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

(11) **EP 3 030 064 A1**

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

(43) Date of publication:
08.06.2016 Bulletin 2016/23

(21) Application number: **14832485.8**

(22) Date of filing: **15.07.2014**

(51) Int Cl.:
H05K 5/06 *(2006.01)*

(86) International application number:
PCT/CN2014/082283

(87) International publication number:
WO 2015/014213 (05.02.2015 Gazette 2015/05)

(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

(30) Priority: **29.07.2013 CN 201320457568 U**

(71) Applicant: **ZTE Corporation**
Shenzhen, Guangdong 518057 (CN)

(72) Inventors:
- **CHEN, Shanjun**
  Shenzhen
  Guangdong 518057 (CN)
- **LI, Xu**
  Shenzhen
  Guangdong 518057 (CN)
- **PENG, Dianming**
  Shenzhen
  Guangdong 518057 (CN)

(74) Representative: **Novagraaf Technologies**
Bâtiment O2
2, rue Sarah Bernhardt
CS90017
92665 Asnières-sur-Seine Cedex (FR)

(54) DEVICE FOR LOCKING SEALING INTERFACE OF MAINTENANCE WINDOW

(57) A device for locking a sealing interface of a maintenance window is provided, which includes: at least one articulated mechanism for hinging a cover plate and a shell of the maintenance window together; and at least one wrench component which is movably mounted on the cover plate and locks the cover plate and the shell in a rotary clamping manner. In addition, the device may further include a sealing element which is fixedly connected with the cover plate and the shell. the device implements locking of the sealing interface of the maintenance window in hinge and clamping manners, and the device is simple and rapid in operation, high in reliability and small in occupied space and may be widely applied to the technical field of communication equipment and other equipment.

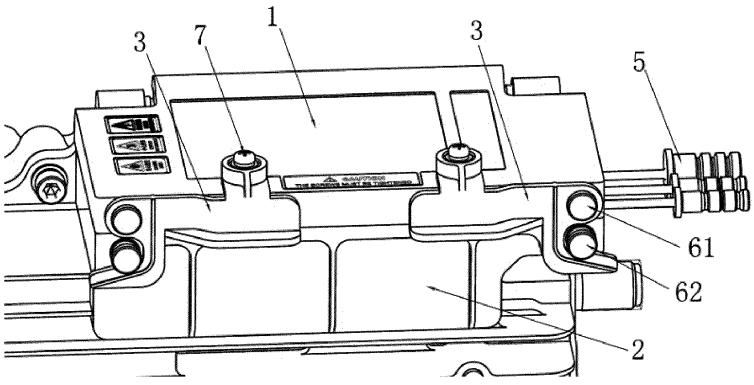

Fig.1

EP 3 030 064 A1

Description

Technical Field

[0001] The present invention relates to the technical field of equipment mounting, and in particular to a device for locking a sealing interface of a maintenance window and the device can be assembled on a complete machine.

Background

[0002] At present, implementing miniaturization of equipment, rapid mounting and easy operation of function units of the equipment and high reliability of the equipment gradually becomes an important means for improving competitiveness by various equipment manufacturers in the technical field of communication. As an important structure function unit of equipment, a maintenance window, particularly a device for locking a sealing interface of a maintenance window, plays an important role in meeting the abovementioned requirements of the equipment. Some of conventional devices for locking the sealing interface of the maintenance window implement locking in hinge and screw locking manners, and some directly lock sealing interfaces through clamping devices. However, these manners have many defects, for example, high time consumption and labour consumption in operation, low reliability caused by low controllability of an operation result and large space occupied by operation.

Summary

[0003] In order to overcome the shortcoming in a related technology, the present invention provides a device for locking a sealing interface of a maintenance window , which implements locking of the sealing interface of the maintenance window in hinge and clamping manners, and the device is simple and rapid in operation, high in reliability and small in occupied space and may be widely applied to the technical field of communication equipment and other equipment.

[0004] In order to achieve the purpose of the present invention, the present invention provides a device for locking a sealing interface of a maintenance window, which may include: at least one articulated mechanism for hinging a cover plate and shell of a maintenance window together; and at least one wrench component which is movably mounted on the cover plate and used for locking the cover plate and the shell in a rotary clamping manner.

[0005] Preferably, the device for locking the sealing interface of the maintenance window may further include: a sealing element which is fixedly connected with the cover plate and the shell to implement sealing of an interface between the shell and the cover plate.

[0006] Preferably, the wrench component may include: at least one first dowel which is fixedly mounted on a front wall of the cover plate and of which one end is exposed; at least one second dowel which is fixedly mounted on a front wall of the shell and of which one end is exposed; and a wrench which is movably connected with the cover plate through the first dowel and may rotate around the first dowel, wherein the wrench is fixed on the cover plate through the first dowel, and may rotate around the first dowel and be clamped with the second dowel to further implement locking of the cover plate and the shell.

[0007] Preferably, the wrench may include: a wrench body with a clamping part and a limiting locking part, in which a dowel hole butted with the first dowel is formed.

[0008] Preferably, the clamping part may include: a clamping groove configured to clamp the second dowel; and a clamping bump which is arranged at a side end of the clamping groove to prevent the second dowel from being separated.

[0009] Preferably, a threaded through hole is formed in the limiting locking part, wherein a screw penetrating through the threaded through hole is fixed with the cover plate after the wrench locks the cover plate and the shell through the screw.

[0010] Preferably, the articulated mechanism may include: a hinge element, which is provided with a hinging part; and a pin shaft connected with the hinge element in a rotating manner, wherein a limiting groove is formed in the hinging part, a limiting table fitted with the limiting groove is arranged on the pin shaft, and the cover plate is limited relative to the shell after being opened by virtue of clamping of the limiting table and the limiting groove.

[0011] Preferably, fastening holes may be formed in the hinge element and the pin shaft respectively, and the articulated mechanism may be connected with the cover plate and the shell to implement locking on this side of the locking device through the fastening holes.

[0012] Preferably, there may be two wrench components.

[0013] Preferably, there may be two articulated mechanisms.

[0014] Compared with the related technology, the present invention has the following advantages:

1) the device for locking the sealing interface of the maintenance window provided by the present invention implements locking of the the sealing interface of the maintenance window by combining the articulated mechanism and the wrench component, and is simple and rapid in operation and maintenance and high in locking reliability;

2) according to the embodiment of the present invention, the wrench is movably connected with the cover plate through the dowel hole formed in the wrench body, the wrench may rotate around the first dowel, and the clamping groove and clamping bump on the clamping part of the wrench body may clamp the second dowel fitted and clamped therewith, thereby implementing locking of the cover plate and

the shell; by the limiting locking part arranged on the wrench body, the wrench of the wrench component is prevented from overpressure after locking, and reliability of the locking device is improved;

3) the hinge element and pin shaft of the articulated mechanism of the present invention form clearance fit, and the pin shaft may freely rotate around the hinge element to open and close the cover plate relative to the shell after being fitted; by clamping combination of the limiting table and the limiting groove, the cover plate may be ensured to be limited at a certain angle relative to the shell after being opened, and the angle may be regulated according to different sizes of the limiting table and the limiting groove; in addition, reliable locking of the sealing interface may be ensured by configuring the number of the articulated mechanism;

4) according to the embodiment of the present invention, the sealing element is fixed on the shell and the cover plate, so that the interface between the shell and the cover plate may be sealed;

5) the device for locking a sealing interface of a maintenance window provided by the present invention adopts a single-sided operation locking manner, and the device is simple in structure, safe, reliable and convenient for engineering maintenance operation; the sealing interfaces of the maintenance window in various sizes may be locked by configuring the number of the wrench; and with adoption of a screw-free design, the problems of high time consumption and labour consumption, low reliability and the like of locking operation over the maintenance window are solved, the maintenance window is also miniaturized, and the locking device is small in occupied space and improved in universality, and may be applied to equipment related to various fields of sealing interface structures.

[0015] The present invention will be further described below with reference to the drawings in detail.

Brief Description of the Drawings

[0016]

Fig. 1 is a structure diagram of a device for locking a sealing interface of a maintenance window according to an embodiment of the present invention;

Fig. 2 is a front view of the device for locking a sealing interface of a maintenance window shown in Fig. 1 in a locked state;

Fig. 3 is a front view of the device for locking a sealing interface of a maintenance window shown in Fig. 1 in an unlocked state;

Fig. 4 is a front view of the device for locking a sealing interface of a maintenance window shown in Fig. 1 in an unlocked state;

Fig. 5 is a back view of the device for locking a sealing interface of a maintenance window shown in Fig. 1;

Fig. 6 is a structure diagram of the wrench according to an embodiment of the present invention;

Fig. 6a is a front view of the clamping part of the wrench shown in Fig. 6;

Fig. 7 is a structure diagram of the articulated mechanism according to an embodiment of the present invention;

Fig. 7a is a structure diagram of the pin shaft shown in Fig. 7;

Fig. 7b is a structure diagram of the hinge element shown in Fig. 7; and

Fig. 8 is a diagram of complete equipment on which a device for locking a sealing interface of a maintenance window is mounted according to an embodiment of the present invention.

[0017] Description about reference signs in the drawings: 1-cover plate; 2-shell; 3-wrench; 31-clamping part; 311-clamping groove; 312-clamping bump; 32-limiting locking part; 33-dowel hole; 34-threaded through hole; 4-articulated mechanism; 41-hinge element; 411-hinging part; 412-limiting groove; 42-pin shaft; 421-limiting table; 43-fastening hole; 5-sealing element; 61-first dowel; 62-second dowel; 7-screw; and A-maintenance window.

Detailed Description of the Embodiments

[0018] As shown in Fig. 1~Fig. 5, in an embodiment of the present invention, a device for locking a sealing interface of a maintenance window includes: at least one articulated mechanism 4 for hinging a cover plate 1 and a shell 2 of a maintenance window together; and at least one wrench component, which is movably mounted on the cover plate 1 and used for locking the cover plate 1 and the shell 2 in a rotary clamping manner.

[0019] Specifically, the device for locking a sealing interface of a maintenance window provided by the embodiment of the present invention further includes a sealing element 5, which is fixedly connected with the cover plate 1 and the shell 2 and namely fixed on the shell 2 and the cover plate 1 to form a sealing interface together with the shell 2 and the cover plate 1 respectively.

[0020] The wrench component of the locking device in the embodiment of the present invention includes: at least one first dowel 61 which is fixedly mounted on a front wall of the cover plate 1 and of which one end is exposed; at least one second dowel 62 which is fixedly mounted on a front wall of the shell 2 and of which one end is exposed; and a wrench 3 which is movably connected with the cover plate 1 through the first dowel 61 and may rotate around the first dowel 61. As shown in Fig. 6 and Fig. 6a, the wrench 3 includes: a wrench body, which is provided with a clamping part 31 and a limiting locking part 32, a dowel hole 33 butted with the first dowel 61 is formed in the wrench body, both the dowel hole 33 and the first dowel 61 may be fitted with the wrench 3 for rotating movement, and in order to achieve locking reli-

ability, such a fit is preferably designed into a fit capable of achieving a damping effect. The clamping part 31 includes: a clamping groove 311 configured to clamp the second dowel 62 therein, and a clamping bump 312 which is arranged at a side end of the clamping groove 311 to prevent the second dowel 62 from being separated from the clamping groove 311 during locking, and when the clamping part 31 is locked with the second dowel 62, fitting of the clamping bump 312 is required, a height difference c for locking and separation prevention is usually required to be reserved between the highest point of the clamping bump 312 and a locking position, and distances a and b for tolerance elimination after assembling are required to be reserved on the clamping bump 312 before and behind a theoretical position of a centreline of the second dowel 62 after locking of the wrench 3 to ensure that the wrench 3 is locked in place (Fig. 6a); and a threaded through hole 34 is formed in the limiting locking part 32, wherein a screw 7 is mounted in the threaded through hole 34 to fix the wrench 3 and the cover plate 1 after the wrench 3 locks the cover plate 1 and the shell 2, so that the wrench 3 is prevented from overpressure during closing operation over the locking device, and mounting the screw 7 further improves reliability of the locking device.

[0021] As shown in Fig. 7~Fig. 7b, the articulated mechanism 4 includes: a hinge element 41, which is provided with a hinging part 411, and a pin shaft 42 connected with the hinge element 41 in a rotating manner, and fit between the hinge element 41 and the pin shaft 42 is clearance fit, and the hinge element 41 and the pin shaft 42 may freely rotate relative to each other after being fitted. A limiting groove 412 is formed in the hinging part 411, a limiting table 421 fitted with the limiting groove 412 is arranged on the pin shaft 42, and the cover plate 1 is limited relative to the shell 2 after being opened by virtue of clamping of the limiting table 421 and the limiting groove 412, that is, different sizes of the limiting table 421 and the limiting groove 412 may be fitted to regulate an opening angle of the locking device to ensure that the cover plate may be limited at a certain angle relative to the shell to achieve reliability and attractive appearance of a limiting manner. Fastening holes 43 are also formed in the hinge element 41 and the pin shaft 42 respectively, and the articulated mechanism 4 may be fixedly connected with the cover plate 1 and the shell 2 to implement locking on this side through the fastening holes. In order to achieve adaptability to the sealing interfaces of the maintenance window in various sizes, reliable locking of the sealing interfaces may be ensured by configuring the number of the articulated mechanism 4, and in addition, the pin shaft 42 may include multiple sections of part structures or be a part structure formed by combining multiple sections of part structures according to the size of the maintenance window.

[0022] In the embodiment, there are preferably two wrench components and two articulated mechanisms 4, and of course, the numbers of the wrench components and the articulated mechanisms 4 may be configured to ensure locking of the sealing interfaces of the maintenance window in various sizes, so that high expansibility is achieved.

[0023] The locked and unlocked states of the device for locking the sealing interface of the maintenance window in the embodiment of the present invention are shown in Fig. 2~Fig. 4. In a locked state, the wrench 3 is fitted with the second dowel 62, and meanwhile, the screw 7 and the cover plate 1 is in a close connection state (Fig. 2). When the locking device is opened, the screw 7 is disconnected from the cover plate 1 at first in a screwing manner, the wrench 3 is pulled, the wrench 3 and the second dowel 62 are unclamped to implement opening operation (Fig. 3 and Fig. 4) under acting force of the sealing element 5 after rotating a certain angle x, and on the contrary, closing operation of the locking device may be implemented. For either the unlock operation and the lock operation, the cover plate 1, the wrench 3 and the other connecting components freely rotate around the articulated mechanism 4 to regulate the opening angle to meet an operation requirement.

[0024] Fig. 8 is a diagram of complete equipment on which the device for locking a sealing interface of a maintenance window in mounted according to an embodiment of the present invention, wherein A is the maintenance window.

[0025] From the technical solution of the implementation mode, it is easy to see that shape and structure characteristics of the device for locking a sealing interface of a maintenance window in the embodiment of the present invention are obvious compared with the related technology, has substantial characteristics, and may also achieve the following beneficial effects: locking of the sealing interface of the maintenance window is implemented by combining the articulated mechanism 4 and the wrench component, and simplicity and rapidness in operation and maintenance and high locking reliability are achieved; the wrench 3 is movably connected with the cover plate 1 through the dowel hole 33 formed in the wrench body, the wrench 3 may rotate around the first dowel 61, and the clamping groove 311 and clamping bump 312 on the clamping part 31 of the wrench body may clamp the second dowel 62 fitted and clamped therewith, thereby implementing locking of the cover plate 1 and the shell 2; by the limiting locking part 32 arranged on the wrench body, the wrench 3 of the wrench component is prevented from overpressure after locking, and reliability of the locking device is improved; the hinge element 41 and pin shaft 42 of the articulated mechanism 4 form clearance fit, and the pin shaft 42 may freely rotate around the hinge element 41 to open and close the cover plate 1 relative to the shell 2 after being fitted; by clamping combination of the limiting table 421 and the limiting groove 412, the cover plate 1 may be ensured to be limited at a certain angle relative to the shell 2 after being opened, and the angle may be regulated according to different sizes of the limiting table 421 and the limiting

groove 412; in addition, reliable locking of the sealing interface may be ensured by configuring the number of the articulated mechanism 4; the sealing element 5 is fixed on the shell 2 and the cover plate 1, so that the interface between the shell 2 and the cover plate 1 may be sealed; moreover, the device for locking a sealing interface of a maintenance window provided by the present invention adopts a single-sided operation locking manner, and is simple in structure, safe, reliable and convenient for engineering maintenance operation; the sealing interfaces of the maintenance window in various sizes may be locked by configuring the number of the wrench 3; and with adoption of a screw-free design, the problems of high time consumption and labour consumption, low reliability and the like of locking operation over the maintenance window are solved, the maintenance window is also miniaturized, and the locking device is small in occupied space and improved in universality, and may be applied to equipment related to various fields of sealing interface structures.

[0026] It should be noted that the terms "first", "second" and the like in the present invention are only adopted to describe the purpose and make the technical solution of the present invention clearer and may not be understood as limits to the technical solution of the present invention. In addition, although the present invention has been described above in detail, the present invention is not limited, and those skilled in the art may implement the present invention through other implementation solutions which are not departed from spiritual essence or necessary characteristics thereof. Therefore, all modifications made according to the content or principle of the present invention shall be understood to fall within the scope of protection of the present invention.

Claims

1. A device for locking a sealing interface of a maintenance window, comprising:

   at least one articulated mechanism (4) for hinging a cover plate (1) and a shell (2) of the maintenance window together; and
   at least one wrench component which is movably mounted on the cover plate (1) and used for locking the cover plate (1) and the shell (2) in a rotary clamping manner.

2. The device according to claim 1, further comprising:

   a sealing element (5) which is fixedly connected with the cover plate (1) and the shell (2).

3. The device according to claim 1 or 2, wherein the wrench component comprises:

   at least one first dowel (61) which is fixedly mounted on a front wall of the cover plate (1) and of which one end is exposed;
   at least one second dowel (62) which is fixedly mounted on a front wall of the shell (2) and of which one end is exposed; and
   a wrench (3) which is movably connected with the cover plate (1) through the first dowel (61) and may rotate around the first dowel (61).

4. The device according to claim 3, wherein the wrench (3) comprises:

   a wrench body with a clamping part (31) and a limiting locking part (32), in which a dowel hole (33) butted with the first dowel (61) is formed.

5. The device according to claim 4, wherein the clamping part (31) comprises:

   a clamping groove (311) for clamping the second dowel (62); and
   a clamping bump (312) which is arranged at a side end of the clamping groove (311) to prevent the second dowel (62) from being separated.

6. The device according to claim 4, wherein a threaded through hole (34) is formed in the limiting locking part (32), wherein
   a screw (7) penetrating through the threaded through hole (34) is fixed with the cover plate (1) after the wrench (3) locks the cover plate (1) and the shell (2) through the screw (7).

7. The device according to claim 1 or 2, wherein the articulated mechanism (4) comprises:

   a hinge element (41), which is provided with a hinging part (411); and
   a pin shaft (42) connected with the hinge element (41) in a rotating manner, wherein
   a limiting groove (412) is formed in the hinging part (411), a limiting table (421) fitted with the limiting groove (412) is arranged on the pin shaft (42), and the cover plate (1) is limited relative to the shell (2) after being opened via clamping of the limiting table (421) and the limiting groove (412).

8. The device according to claim 7, wherein fastening holes (43) are formed in the hinge element (41) and the pin shaft (42) respectively.

9. The device according to claim 1 or 2, wherein there are two wrench components.

10. The device according to claim 1 or 2, wherein there are two articulated mechanisms (4).

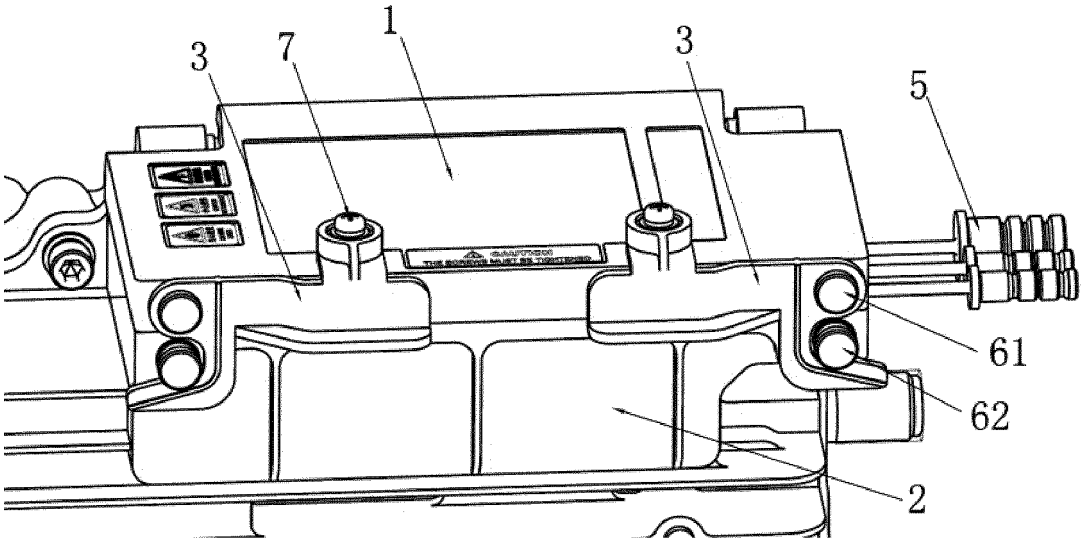

Fig.1

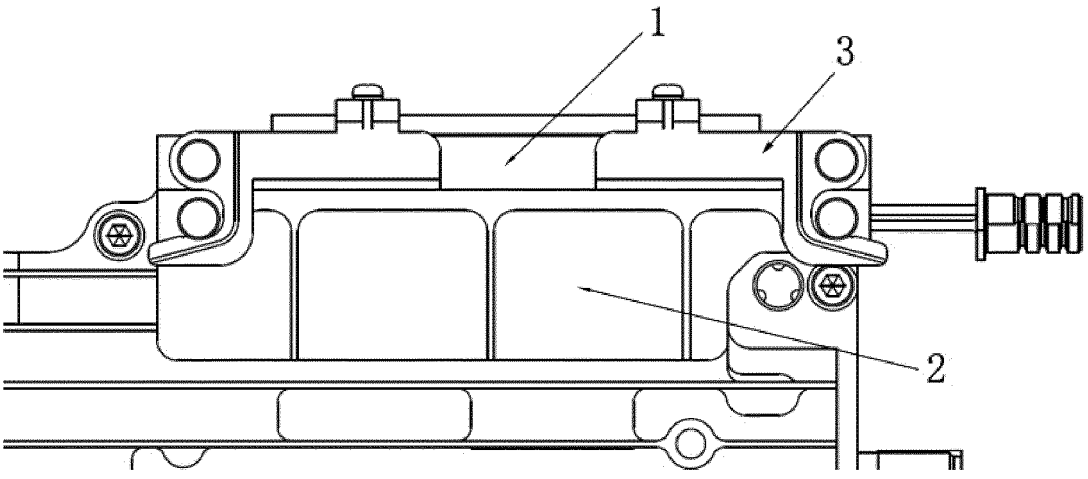

Fig.2

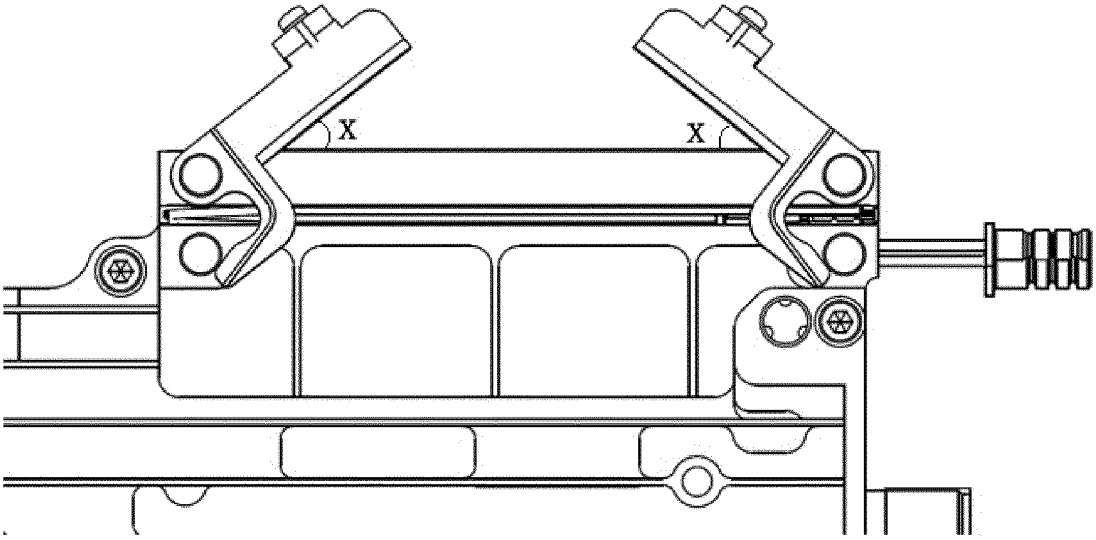

Fig.3

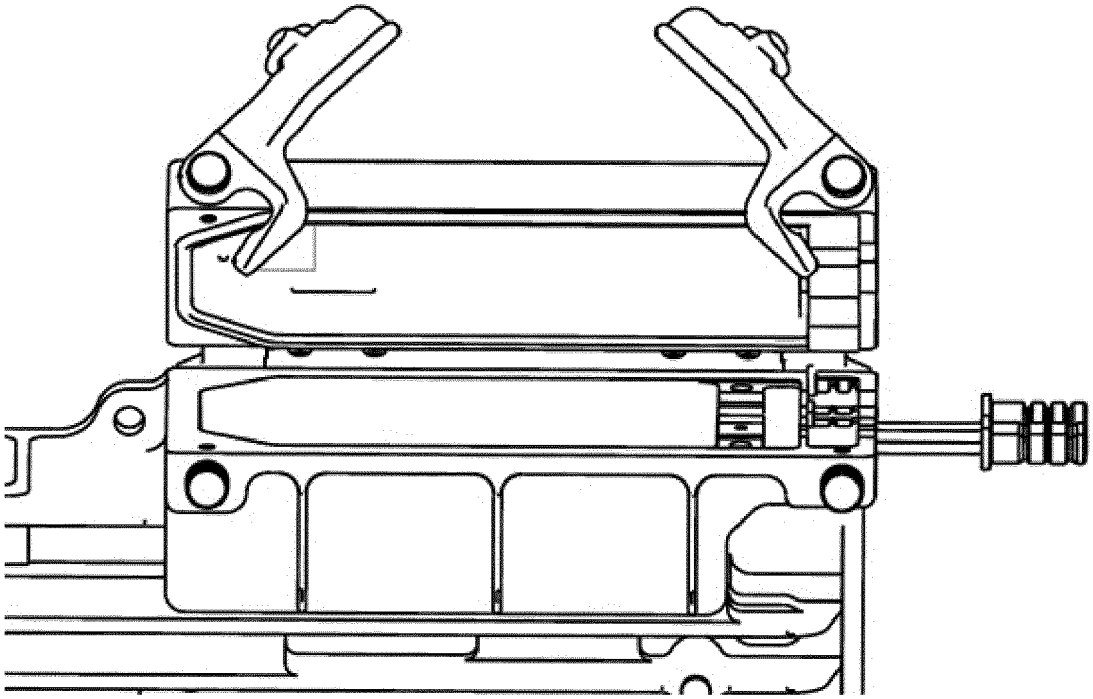

Fig.4

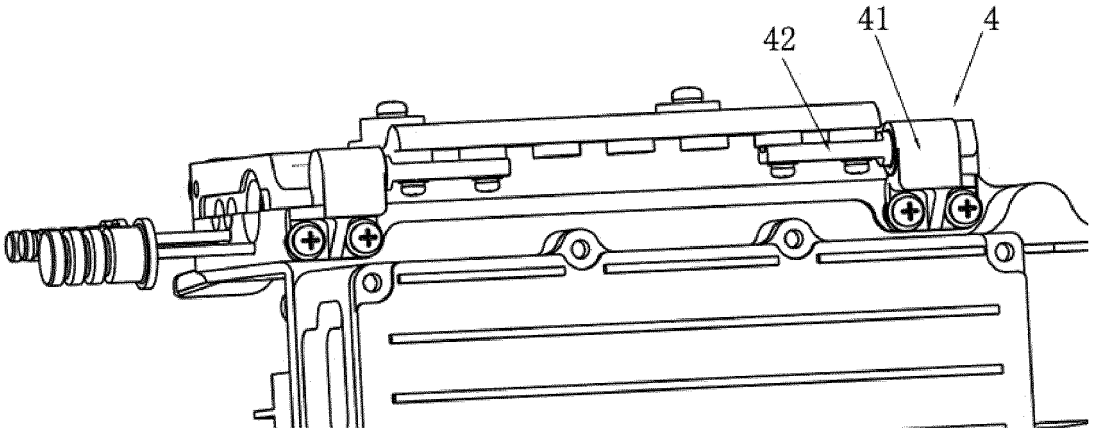

Fig.5

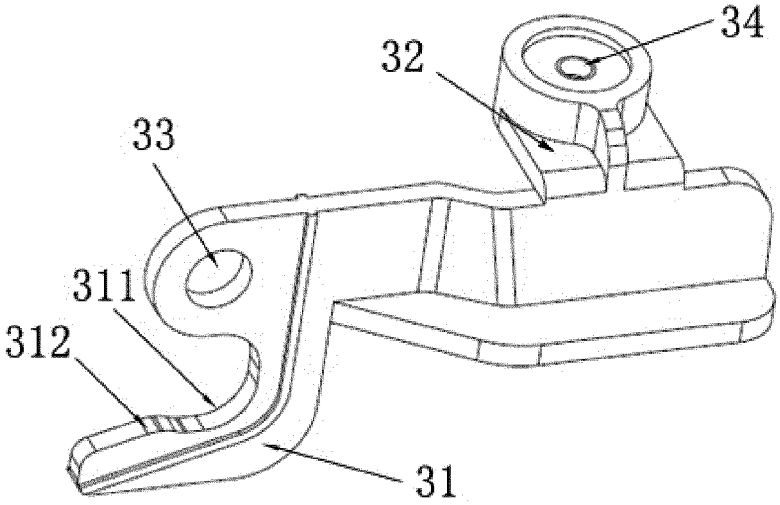

Fig.6

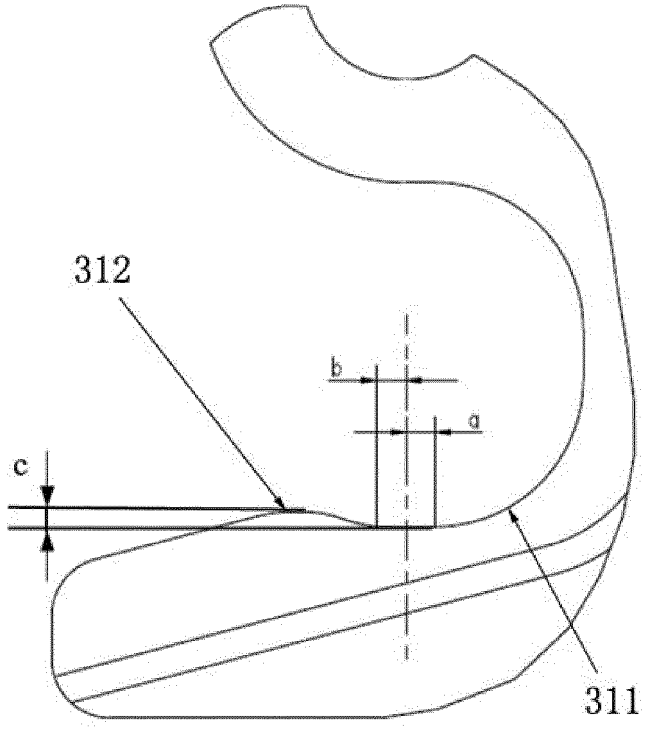

Fig.6a

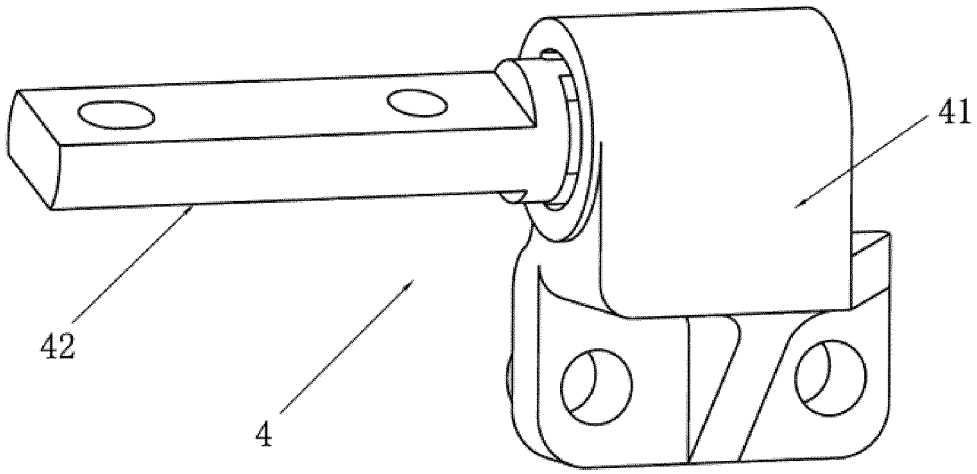

Fig.7

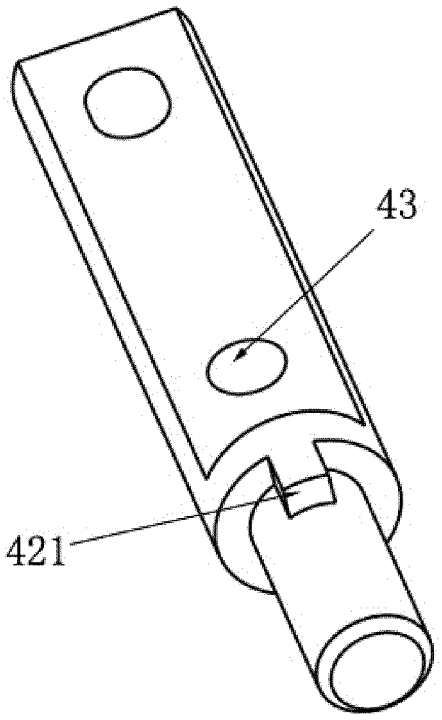

Fig.7a

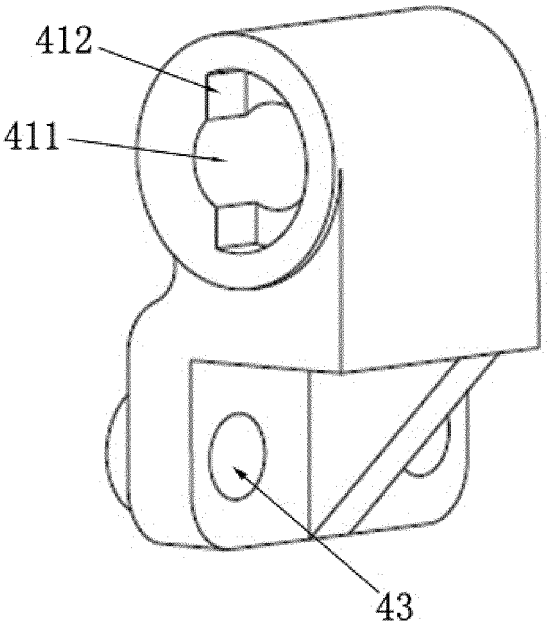

Fig.7b

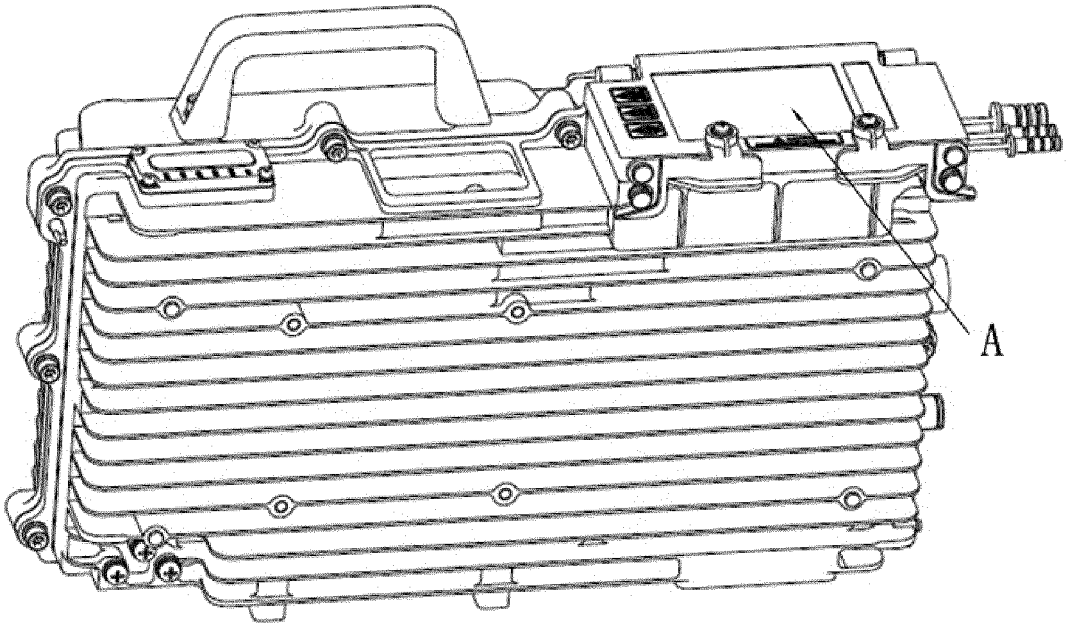

Fig.8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/082283

A. CLASSIFICATION OF SUBJECT MATTER

H05K 5/06 (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)

IPC: H05K; G06F; H04L; F16C

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)

WPI, EPODOC, GOOGLE, CNPAT, CNKI, IEEE: maintenance window, window, hinge, cover, shell, rotate, clamp, wrench, seal, lock, limit, angle, maintenance, lid, spanner

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 203482529 U (ZTE CORPORATION) 12 March 2014 (12.03.2014) the whole document	1-10
X	CN 201967260 U (ZTE CORPORATION) 07 September 2011 (07.09.2011) description, paragraphs [0003], [0004], [0056] to [0063] and figures 1 to 6	1-10
A	US 2008141489 A1 (HONG FU JIN PRECISION INDUSTRY SHENZHEN CO., LTD. et al.) 19 June 2008 (19.06.2008) the whole document	1-10
A	CN 202592508 U (SHEPHERD CO., LTD) 12 December 2012 (12.12.2012) the whole document	1-10
A	CN 201754652 U (COMBA TELECOM SYSTEM CHINA HOLDINGS LTD) 02 March 2011 (02.03.2011) the whole document	1-10
A	WO 2012041121 A1 (ZTE CORPORATION et al.) 05 April 2012 (05.04.2012) the whole document	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
19 September 2014	29 September 2014
Name and mailing address of the ISA 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 WU, Shaohong Telephone No. (86-10) 82245502

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/082283

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 203482529 U	12 March 2014	None	
CN 201967260 U	07 September 2011	None	
US 2008141489 A1	19 June 2008	CN 101201077 A	18 June 2008
CN 202592508 U	12 December 2012	None	
CN 201754652 U	02 March 2011	None	
WO 2012041121 A1	05 April 2012	CN 201805653 U	20 April 2011

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