(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 780 285 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
**17.02.2021 Bulletin 2021/07**

(21) Application number: **19903353.1**

(22) Date of filing: **14.01.2019**

(51) Int Cl.:
***H01R 13/52*** *(2006.01)*

(86) International application number:
**PCT/CN2019/071646**

(87) International publication number:
**WO 2020/133599 (02.07.2020 Gazette 2020/27)**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**KH MA MD TN**

(30) Priority: **28.12.2018 CN 201811626201**

(71) Applicant: **Jiangsu Enman Electronic Industry Co., Ltd.**
**Kunshan, Jiangsu 215000 (CN)**

(72) Inventor: **WANG, Chuanbao**
**huainan, Anhui 232200 (CN)**

(74) Representative: **Cabinet Chaillot**
**16/20, avenue de l'Agent Sarre**
**B.P. 74**
**92703 Colombes Cedex (FR)**

# (54) ELECTRIC PLUG CONNECTOR AND MODULE WITH NEW DUST PREVENTION DOOR MECHANISM

(57) The invention discloses an electrical plug connector & module with new type dust-proof shutter mechanism, comprising an electrical plug connector slot, a window installed on the slot, a dust-proof shutter mechanism installed inside the window. The dust-proof shutter mechanism comprising a dust-proof shutter and a torsion spring, the clamps installed on opposite sides in the window for rotating the lower end of dust-proof shutter, an embedded torsion spring groove installed at the side of dust-proof shutter, a torsion spring fixed point installed on the inner wall of torsion spring groove, torsion spring sleeve installed on the torsion spring fixed point, dust-proof shutter installed on the dust-proof shutter clamp column by rotating the torsion spring, the direction of rotation is inside the window. The window is closed type window, the closed type window complete cover dust-proof shutter mechanism, the dust-proof shutter is provided with a limited structure to prevent the dust-proof shutter from being bombarded. After adopting the above solution, the dust-proof shutter will not protrude from the window and not easy to bounce out of the docking space/window, and the dust-proof effect is good with a new type of dust-proof shutter mechanism.

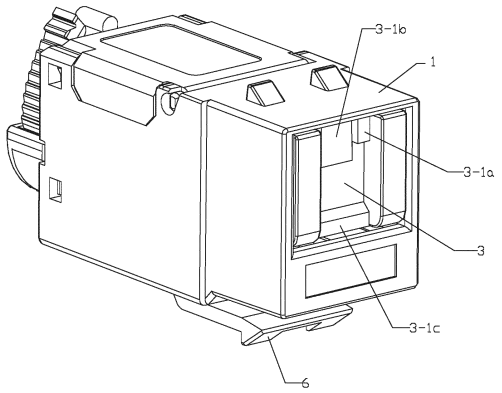


FIG.2

EP 3 780 285 A1

## Description

### Technical Field

**[0001]** The invention relates to electrical plug connector and module with new type dust-proof shutter mechanism & electrical plug connector module.

### Background Technology

**[0002]** The electrical plug connector is used to establish an electrical connection between the first cable and the second cable, or is also used to establish an electrical connection between the first cable and the electrical appliance, to prevent the dust enter into the electrical plug connector and causing poor connection, thus, a dust-proof shutter structure will be added, some dust-proof shutter structures are non-rotating, plug in and out are complicated. To solve this problem, the Chinese invention patent with application publication number CN 103-135183 A and application publication date of 2013.06.05 discloses an optical fiber connector with a dust-proof shutter structure, which discloses that the dust-proof shutter can directly plug in through the setting of elastic elements, but when plug out, the dust-proof shutter will bounce out of the docking space where the dust-proof door is installed due to the elastic element, the dust-proof effect is not good.

### Content Of Invention

**[0003]** In order to overcome the above-mentioned shortcomings, the object of the present invention is to provide an electrical plug connector and module with new type dust-proof shutter mechanism, which will not protrude from the window and not easy to bounce out of the docking space/window, and the dust-proof effect is good.

**[0004]** In order to achieve the above object, the technical solution adopted by the present invention is: an electrical plug connector and module with new type dust-proof shutter mechanism, comprising an electrical plug connector slot body, a window installed on the slot, and the dust-proof shutter mechanism installed inside the window, the dust-proof shutter mechanism comprising a dust-proof shutter and a torsion spring, the clamping column installed on opposite sides in the window for rotating the lower end of dust-proof shutter, and an embedded torsion spring groove installed at the side of dust-proof shutter, a torsion spring fixed point installed on the inner wall of torsion spring groove, torsion spring sleeve installed on the torsion spring fixed point, dust-proof shutter installed on the dust-proof shutter clamping column by rotating the torsion spring ,the direction of rotation is inside the window, the window is closed type window, the closed type window complete cover dust-proof shutter mechanism, the dust-proof shutter is provided with a limited structure to prevent the dust-proof shutter from being bombarded.

**[0005]** The good effect of this invention for electrical plug connector & module with new type dust-proof shutter mechanism is, the window is closed type to completely cover the dust-proof shutter mechanism, to prevent dust enter into the window, and the limited structure protect the dust-proof door from turning out, so that the dust-proof door will not protrude from the window and it is not easy to rebound out of the docking space /window, good dust-proof effect.

**[0006]** Preferably, the limit structure does not require an extra additional structure, only need to set the position of limited structure and structure.

**[0007]** The limited structure in the present invention is arranged at the frame of the dust-proof shutter rotating area, the limited structure comprising an arc structure set on the inner side of the frame of the dust-proof shutter rotating area, and right angle structure set on the outside of the frame of the dust-proof shutter rotating area.

**[0008]** As the dust-proof shutter is turned inward, when the dust-proof shutter rotates to the inside around the dust-proof shutter clamping column, the arc structure on the inner side of the dust-proof shutter will not hinder the rotation of the dust-proof shutter, and the torsion spring is in a compressed state; When the plug is withdrawn, the elastic force released from the torsion spring will push the dust-proof shutter pop out. When the inner frame of the window touches the right angle structure, the rotation of the dust-proof shutter is restricted. In the specific implementation, it is necessary to ensure that the gap between the right angle structure of the dust-proof shutter and the inner frame of the window is small, and the value range of the tiny gap is not required. The value range only needs to be guaranteed: when the right angle structure of the dust-proof shutter touches inner frame of the closed type window, the dust-proof shutter is limited in the closed type window, and will not pop up due to elastic force.

**[0009]** Preferably, a ferrule limiting lip installed in the closed type window, the ferrule limiting lip and dust-proof shutter rotating area are located at opposite ends of the dust-proof shutter. The ferrule limiting lip can prevent the plug from independent bearing and shaking effectively, and ensure the effective contact between the ferrule and the plug.

**[0010]** Preferably, the inner borders of the inside of the closed type window is in right angle cutting process. It makes the closed type window fit electrical plug connector better.

**[0011]** Preferably, both ends of the outside of the dust-proof shutter close to the dust-proof shutter rotating area are provided with plug fixing blocks. After the plug of the electrical plug connector is inserted, the plug fixing block effectively prevents the plug from being unintentionally pulled out, so that the ferrule and the plug are effectively contacted to ensure continuous and effective signal transmission. A plug guide groove is formed between the two plug fixing blocks to guide the plug.

**[0012]** Preferably, the outside of the dust-proof shutter

at the other end opposite to the plug fixing block is provided with a plug limiting block. After the electrical plug connector plug is inserted, the plug limiting block effectively prevents the plug from being excessively inserted into the damaged block ferrule due to excessive force.

**[0013]** Preferably, conductive shrapnel avoidance grooves are provided on both sides of one end of the dust-proof shutter provided with the plug limiting block.

**[0014]** Preferably, the torsion spring groove has a free end groove for accommodating one of the free ends of the torsion spring, and the torsion spring groove is provided with a free end clamping groove for the other free end of the torsion spring to extend. The free end groove and the free end clamping groove are arranged oppositely.

**[0015]** The torsion spring body is located in the torsion spring groove, one free end is located in the free end accommodating groove, and the other free end is located in the free end clamping groove.

**[0016]** Preferably, the electrical plug connector and module with new type dust-proof shutter mechanism comprising a cover plate, pothook, 180 degree and 90 degree direct pressure ferrule, a PCB board, several contact teeth, a terminal base, a wire bonding cover and a wire management. The cover plate is rotated and set on the top of slot, and the pothook is set on the bottom of slot, the 180 degree or 90 degree direct pressure ferrule is inserted into the slot, the 180 degree or 90 degree direct pressure ferrule, PCB board, several contact teeth, the terminal base, the wire-bonding cover and the wire management are connected in sequence, the front end of the contact teeth are connected to the PCB board, the rear end of the contact teeth pass through the terminal base and connected with the cable pass through the rear end of the wire management.

**[0017]** Preferably, when the slot is a shielded slot, the pothook is separated from shielded pothook, and the pothook clip into from the side and fits into the pothook groove of shielded slot; or the slot is a shielded slot, the pothook is integrated with the unshielded slot.

**[0018]** Preferably, when the slot is a shielded slot, a limited fixing clamping column post in the pothook groove. The rear of the separated pothook is provided with a fixed chute, and the mouth of the fixed chute is provided with a limited pothook, and the opening of the fixed chute is an eight-character groove that is convenient for the sliding of the limited fixing clamping column. The setting of eight-character groove makes it convenient for the limit fixing clamping column to be introduced into the fixed chute. During installation, the separated pothook is clamped in place by the side extension limit fixing clamping column, and the limit pothook at the opening of the fixed chute will fix the limit fixing column, so that the pothook is completely fixed to the shielded slot, and will not fall off due to external force.

**[0019]** The electrical plug connector and module comprising at least one electrical plug connector with new type dust-proof shutter mechanism and a blank patch panel, at least one electrical plug connector with new type dust-proof shutter mechanism installed on the blank patch panel.

**[0020]** The benefit of the invention is that the electrical plug connector module of the present invention is that the above-mentioned electrical plug connector with the new dust-proof shutter mechanism is applied to the electrical plug connector module.

**[0021]** Similarly, since the window is in a closed type that the dust-proof shutter mechanism is completely covered which make it difficult for dust to enter the inside of the window, and the limiting structure is used to limit the dust-proof shutter from turning out. It is used in conjunction with the structure of the dust-proof shutter to make the electrical plug connector module have a good dust-proof effect, the contact between the plug and the ferrule is stable, the appearance is better, the use is more convenient, the life is longer, and the dust-proof shutter does not turn out.

## Description Of Figures

**[0022]**

FIG. 1 is a graphic model of embodiment of disassembled 90 degrees electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG. 2 is a graphic model of embodiment of 90 degrees electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG. 3 is a graphic model of 90 degrees dust-proof shutter electrical plug connector in use;

FIG. 4 is a graphic model of embodiment of 180 degrees electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG. 5 is a graphic model of embodiment of the dust-proof shutter in the electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG. 6 is a graphic model of embodiment of another angle of the dust-proof shutter in the electric plug connector with dust-proof shutter mechanism of the present invention;

FIG.7 is a main view of electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG.8 is a side view of electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG. 9 is a graphic model of embodiment of the torsion spring groove in the electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG. 10 is a graphic model of embodiment of shielded slot of the present invention;

FIG. 11 is a graphic model of embodiment of one angle of the pothook of the present invention;

FIG. 12 is a graphic model of embodiment of another angle of the pothook of the present invention;

FIG. 13 is an explosion diagram of embodiment of the electrical plug connector with dust-proof shutter mechanism of the present invention;

FIG. 14 is a graphic model of embodiment of electrical plug connector module of the present invention;

FIG. 15 is a graphic model of embodiment of the application of the dust-proof shutter mechanism in network patch panel of the present invention.

**Concrete Implementation Method**

**[0023]** The following is a detailed description of the preferred embodiment of the invention in combination with the figures, so that the advantages and features of the invention can be more easily understood by technicians in this line, then to make a clearer definition of the protection scope of this invention.

**[0024]** As shown in Fig. 1-13, an electrical plug connector with dust-proof shutter mechanism in the embodiment comprises an electrical plug connector slot body 1, a window 2 installed on the slot, and the dust-proof shutter mechanism 3 installed inside the window, the dust-proof shutter mechanism 3 comprising a dust-proof shutter 3-1 and a torsion spring 3-3, the clamping column 2-1 is installed on opposite sides in the window 2 for rotating the lower end of dust-proof shutter 3-1.

**[0025]** The upper end of the dust-proof shutter is the rotating area A of dust-proof shutter.

**[0026]** An embedded torsion spring groove 3-2 is installed at the side of dust-proof shutter 3-1, a torsion spring fixed point is installed on the inner wall of torsion spring groove 3-2, a torsion spring 3-3 sleeve is installed on the torsion spring fixed point, dust-proof shutter 3-1 is installed on the dust-proof shutter clamping column 2-1 by rotating the torsion spring 3-3, the direction of rotation is inside the window, the window 2 is closed type window 2, the inner borders of the inside of the closed type window is in right angle cutting process, it makes the closed type window fit electrical plug connector better, the closed type window 2 complete cover dust-proof shutter mechanism 3, the dust-proof shutter 3-1 is provided with a limited structure 4 to prevent the dust-proof shutter 3-1 from being bombarded.

**[0027]** The limited structure 4 in the present invention is arranged at the frame of the dust-proof shutter rotating area A, the limited structure 4 comprising an arc structure 4-1 set on the inner side of the frame of the dust-proof shutter rotating area A, and right angle structure 4-2 set on the outside of the frame of the dust-proof shutter rotating area A.

**[0028]** As shown in Fig. 1-2, in order to limit the ferrule, a ferrule limiting lip 5 installed in the bottom of the closed type window 2, the ferrule limiting lip 5 and dust-proof shutter rotating area A are located at opposite ends of the dust-proof shutter 3-1. The ferrule limiting lip 5can prevent the plug from independent bearing and shaking effectively, and ensure the effective contact between the ferrule and the plug.

**[0029]** In order to facilitate plug insertion, both ends of the outside of the dust-proof shutter 3-1 near the dust-proof rotating area A are provided with plug fixing blocks 3-1a, after the plug of the electrical plug connector is inserted, the plug fixing block 3-1a effectively prevents the plug from being unintentionally pulled out, so that the ferrule and the plug are effectively contacted to ensure continuous and effective signal transmission.

**[0030]** A plug guide groove 3-1b is formed between the two plug fixing blocks 3-1a.

**[0031]** In order to facilitate plug insertion, as shown in Fig. 5, the outside of the dust-proof shutter 3-1 at the other end opposite to the plug fixing block 3-1a is provided with a plug limiting block 3-1c. As shown in Fig. 5, the conductive shrapnel avoidance grooves 3-1d are provided on both sides of one end of the dust-proof shutter 3-1 provided with the plug limiting block 3-1c.

**[0032]** As shown in Fig. 9, the torsion spring groove 3-2 has a free end groove 3-2a for accommodating one of the free ends of the torsion spring 3-3, and the torsion spring groove 3-2 is provided with a free end clamping groove 3-2b for the other free end of the torsion spring 3-3 to extend. The free end groove 3-2a and the free end clamping groove 3-2b are arranged oppositely. Ensure the accurate installation of torsion spring 3-3.

**[0033]** As shown in Fig. 1,2,10, the electrical plug connector and module with new type dust-proof shutter mechanism 13 comprises a cover plate 5, pothook 6, 180 degree and 90 degree direct pressure ferrule 7, a PCB board 8, several contact teeth 9, a terminal base 10, a wire bonding cover 11 and a wire management 12. The cover plate 5 is rotated and set on the top of slot 1, and the pothook 6 is set on the bottom of slot 1, the 180 degree or 90 degree direct pressure ferrule 7 is inserted into the slot, the 180 degree or 90 degree direct pressure ferrule 7, PCB board 8, several contact teeth 9, the terminal base 10, the wire-bonding cover 11 and the wire management 12 are connected in sequence, the front end of the contact teeth are connected to the PCB board 8, the rear end of the contact teeth 9 pass through the terminal base 10 and connected with the cable pass through the rear end of the wire management 12.

**[0034]** The slot 1 can be a shielded slot 1a,the pothook 6 is separated from shielded slot 1a,and the pothook 6 clip into from the side and fits into the pothook groove 1b of shielded slot 1a.

**[0035]** When the slot is a shielded slot 1a, a limited fixing clamping column 1c post in the pothook groove 1b. The rear of the separated pothook 6 is provided with a fixed chute 6a, and the mouth of the fixed chute 6a is provided with a limited pothook 6b, and the opening of the fixed chute 6a is an eight-character groove 6c that is convenient for the sliding of the limited fixing clamping column 1c.

**[0036]** The setting of eight-character groove makes it convenient for the limit fixing clamping column to be introduced into the fixed chute 6a. During installation, the separated pothook is clamped in place by the side extension limit fixing clamping column 1c, and the limit pothook 6b at the opening of the fixed chute will fix the limit fixing column, so that the pothook is completely fixed to the shielded slot, and will not fall off due to external force.

**[0037]** The slot 1 can be a unshielded slot, the pothook 6 integrated with unshielded slot.

**[0038]** As shown in Fig. 14, the electrical plug connector and module comprising above mentioned electrical plug connector with new type dust-proof shutter mechanism 13, a blank patch panel 14, at least one electrical plug connector with new type dust-proof shutter mechanism 13 installed on the blank patch panel 14.

**[0039]** As shown in Fig. 15, the quantity of ports can be add according to the exact application of network patch panel.

**[0040]** The above implementation mode is only to illustrate the technical conception and characteristics of the invention, and its purpose is to let people familiar with the technology understand the content of the invention and implement it, and cannot limit the protection scope of the invention. All equivalent changes or modifications made according to the spiritual essence of the invention shall be covered in the protection scope of the invention.

## Claims

1. Electrical plug connector and module with new type dust-proof shutter mechanism (13), comprising an electrical plug connector slot body (1), a window (2) installed on the slot, and the dust-proof shutter mechanism (3) installed inside the window, the dust-proof shutter mechanism (3) comprising a dust-proof shutter (3-1) and a torsion spring (3-3), a clamping column (2-1) installed on opposite sides in the window (2) for rotating the lower end of dust-proof shutter (3-1), and an embedded torsion spring groove (3-2) installed at the side of the dust-proof shutter (3-1), a torsion spring fixed point installed on the inner wall of torsion spring groove (3-2), torsion spring (3-3) sleeve installed on the torsion spring fixed point, dust-proof shutter (3-1) installed on the dust-proof shutter clamping column (2-1) by rotating the torsion spring (3-3), the direction of rotation is inside the window, **characterized in that** the window is closed type window (2), the closed type window complete cover dust-proof shutter mechanism (3), the dust-proof shutter (3-1) is provided with a limited structure (4) to prevent the dust-proof shutter (3-1) from being bombarded.

2. The electrical plug connector and module with new type dust-proof shutter mechanism (13) according to claim 1, **characterized in that** the limited structure (4) is installed at the frame of dust-proof shutter rotating area (A), the limited structure (4) comprising an arc structure (4-1) set on the inner side of the frame (A1) of the dust-proof shutter rotating area (A), and right angle structure (4-2) set on the outside of the frame (A1) of the dust-proof shutter rotating area (A).

3. The electrical plug connector with new type dust-proof shutter mechanism (13) according to claim 1, **characterized in that** a ferrule limiting lip (5) is installed in the closed type window (2), the ferrule limiting lip (5) and dust-proof shutter rotating area (A) are located at opposite ends of the dust-proof shutter (3-1).

4. The electrical plug connector and module with new type dust-proof shutter mechanism (13) according to claim 1, **characterized in that** the inner borders of the inside of the closed type window (2) is in right angle cutting process.

5. The electrical plug connector and module with new type dust-proof shutter mechanism (13) according to claim 2, **characterized in that**
both ends of the outside of the dust-proof shutter (3-1) close to the dust-proof shutter rotating area (A) are provided with plug fixing blocks (3-1a), and a plug guide groove (3-1b) is formed between the two plug fixing blocks(3-1a);
the outside of the dust-proof shutter at the other end opposite to the plug fixing block is provided with a plug limit block (3-1); conductive shrapnel avoidance grooves (3-1d) are provided on both sides of one end of the dust-proof shutter (3-1) provided with the plug limit block (3-1c).

6. The electrical plug connector and module with new type dust-proof shutter mechanism (13) according to claim 1, **characterized in that** the torsion spring groove (3-2) has a free end groove (3-2a) for accommodating one of the free ends of the torsion spring (3-3), and the torsion spring groove (3-2) is provided with a free end clamping groove (3-2b) for the other free end of the torsion spring (3-3) to extend; the free end groove (3-2a) and the free clamping groove

(3-2b) are arranged oppositely.

**7.** The electrical plug connector and module with new type dust-proof shutter mechanism (13) according to claim 1,**characterized in** comprising a cover plate (15), pothook (6), 180 degree and 90 degree direct pressure ferrule (7), a PCB board, several contact teeth (9), a terminal base (10), a wire bonding cover (11) and a wire management (12); the cover plate (15) is rotated and set on the top of slot (1), and the pothook (6) is set on the bottom of slot (2), the 180 degree or 90 degree direct pressure ferrule (7) is inserted into the slot (1), the 180 degree or 90 degree direct pressure ferrule (7), PCB board (8), several contact teeth (9), the terminal base (10), the wire-bonding cover (11) and the wire management (12) are connected in sequence, the front end of the contact teeth (9) is connected to the PCB board (8), the rear end of the contact teeth (9) pass through the terminal base (10) and connected with the cable pass through the rear end of the wire management (12).

**8.** The electrical plug connector and module with new type dust-proof shutter mechanism (13) according to claim 1, **characterized in that** the slot is a shielded slot (1a), the pothook (6) is separated from shielded pothook (1a), and the pothook (6) clip into from the side and fits into the pothook groove (1b) of shielded slot (1a); or
Slot (1) is a shielded slot (1a), the pothook (6) is integrated with the unshielded slot.

**9.** The electrical plug connector and module with new type dust-proof shutter mechanism (13) according to claim 10, **characterized in that** a limited fixing clamping column (1c) post in the pothook groove (1b); the rear of the separated hook is provided with a fixed chute (6a), and the mouth of the fixed chute (6a) is provided with a limited pothook (6b), and the mouth of the fixed chute (6a) is an eight-character groove (6c) that is convenient for the sliding of the limited fixing clamping column (1c).

**10.** The electrical plug connector and module, **characterized in** comprising at least one electrical plug connector with new type dust-proof shutter mechanism (13) according to any one of claims 1 to 11, a blank patch panel (14), at least one electrical plug connector with new type dust-proof shutter mechanism (13) installed on the blank patch panel (14).

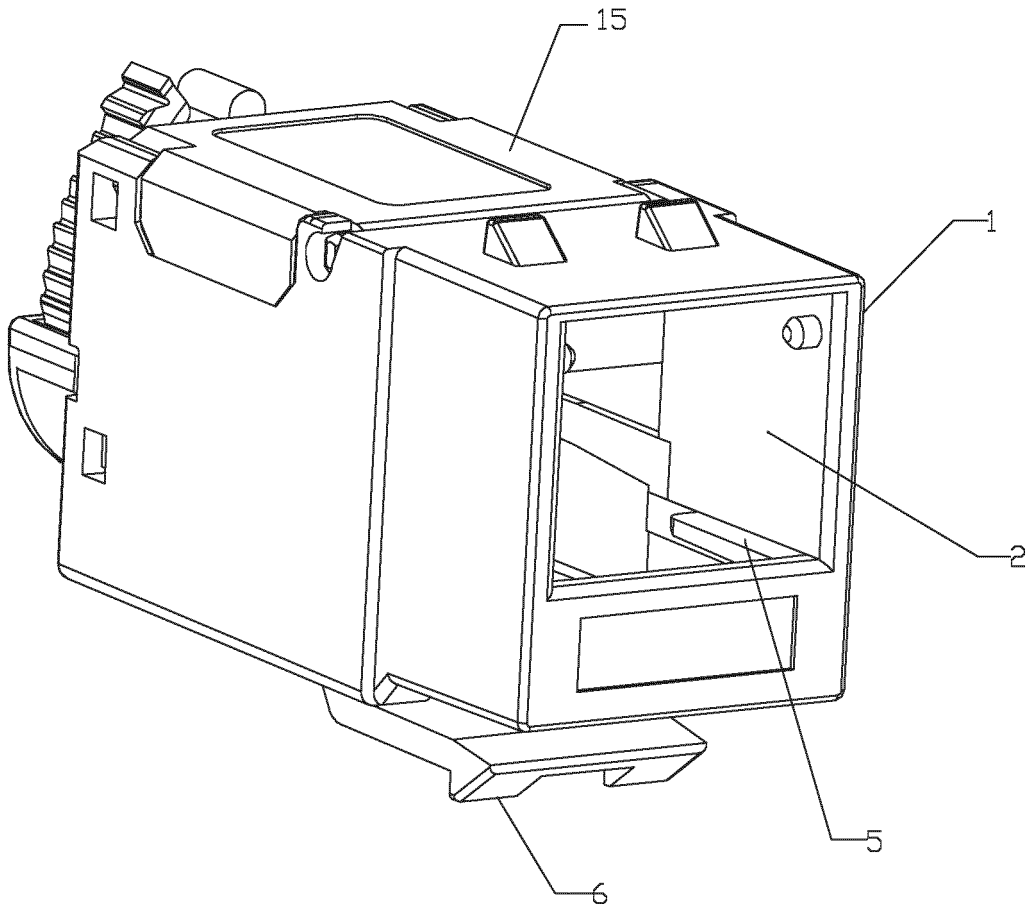


FIG.1

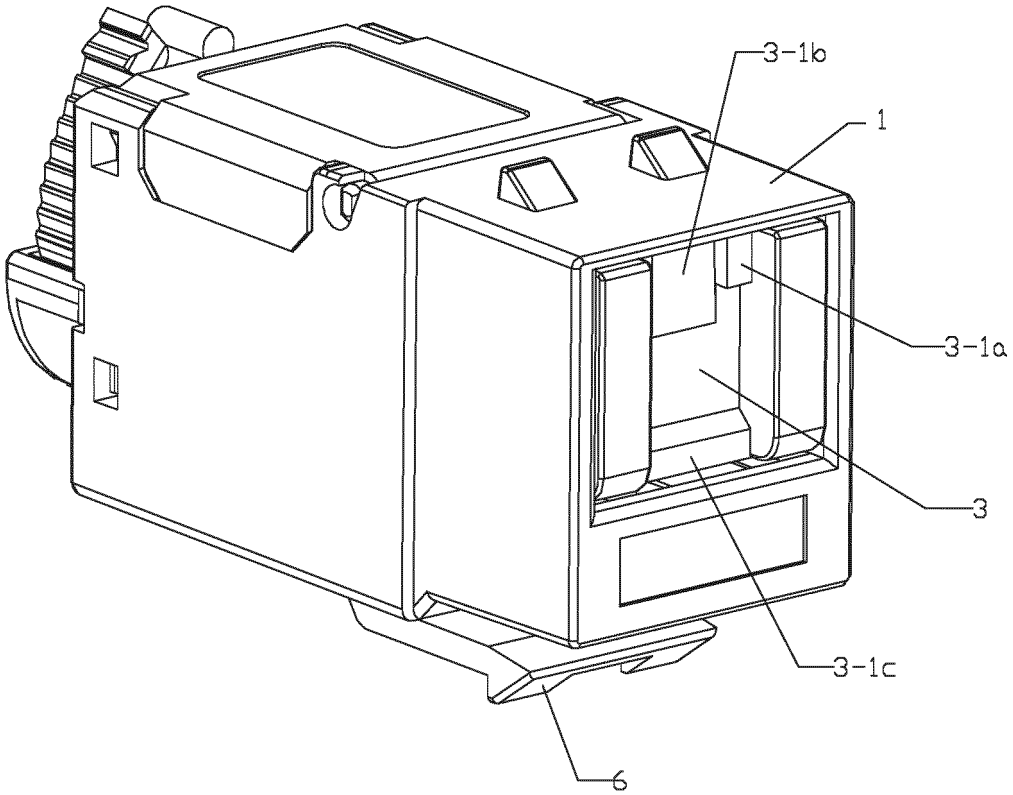


FIG.2

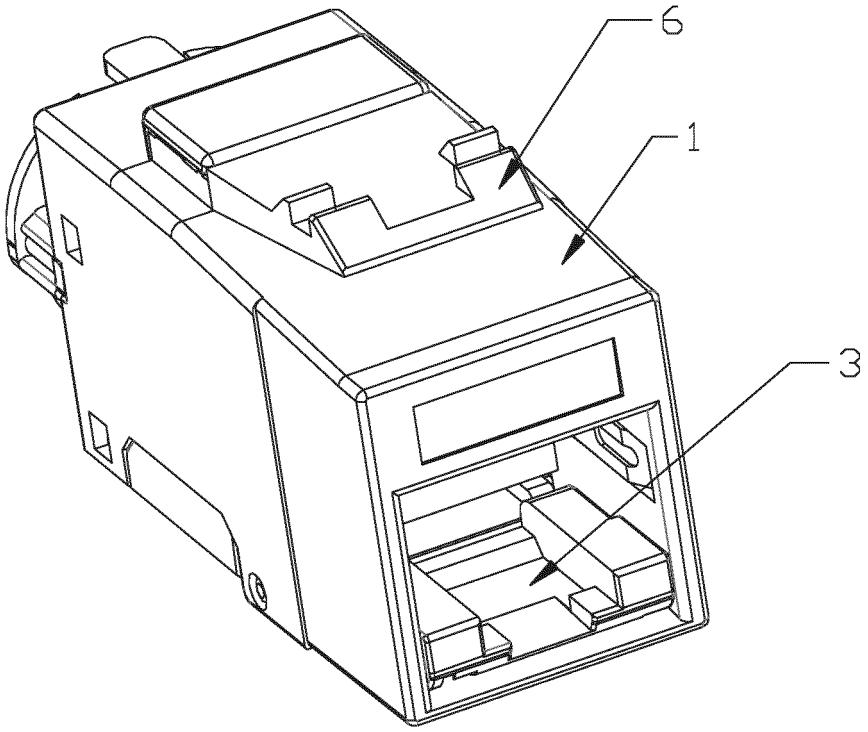


FIG.3

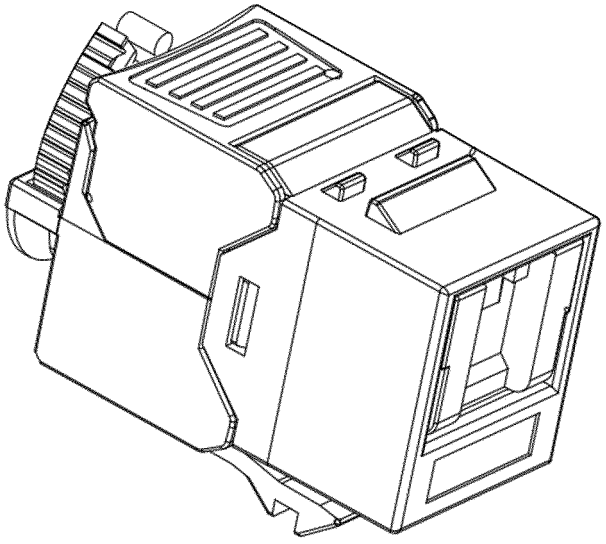

FIG.4

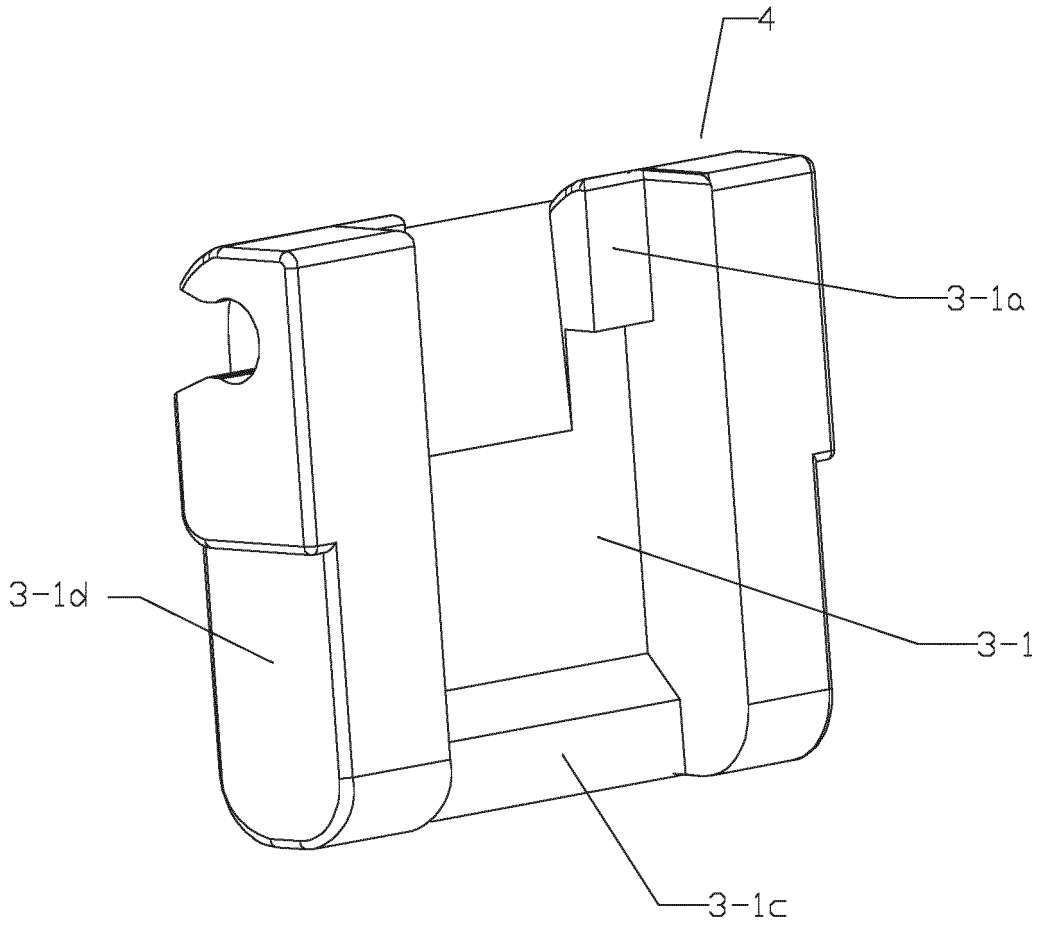


FIG.5

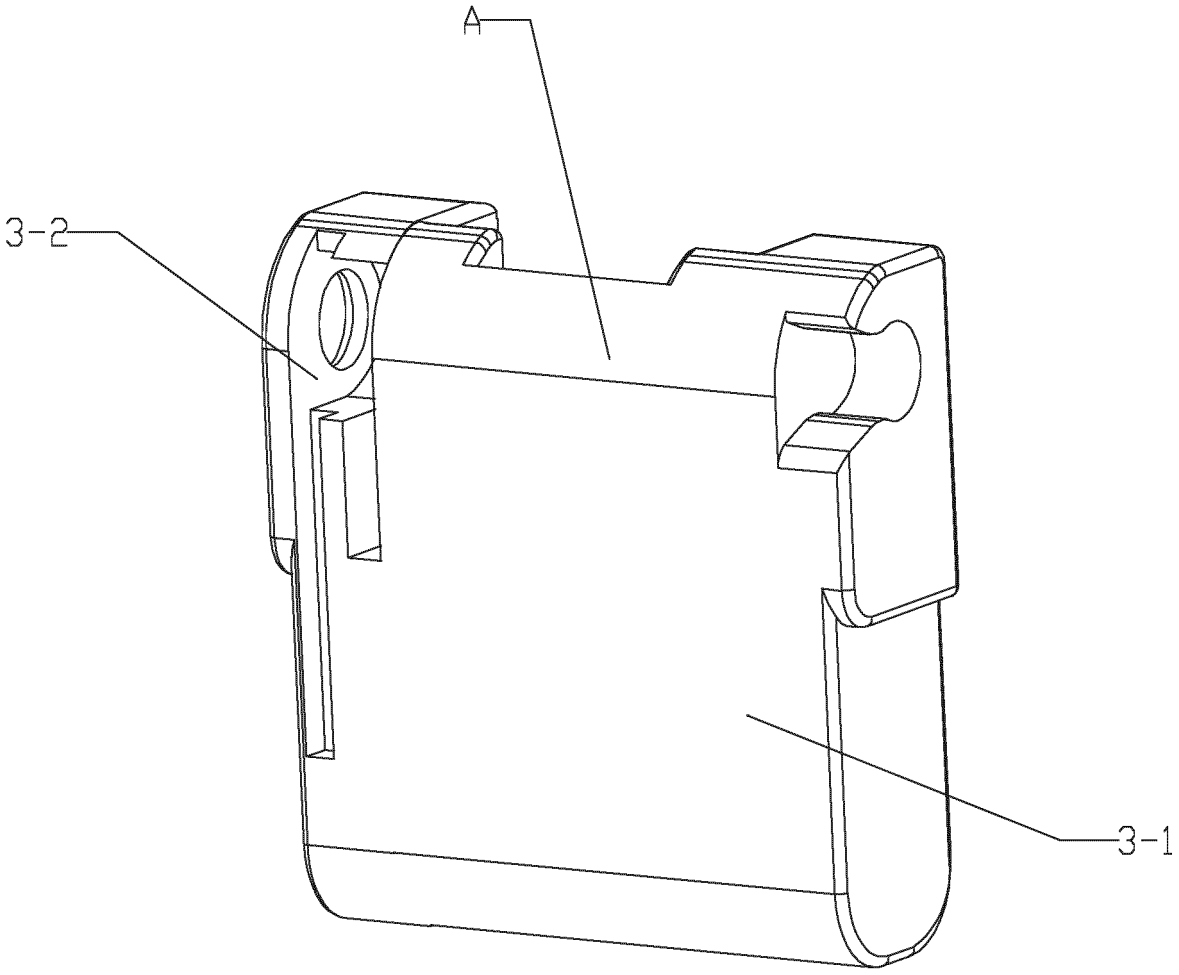


FIG.6

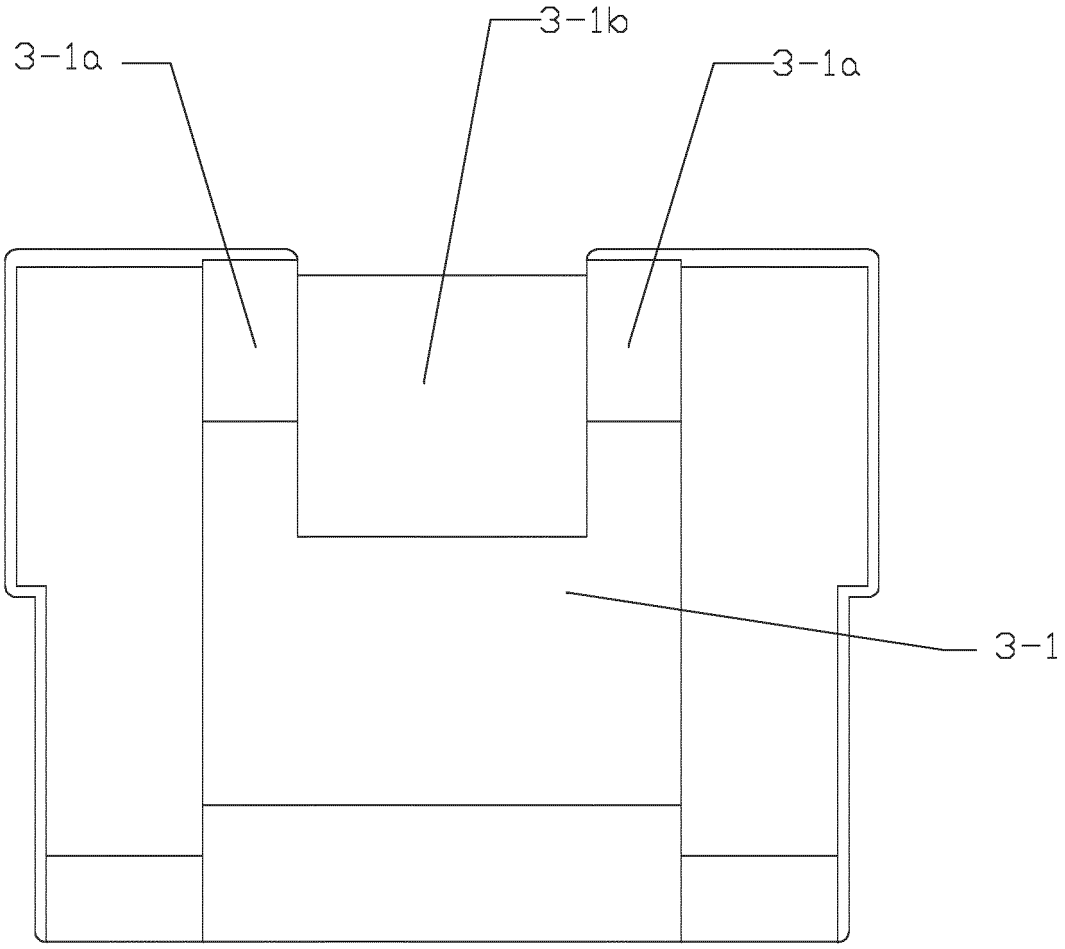


FIG.7

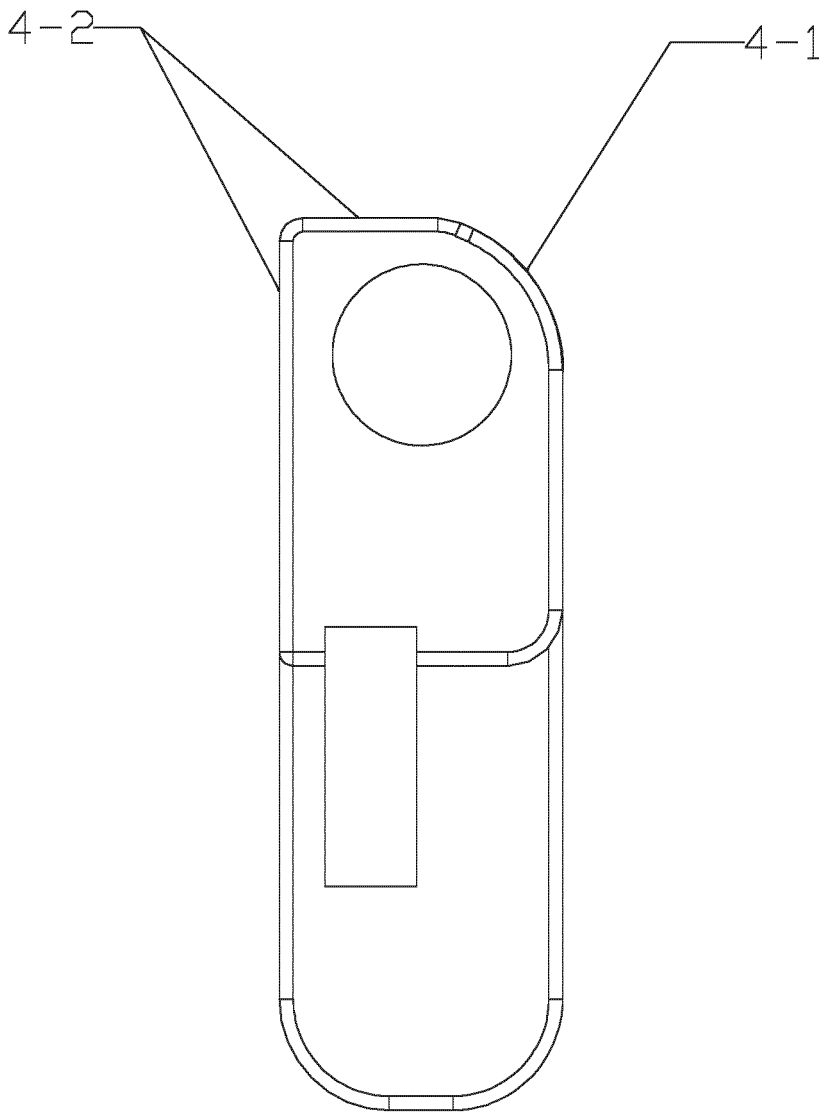


FIG.8

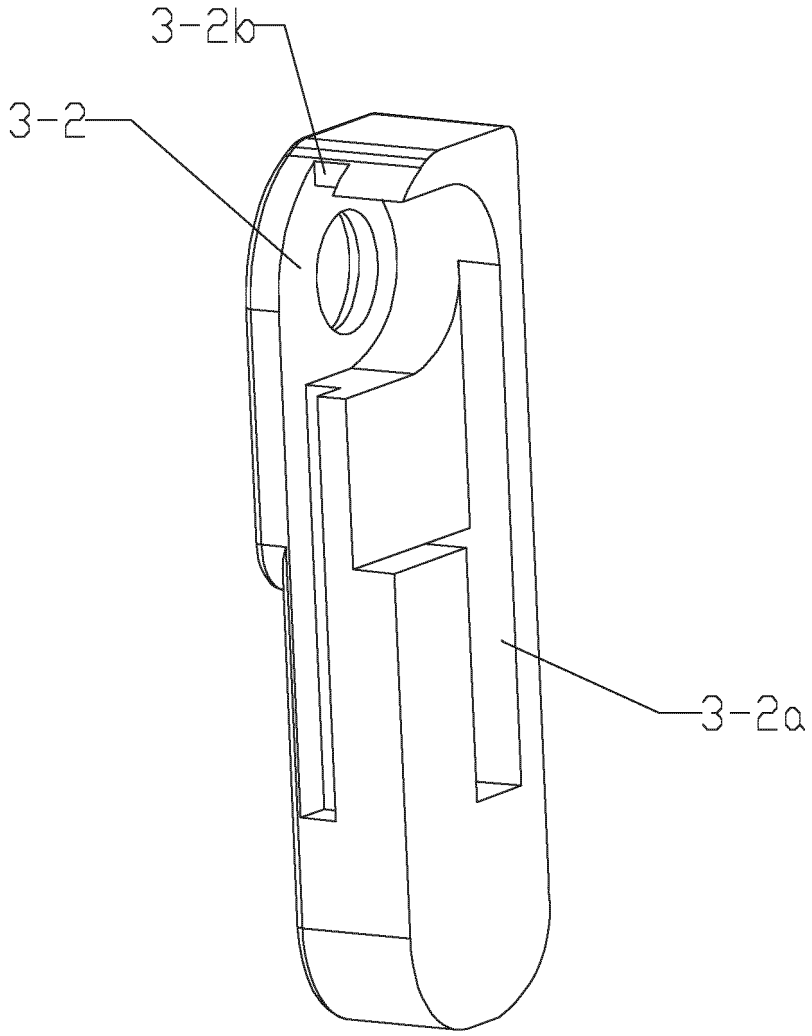


FIG.9

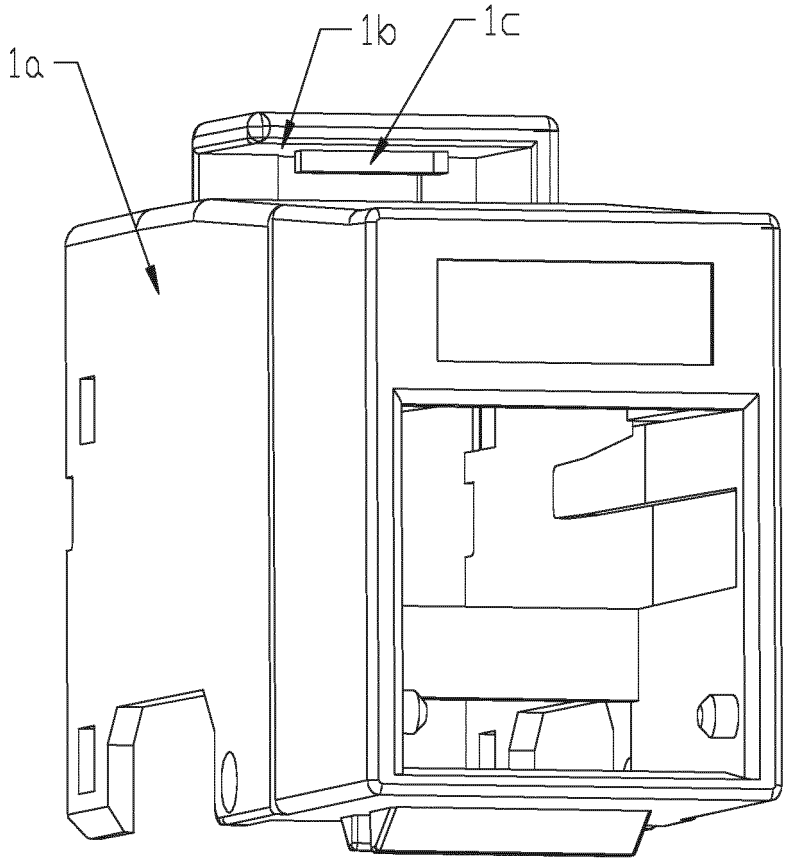


FIG.10

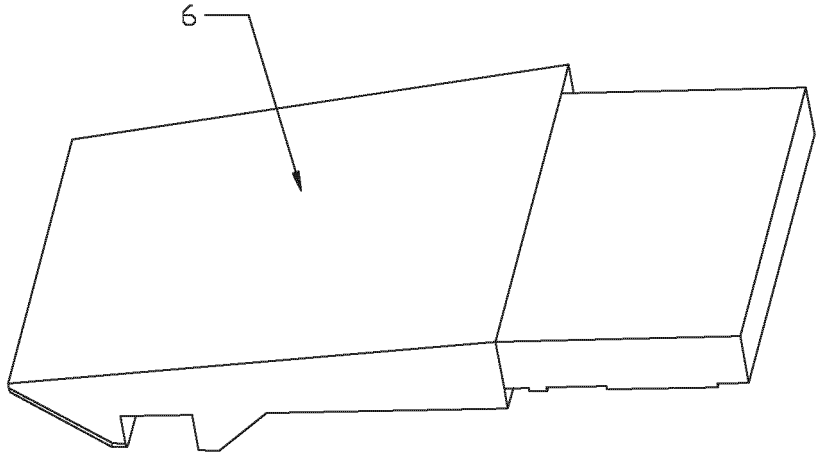


FIG.11

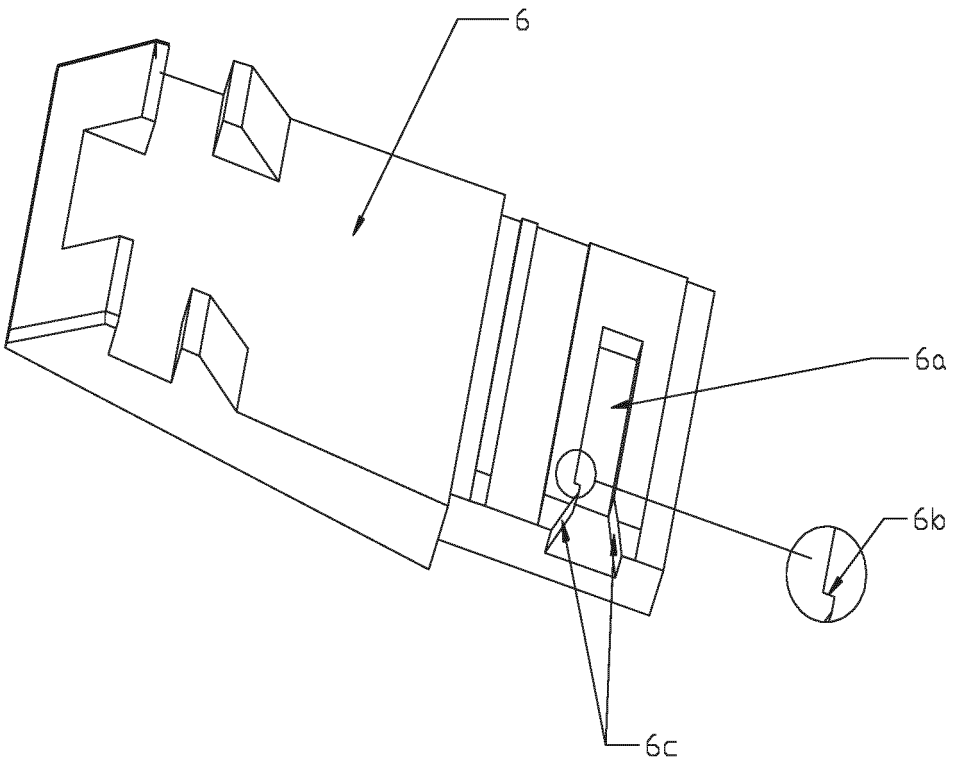


FIG.12

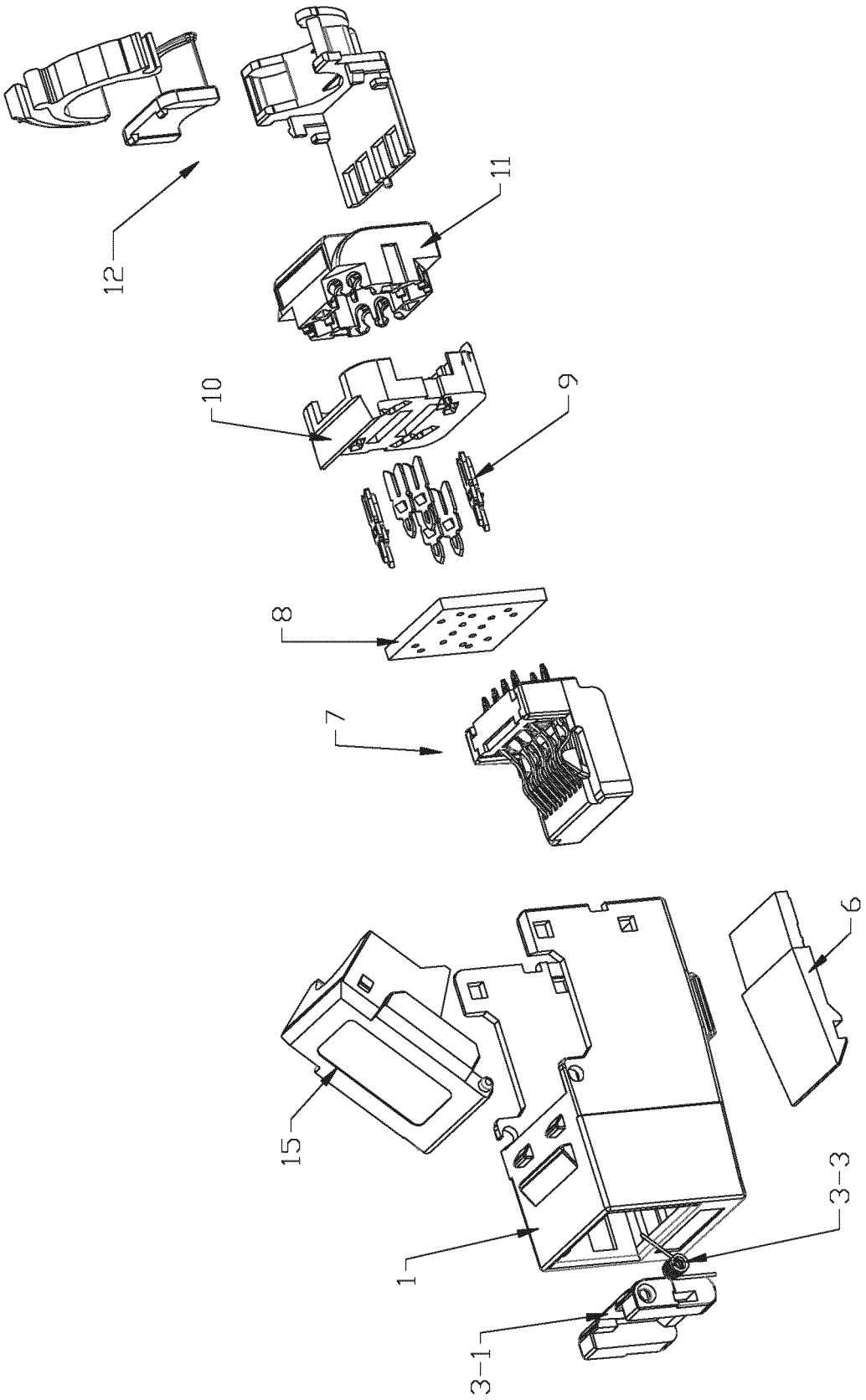


FIG. 13

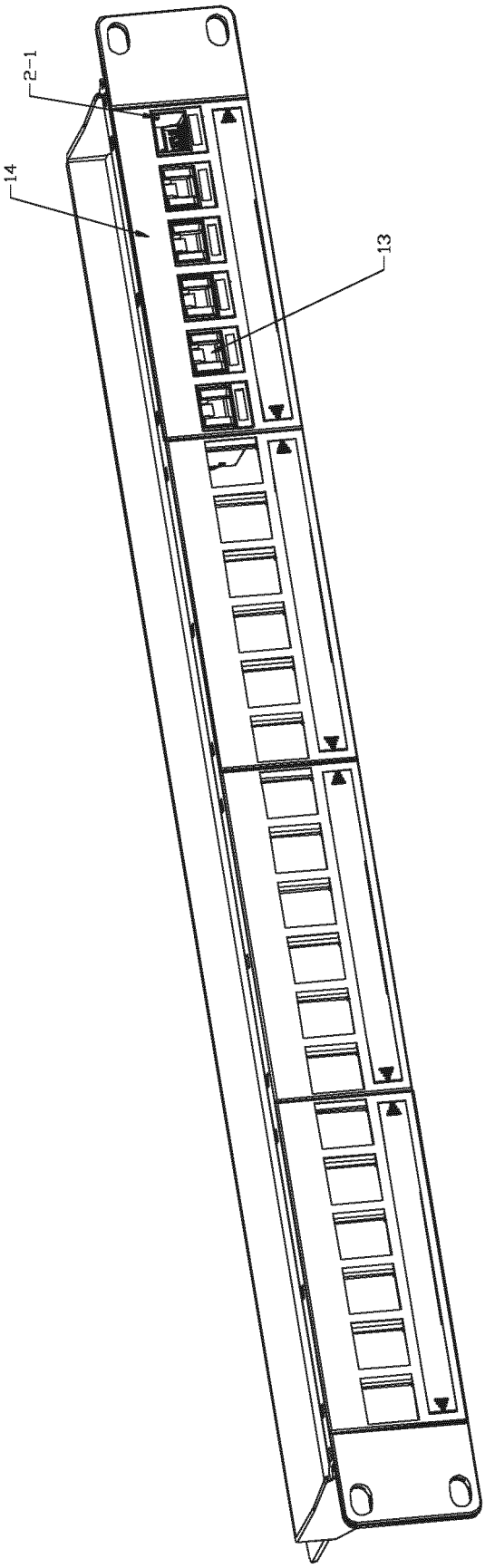


FIG. 14

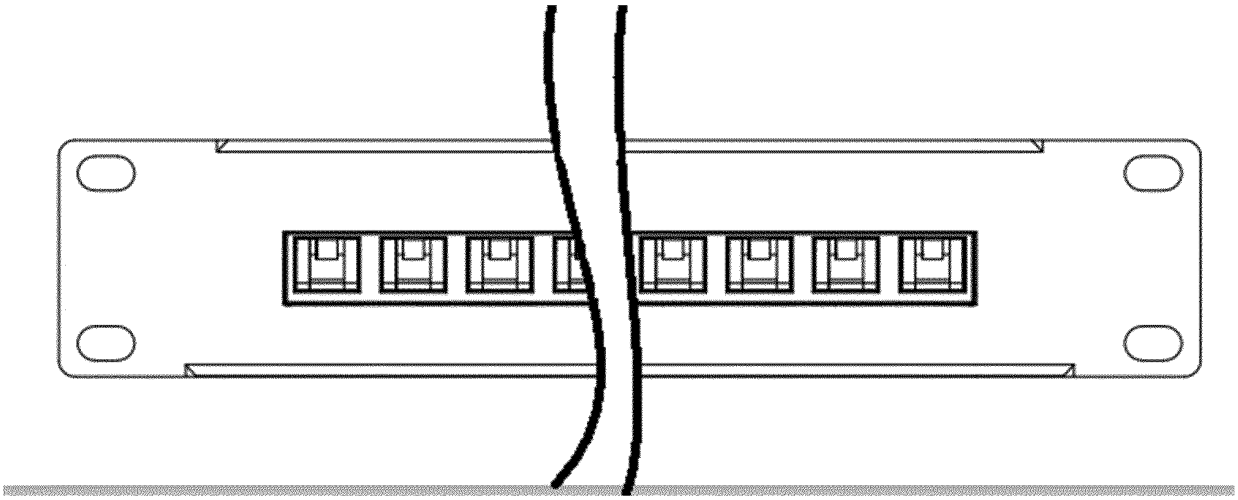

FIG.15

## INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2019/071646**

**A. CLASSIFICATION OF SUBJECT MATTER**

H01R 13/52(2006.01)i

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

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, EPODOC, WPI: 防尘门, 连接器, 扭簧, 限位, 窗口, 水晶头, 网口, 插入, spring, reset, door or baffle, connector, port, close+, open, crystal, position, plug

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | CN 201975608 U (WUXI GUOFENG ELECTRONIC TECHNOLOGY CO., LTD.) 14 September 2011 (2011-09-14)<br>description, paragraphs 0009-0012, and figure 1 | 1-10 |
| Y | CN 204130786 U (DONGGUAN SUKCONN INDUSTRIAL CO., LTD.) 28 January 2015 (2015-01-28)<br>description, paragraph 0022 | 1-10 |
| Y | CN 206451905 U (SHANGHAI TIANCHENG COMMUNICATION TECHNOLOGY CO., LTD.) 29 August 2017 (2017-08-29)<br>description, paragraphs 0029-0030, and figures 1-5 | 5 |
| Y | CN 201629444 U (EMCOM TECHNOLOGY INC.) 10 November 2010 (2010-11-10)<br>description, paragraphs 0023-0055, and figures 2-9 | 7 |
| Y | CN 200976424 Y (GONG, Ting) 14 November 2007 (2007-11-14)<br>description, page 2, last paragraph to page 3, bottom line, and figure 1 | 7 |
| Y | CN 203734076 U (SHANGHAI TIANCHENG COMMUNICATION TECHNOLOGY CO., LTD.) 23 July 2014 (2014-07-23)<br>description, paragraphs 0020-0021, and figure 1 | 10 |

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| **18 September 2019** | **27 September 2019** |
| Name and mailing address of the ISA/CN<br>**China National Intellectual Property Administration**<br>**No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088**<br>**China**<br>Facsimile No. **(86-10)62019451** | Authorized officer<br><br>Telephone No. |

Form PCT/ISA/210 (second sheet) (January 2015)

**INTERNATIONAL SEARCH REPORT**

International application No.
**PCT/CN2019/071646**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | CN 202474460 U (WUXI GUOFENG ELECTRONIC TECHNOLOGY CO., LTD.) 03 October 2012 (2012-10-03)<br>entire document | 1-10 |
| A | US 2013017696 A1 (APPLE INC.) 17 January 2013 (2013-01-17)<br>entire document | 1-10 |
| A | CN 103135183 A (WUJIANG SOURTON ELECTRONICS CO., LTD.) 05 June 2013 (2013-06-05)<br>entire document | 1-10 |

Form PCT/ISA/210 (second sheet) (January 2015)

**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
**PCT/CN2019/071646**

| Patent document cited in search report | Publication date (day/month/year) | Patent family member(s) | Publication date (day/month/year) |
|---|---|---|---|
| CN 201975608 U | 14 September 2011 | None | |
| CN 204130786 U | 28 January 2015 | None | |
| CN 206451905 U | 29 August 2017 | None | |
| CN 201629444 U | 10 November 2010 | None | |
| CN 200976424 Y | 14 November 2007 | None | |
| CN 203734076 U | 23 July 2014 | None | |
| CN 202474460 U | 03 October 2012 | None | |
| US 2013017696 A1 | 17 January 2013 | US 8425243 B2 | 23 April 2013 |
| CN 103135183 A | 05 June 2013 | None | |

Form PCT/ISA/210 (patent family annex) (January 2015)

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- CN 103135183 A **[0002]**