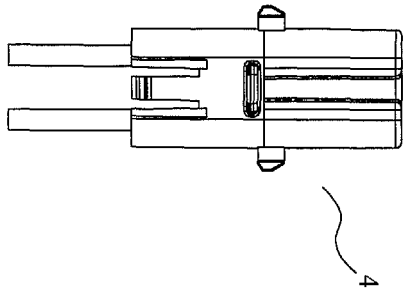

FIG. 5D

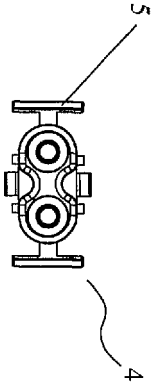

FIG. 5E

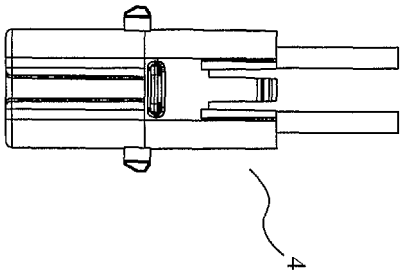

FIG. 5F

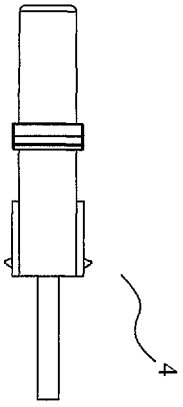

FIG. 5G

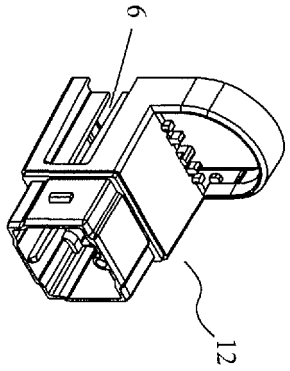

FIG. 6A

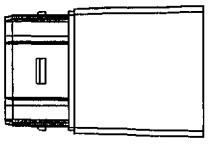

FIG. 6B

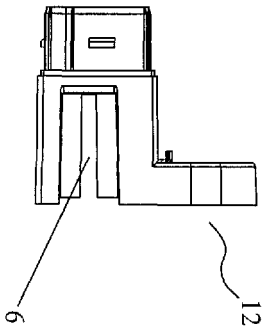

FIG. 6C

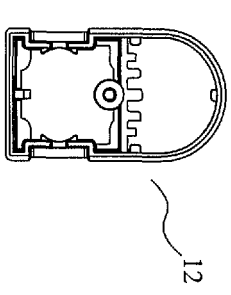

FIG. 6D

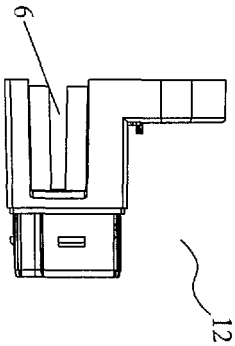

FIG. 6E

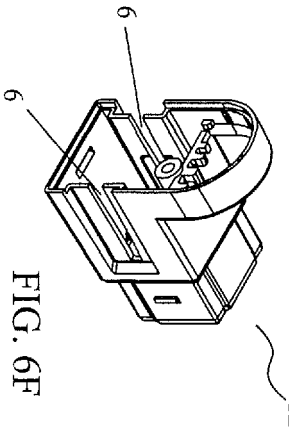

FIG. 6F

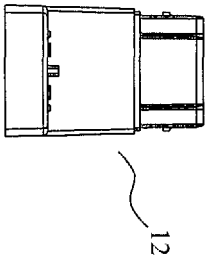

FIG. 6G

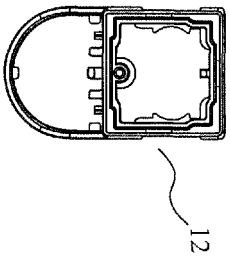

FIG. 6H

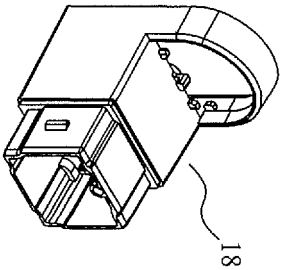

FIG. 6I

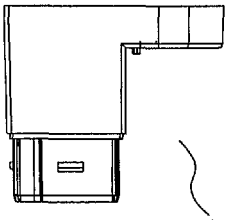

FIG. 6J

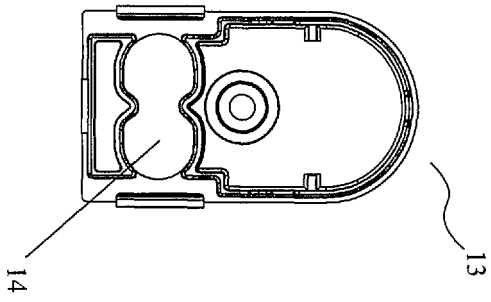

FIG. 7A

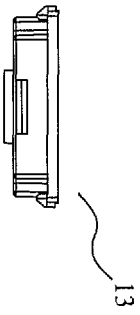

FIG. 7B

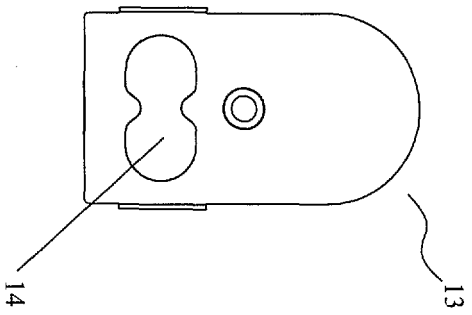

FIG. 7C

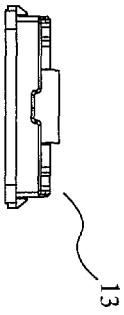

FIG. 7D

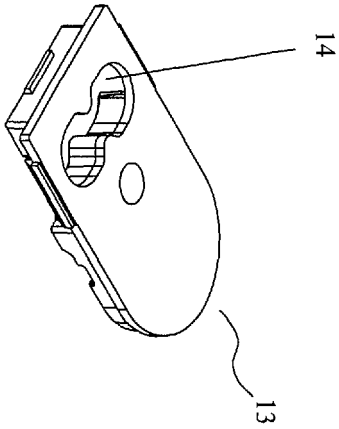

FIG. 7E

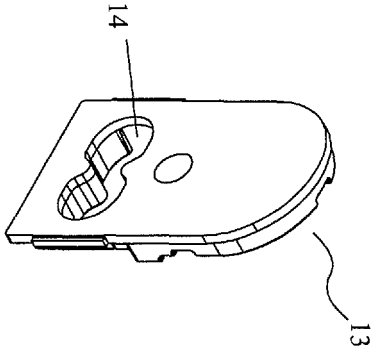

FIG. 7F

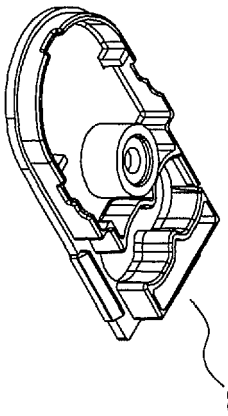

FIG. 7G

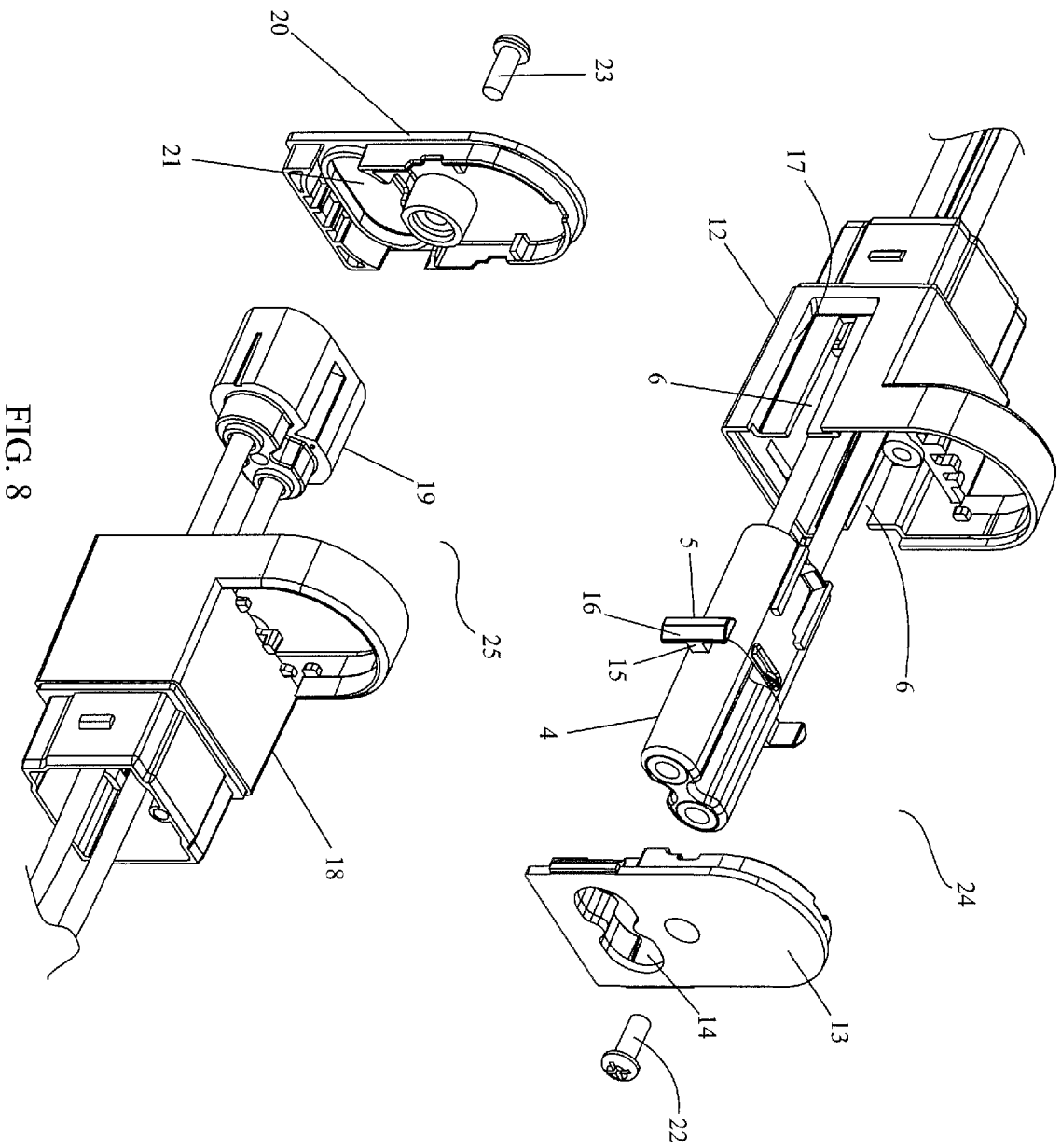

FIG. 8

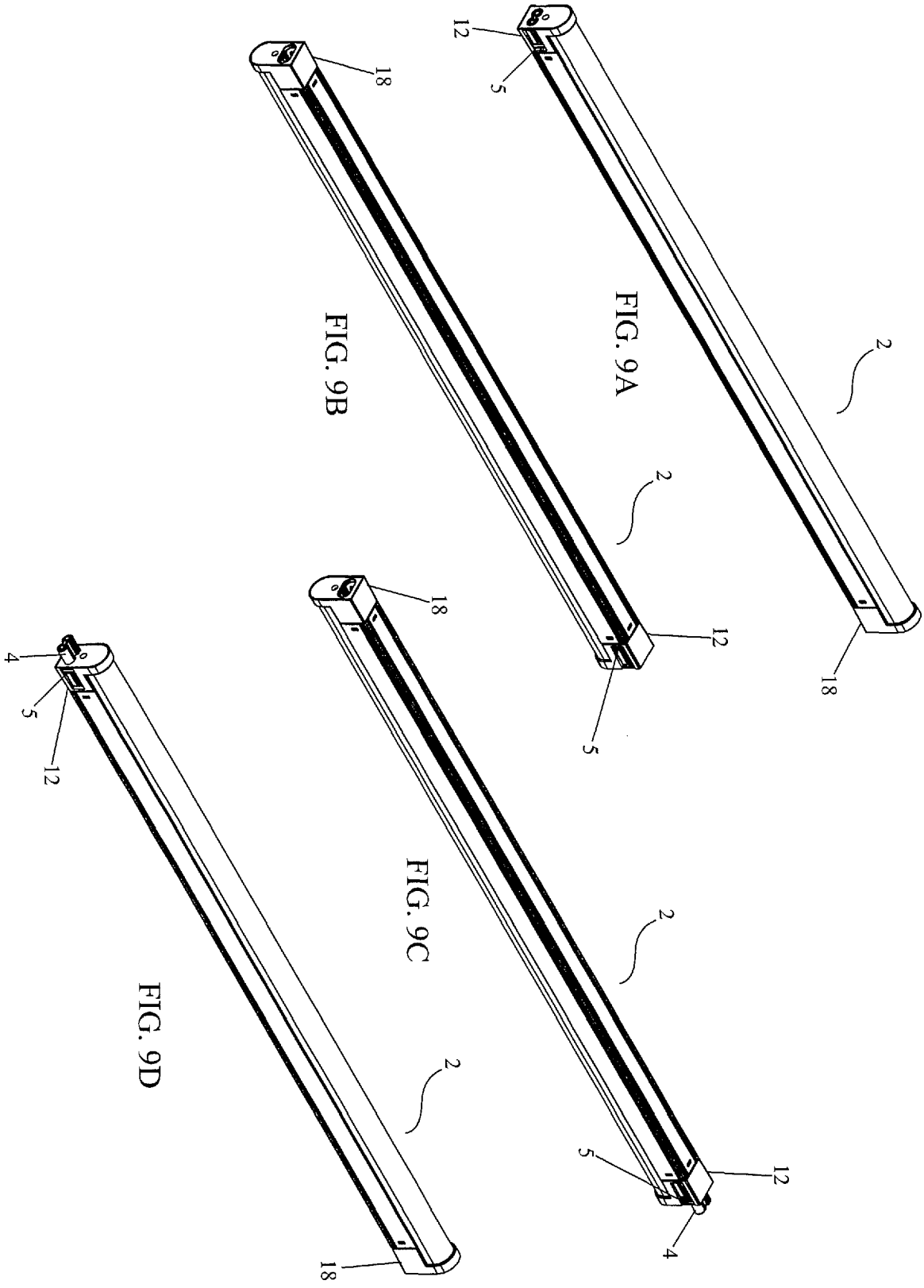
12
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FIG. 9A
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FIG. 9B
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FIG. 9C
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FIG. 9D

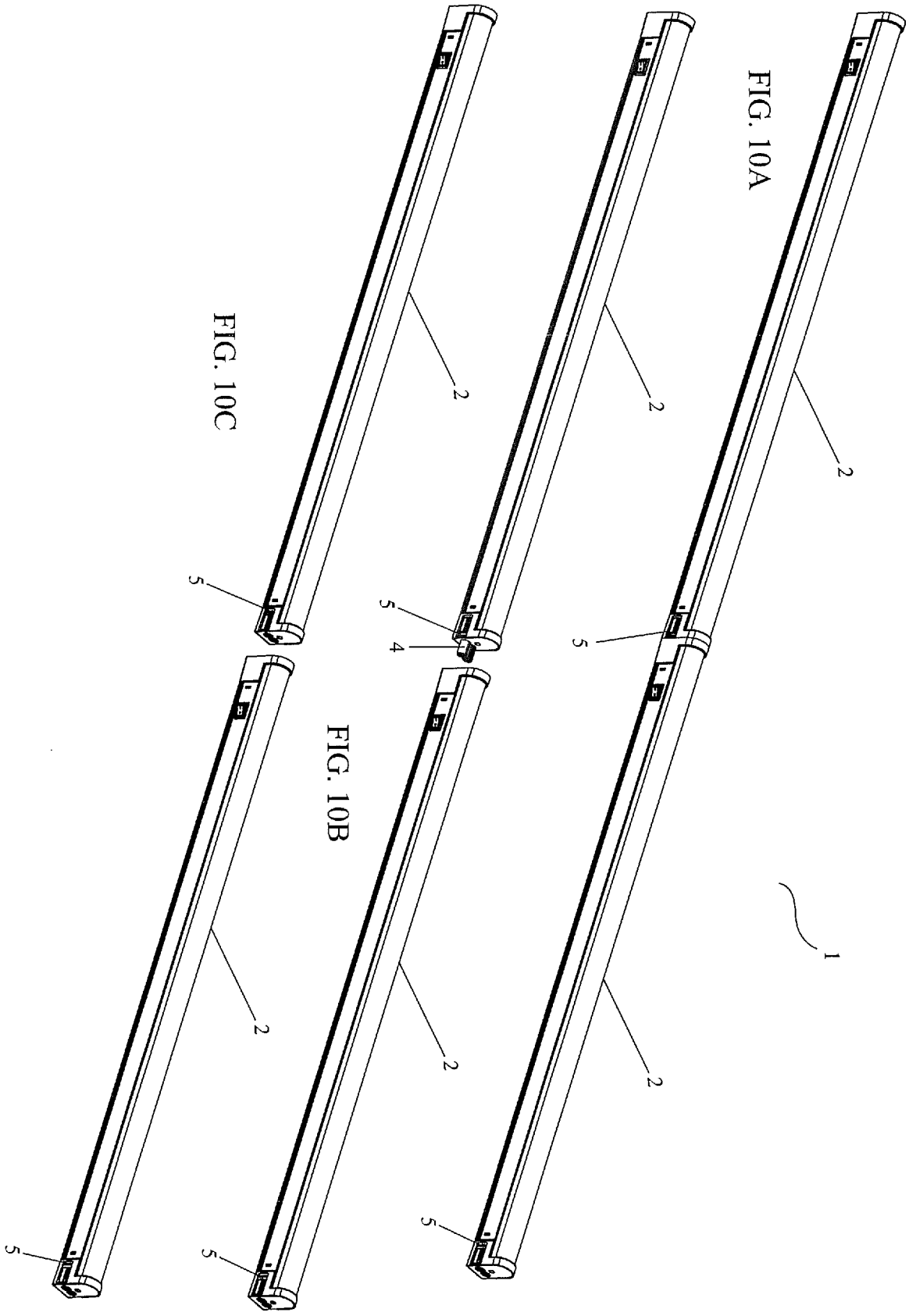

FIG. 10A

FIG. 10B

FIG. 10C

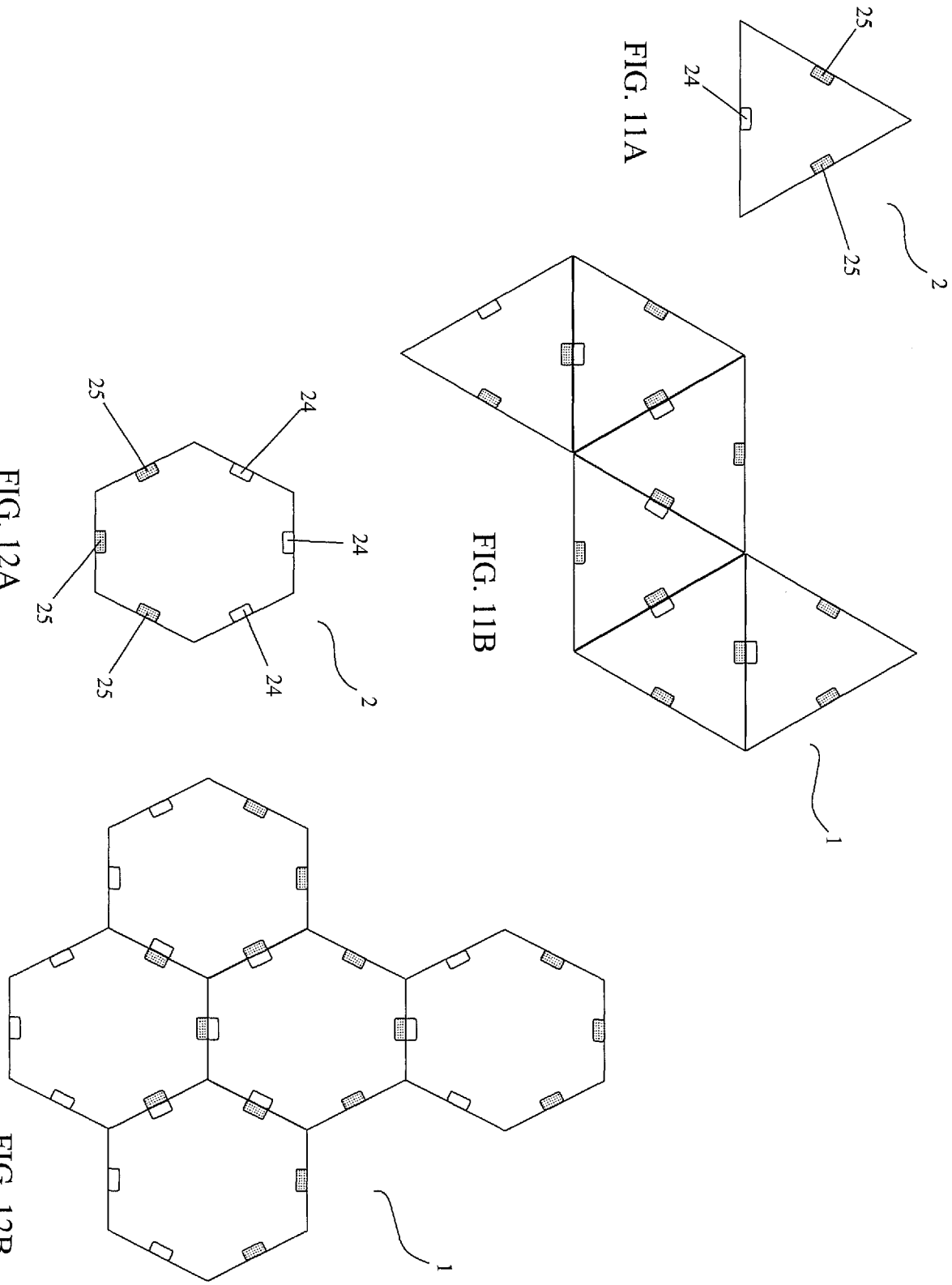

FIG. 11A

FIG. 11B

FIG. 12A

FIG. 12B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/089911

A. CLASSIFICATION OF SUBJECT MATTER

F21V 23/06 (2006.01) i; F21S 8/00 (2006.01) i; F21Y 101/02 (2006.01) n

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; F21V; F21Y

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)

CNKI, CNPAT, WPI, EPODOC: MASS TECHNOLOGY CO., LTD.; HU, Anhua; electric connection, lamp, light emitting diode, component, electric, connect, retract, extend, LED

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203336267 U (OSRAM GMBH), 11 December 2013 (11.12.2013), description, paragraphs 0041-0065, and figures 2-9	1-17
PX	CN 204328635 U (MASS TECHNOLOGY CO., LTD.), 13 May 2015 (13.05.2015), claims 1-17	1-17
A	DE 102011008898 A1 (SUPERNOVA LIGHTING INNOVATION CO., LTD.), 19 July 2012 (19.07.2012), the whole document	1-17
A	CN 203771104 U (FUJIAN SCOTON ELECTRONIC TECHNOLOGY CO., LTD.), 13 August 2014 (13.08.2014), the whole document	1-17
A	CN 202915096 U (OSRAM GMBH), 01 May 2013 (01.05.2013), the whole document	1-17

☐ 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	Date of mailing of the international search report
19 October 2015 (19.10.2015)	**04 November 2015 (04.11.2015)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **XING, Minghao** Telephone No.: (86-10) **62413449**

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/089911

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 203336267 U	11 December 2013	None	
CN 204328635 U	13 May 2015	None	
DE 102011008898 A1	19 July 2012	None	
CN 203771104 U	13 August 2014	None	
CN 202915096 U	01 May 2013	None	

Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 201110008898 **[0003]**