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(71) Applicant: ABB SCHWEIZ AG [CH/CH]; Brown Boveri Strasse 6, 5400 Baden (CH).

(72) Inventors; and

(71) Applicants (for TT only): WU, YiEr [CN/CN]; Room 608, Building 9, Dongqingxincun, Huicheng Town, Xinhui District, Jiangmen, Guangdong 529100 (CN). REN, Jiancheng

[CN/CN]; Room 501, Building 4, No. 11 Dilin Road, Huicheng Town, Xinhui District, Jiangmen, Guangdong 529100 (CN). LI, Jianwei [CN/CN]; Room 602, Unit 3, No. 100 Gangkou Road, Pengjiang District, Jiangmen, Guangdong 529000 (CN).

(74) Agent: KING & WOOD MALLESONS; 20th Floor, East Tower, World Financial Centre, No. 1 Dongsanhuan Zhonglu, Chaoyang District, Beijing 100020 (CN).

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(54) Title: APPARATUS FOR USE WITH ELECTRICAL EQUIPMENT, CORRESPONDING ELECTRICAL EQUIPMENT, METHOD OF PRODUCING THE APPARATUS AND USE OF THE APPARATUS

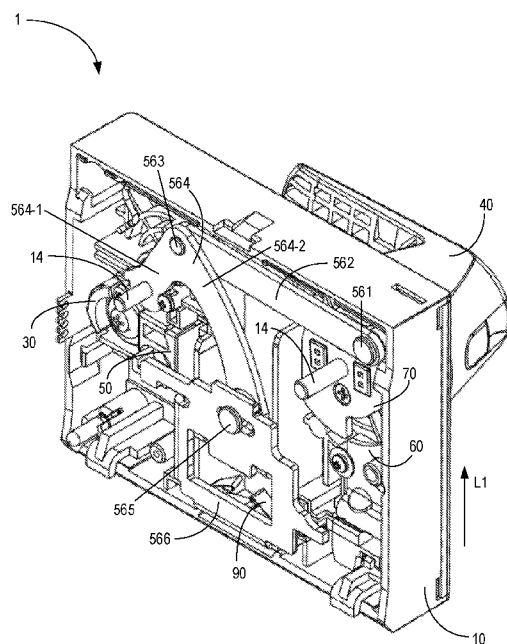


Fig. 1

(57) Abstract: The apparatus (1) for use with electrical equipment comprises a housing (10) and an actuating component (20) arranged outside the housing (10) and rotatable about an axis (22) perpendicular to an outer surface of the housing (10). The apparatus (1) further comprises a first drive member (30) arranged inside the housing (10) and adapted to rotate with the rotation of the actuating component (20); and a second drive member (50) arranged inside the housing (10) and adapted to block a rotation of a handle (40) arranged outside the housing (10). The actuating component (20) can be switched to a lock position where the first drive member (30) is rotated to rest against the second drive member (50) and block the movement of the second drive member (50) and the rotation of the handle (40). According to the present disclosure, the operator cannot disassemble the handle (40) from a circuit breaker in off position while

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the handle (40) is locked and thus the safety of the operator and the electrical equipment can be ensured. Corresponding electrical equipment, a method of producing the apparatus and use of the apparatus are also disclose.

**APPARATUS FOR USE WITH ELECTRICAL EQUIPMENT, CORRESPONDING
ELECTRICAL EQUIPMENT, METHOD OF PRODUCING THE APPARATUS
AND USE OF THE APPARATUS**

5 **FIELD**

[0001] Example embodiments of the present disclosure generally relate to safety device in the electrical field and more particularly, to an apparatus for use with electrical equipment and corresponding electrical equipment, method of producing the apparatus and use of the apparatus.

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BACKGROUND

[0002] In the field of electrical equipment, a rotary handle is an operating accessory for a circuit breaker. An operator can manage the circuit-breaker through rotary handle outside a power distribution cabinet without touching the electrical elements directly, so as to increase the safety for the operator. A handle with a padlock or a key-lock may increase the safety of both the operator and the equipment as no one should be allowed to operate the rotary handle in off position, in order to keep the circuit breaker stable in specified environment.

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[0003] Various solutions have been proposed for increasing the safety of the electrical equipment. For example, CN 109036887A describes a load switch cabinet door and a manual operation safety device, wherein the device comprises a manual operation device, a door panel, a load switch and an operation handle.

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[0004] However, in these conventional approaches, it is possible for the operator to intentionally operate the circuit breaker even the handle is in off-position. For example, the handle is tightened by screws and the operator may still loose the screws with a tool to remove the handle, which would leave a potential risk of hurting the operator. Therefore, how to keep the handle fixed in off position becomes necessary.

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SUMMARY

[0005] Example embodiments of the present disclosure propose a solution for locking the handle in place to ensure the safety of the electrical equipment and the operator.

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[0006] In a first aspect, example embodiments of the present disclosure provide an

apparatus for use with electrical equipment. The apparatus comprises a housing and an actuating component arranged outside the housing and rotatable about an axis perpendicular to an outer surface of the housing. The apparatus further comprises a first drive member arranged inside the housing and adapted to rotate with the rotation of the actuating component; and a second drive member arranged inside the housing and adapted to block a rotation of a handle arranged outside the housing. The actuating component can be switched to a lock position where the first drive member is rotated to rest against the second drive member and block the movement of the second drive member and the rotation of the handle.

[0007] According to embodiments of the present disclosure, if the handle is locked with the actuating component, the handle cannot be rotated by the operator outside the housing, thus improving the safety of the apparatus.

[0008] In some embodiments, the apparatus further comprises a lock arranged outside the housing and comprising: a tongue adapted to move to a lock position when the lock is in a lock state; and a rotating member arranged inside the housing and adapted to rotate with the rotation of the handle, wherein the tongue rests against the rotating member and blocks the rotation of the rotating member when the tongue is in the lock position, thereby blocking the rotation of the handle. In this way, only when both the lock and the actuating member in off position can the handle be rotated. Therefore, the security of the apparatus may be improved.

[0009] In some embodiments, the apparatus further comprises a base plate arranged on a first side of the housing, wherein the handle is arranged on a second side of the housing, the first and second sides being opposite to one another; a sliding member coupled to the base plate and adapted to slide with the base plate along a first direction perpendicular to the axis; and a linkage adapted to rotate about a shaft fixed to the housing and rest against the second drive member.

[0010] In some embodiments, the apparatus further comprises a toggle adjacent to the base plate and adapted to control an operation of a circuit breaker associated with the apparatus, wherein the toggle has a gap with the linkage along the first direction, the gap being greater than a sliding stroke of the sliding member. In this way, the handle may be easily disengaged by moving the sliding member when both the lock and the actuating member in off position, thus ensuring normal operation of the apparatus.

[0011] In some embodiments, wherein the linkage further comprising: a first level hinged to a surface of the rotating member on one end and adapted to rotate around the end; a second level hinged with the first level and adapted to rotate with the shaft; and a third level hinged with the second level and adapted to move along the first direction. In this way, by means of the linkage, the volume of the apparatus can be effectively controlled.

[0012] In some embodiments, the rotating member is disk-shaped and comprises a notch recessed from an edge of the rotating member toward the center; and the tongue is adapted to enter the notch to block the rotation of the rotating member. In this way, the handle may be controlled easily without the need to greatly modify the existing structure of the apparatus.

[0013] In some embodiments, the actuating component can be switched to a unlock position where the linkage is moved to disengage from the second drive member and the linkage can be moved freely with the handle. In this way, when the handle has not been locked, the operator can remove the handle from the circuit breaker, which ensures the normal operation of the apparatus.

[0014] In a second aspect, example embodiments of the present disclosure provide electrical equipment. The electrical equipment comprises a circuit breaker and an apparatus of the first aspect.

[0015] In a third aspect, example embodiments of the present disclosure provide a method of producing an apparatus for use with electrical equipment, comprising: providing a housing; arranging an actuating component outside the housing and the actuating component being rotatable about an axis perpendicular to an outer surface of the housing; arranging a first drive member inside the housing and the first drive member being adapted to rotate with the rotation of the actuating component; and arranging a second drive member inside the housing and the second drive member being adapted to block a rotation of a handle arranged outside the housing, wherein the actuating component can be switched to a lock position where the first drive member is rotated to rest against the second drive member and block the movement of the second drive member and the rotation of the handle.

[0016] In a fourth aspect, example embodiments of the present disclosure provide use of an apparatus of the first aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Through the following detailed descriptions with reference to the accompanying drawings, the above and other objectives, features and advantages of the example embodiments disclosed herein will become more comprehensible. In the drawings, several example embodiments disclosed herein will be illustrated in an example and in a non-limiting manner, wherein:

[0018] Fig.1 illustrates a schematic diagram of a safety lock apparatus in accordance with some example embodiments of the present disclosure;

[0019] Fig.2 illustrates a front view of the safety lock apparatus shown in Fig. 1 in accordance with some example embodiments of the present disclosure;

[0020] Fig.3 illustrates a cross section view of the safety lock apparatus shown in Fig. 1 in accordance with some example embodiments of the present disclosure;

[0021] Fig.4 illustrates an enlarged internal view of the safety lock apparatus shown in Fig. 1 in accordance with some example embodiments of the present disclosure; and

[0022] Fig.5 illustrates an internal view of the safety lock apparatus shown in Fig. 1 in accordance with some example embodiments of the present disclosure.

DETAILED DESCRIPTION

[0023] The subject matter described herein will now be discussed with reference to several example embodiments. These embodiments are discussed only for the purpose of enabling those skilled persons in the art to better understand and thus implement the subject matter described herein, rather than suggesting any limitations on the scope of the subject matter.

[0024] The term “comprises” or “includes” and its variants are to be read as open terms that mean “includes, but is not limited to.” The term “or” is to be read as “and/or” unless the context clearly indicates otherwise. The term “based on” is to be read as “based at least in part on.” The term “being operable to” is to mean a function, an action, a motion or a state can be achieved by an operation induced by a user or an external mechanism. The term “one embodiment” and “an embodiment” are to be read as “at least one embodiment.” The term “another embodiment” is to be read as “at least one other embodiment”.

[0025] Unless specified or limited otherwise, the terms “mounted,” “connected,” “supported,” and “coupled” and variations thereof are used broadly and encompass direct and indirect mountings, connections, supports, and couplings. Furthermore, “connected” and “coupled” are not restricted to physical or mechanical connections or couplings. In the description below, like reference numerals and labels are used to describe the same, similar or corresponding parts in the figures. Other definitions, explicit and implicit, may be included below.

[0026] Some example embodiments of the present disclosure are described below with respect to Figs. 1-5.

[0027] Fig.1 illustrates a schematic diagram of an apparatus 1 for use with electrical equipment in accordance with some example embodiments of the present disclosure. Fig.2 illustrates a front view of the safety lock apparatus shown in Fig 1. As shown, the apparatus 1 comprises, among other things, a housing 10 and an actuating component 20. The actuating component 20 is arranged outside the housing 10 and is adapted to rotate with an axis 22. As illustrated, the axis 22 is perpendicular with an outer surface of the housing 10.

[0028] As illustrated in Fig. 1, the apparatus 1 comprises a first drive member 30 and a second drive member 50. The first drive member 30 is arranged inside the housing 10 and can rotate with the rotation of the actuating component 20. In some embodiments, the first drive member 30 may be coupled to the actuation component 20 with a shaft. The second drive member 50 is arranged inside the housing 10. As illustrated in Fig. 2, the apparatus 1 further comprises rotatable handle 40 arranged outside the housing 10. The second drive member 50 can be provided to block the rotation of the handle 40.

[0029] The actuating component 20 can be switched to a lock position when being actuated by the operator. In such a lock position, the first drive member 30 is rotated to rest against the second drive member 50. In this way, the movement of the second drive member 50 is blocked by the first drive member 30. Since the second drive member 50 is adapted to block the rotation of the handle 40, the handle 40 may be “locked” as well and cannot be turned.

[0030] According to embodiments of the present disclosure, by means of the engagement between the first drive member 30 and the second drive member 50 inside the housing 10, the operator cannot swivel the handle 40 on purpose from outside when

locked. In this way, an apparatus 1 can be made much safer.

[0031] In some embodiments, as illustrated in Fig. 3, the actuating component 20 may be a key. With this configuration, the handle 40 may be blocked in the off position of the key. This may be referred to as a “key-lock” approach.

5 [0032] It is to be understood that this configuration is merely an example without suggesting any limitation as to the scope of the present disclosure. The actuating component 20 may be shaped in a different way as long as the actuating component 20 may drive the first member 30 to turn around.

10 [0033] In some embodiments, the key may be rotated around its axis 22 back and forth by 90 degrees to be switched between the lock state and a unlock state. It should be appreciated that the value listed herein is only illustrative, rather than restrictive. The key may be rotated around its axis 22 back and forth by other degrees e.g. 135 or 180 degree, as long as the key may be switched between the lock state and the unlock state.

15 [0034] Although merely one actuating member 20 is shown in Fig. 3, it is to be understood that this is merely example without suggesting any limitation as to the scope of the present disclosure. Any other number of the actuating member 20 may also be possible, for example, two, three and even more, which may depend on the demand of the user and the size of apparatus 1.

20 [0035] In some embodiments, the apparatus 1 may further comprise a lock (not shown) arranged outside the housing 10. The lock may be used with the lock receiver 80, as illustrated in Fig. 2. The lock comprises a tongue 60 adapted to move to a lock position when the lock is in a lock state. The apparatus 1 may further comprise a rotating member 70. The rotating member 70 is arranged inside the housing 10 and adapted to rotate together with the rotation of the handle 40.

25 [0036] When the tongue 60 is in the lock position, the tongue 60 rests against the rotating member 70. In such a position, the tongue 60 may block the rotation of the rotating member 70. Since the handle 40 and the rotating member 70 are coupled, the rotation of the handle 40 may be blocked.

30 [0037] In this way, the handle 40 may also be locked by means of the lock. This may be referred to as a “padlock” approach.

[0038] In some embodiments, the “key-lock” and “padlock” approaches may be performed independently. That is to say, only when both the “key-lock” and “padlock”

are in off position can the handle 40 be turned. In this way, the security of the operator and the apparatus can be enhanced.

[0039] In some embodiments, the apparatus 1 may comprise a base plate 12 arranged on a first side of the housing 10. In such an apparatus 1, the handle 40 is arranged on a second side of the housing 10 which is opposite to the first side.

[0040] The apparatus 1 may further comprise a sliding member 54 coupled to the base plate 12. The sliding member 54 may slide with the base plate 12 along a first direction L1 perpendicular to the axis 22. The sliding member 54 may be provided to disassemble the apparatus 1. As illustrated in Fig. 1, the apparatus 1 may further comprise a linkage 56. The linkage 56 is adapted to rotate about a shaft 14 fixed to the housing 10 and rest against the second drive member 50. When the linkage 56 contacts the second drive member 50, the second drive member 50 may block the movement of the linkage 56.

[0041] In some embodiments, as illustrated in Fig. 3, the sliding member 54 may be coupled to the linkage 56. As discussed above, if the operator attempts to dismantle the apparatus 1, he must actuate the sliding member 54. When any of the “key-lock” and “padlock” is in off position, the linkage 56 would be locked in position, which would hold the handle 40 in position, and the sliding member 54 would be locked accordingly.

[0042] In this way, the operator cannot disassemble the apparatus 1 though acting on the sliding member 54. The security of the operator and the electric equipment would be enhanced. In other words, the handle 40 can only be rotated by damaging the whole structure of the apparatus 1, which seems impossible to the operator. Therefore, the configuration may prevent the operator from operating the handle 40 or the sliding member 54 when the apparatus 1 is in off position.

[0043] In some embodiments, as illustrated in Fig. 3, the apparatus 1 may comprise a toggle 92 adapted to control an operation of a circuit breaker associated with the apparatus 1. As illustrated, the toggle 92 is adjacent to the base plate 12. The toggle 92 has a gap with the linkage 56 along the first direction L1, which is greater than a sliding stroke of the sliding member 54 along the first direction L1.

[0044] In this way, the gap may leave enough space for disengagement. Therefore, the handle 40 may be removed from the apparatus 1 while in on position, thus ensuring the normal operation of the apparatus 1.

[0045] In some embodiments, the linkage 56 may comprise a plurality of levels. As

illustrated in Figs. 1 and 5, the linkage 56 may generally comprise a first level 562, a second level 564 and a third level 566. As shown, the first level 562 is hinged to a surface of the rotating member 70 on one end 561. The first level 562 is adapted to rotate around the end 561. The second level 564 is hinged with the first level 562 and adapted to rotate with the shaft 14. In addition, the third level 566 is hinged with the second level 564. The third level 566 is adapted to move along the first direction L1.

[0046] In this way, when the rotating member 70 rotates, the first level 562 may be driven. With the hinge 563 associated with the first level 562 and the second level 564, the second level 564 may be rotated around the shaft 14. Further, with the hinge 565, the third level 566 may be driven accordingly.

[0047] In some embodiments, the second level 564 may be of an elbow shape with two sections. As illustrated, the first section 564-1 may be coupled to the shaft 14 and the second section 564-2 may be coupled to the third level 566. In this way, the second level 564 can take advantage of the limited space within the housing 10. Therefore, the volume of the apparatus 1 can be effectively controlled.

[0048] In some embodiments, the third level 566 may include an arm 567 extending towards second drive member 50. When the arm 567 is in an off position as illustrated in Fig. 4, the arm 567 would engage with the drive member 50 and then be kept still.

[0049] In some embodiments, as illustrated in Fig. 4, the rotating member 70 may be disk-shaped. As shown in the enlarged view indicated by arrow B, the rotating member 70 comprises a notch 74 recessed from an edge 72 of the rotating member 70 toward the center of the rotating member 70.

[0050] As shown in Fig. 4, when the lock is driven to be placed in the lock state, the tongue 60 may be moved upward along the first direction L1 and enter the notch 74 of the rotating member 70. In this way, the rotation of the rotating member 70 along the second direction L2 would be blocked.

[0051] In some embodiments, the outer profile of the tongue 60 may match that of the notch 74. In this way, the contact area of the tongue 60 and the notch 74 can be increased to improve the interaction between the tongue 60 and the notch 74. Therefore, the blocking effect of tongue 60 may be improved.

[0052] Alternatively, in some embodiment, the shape of the tongue 60 and the rotating member 70 may be interchanged. For example, a notch may be formed on the tongue 60

and the rotating member 70 may enter the notch 74 to engage with the tongue 60.

[0053] In some embodiments, the actuating component 20 may be switched to a unlock position. In the unlock position, the linkage 56 is moved to disengage from the second drive member 50. The linkage 56 is then free to move with the handle 40. In this way, since there is no interaction between the linkage 56 and the second drive member 50, the handle 40 may be rotated freely by the operator from outside. Hence, the handle 40 can be disassembled if necessary to ensure the normal operation of the apparatus 1.

[0054] In a second aspect, example embodiments of the present disclosure provide electrical equipment. The electrical equipment comprises a circuit breaker and an apparatus 1 discussed above.

[0055] According to embodiment of the present disclosure, the safety of electrical equipment may be ensured.

[0056] In some embodiments, the housing 10 may be made of a rigid material to prevent the apparatus 1 from being damaged by the operator. The material may be any material already known or to be developed in the future, e.g. ABS (Acrylonitrile Butadiene Styrene) plastic, PBT (Polybutylene terephthalate) plastic, or other suitable materials, as long as the material may protect the elements with the housing 10 from being damage as well as protect the operator from shocked.

[0057] In a third aspect, example embodiments of the present disclosure relate to a method of producing an apparatus 1 for use with electrical equipment. It is to be understood that the apparatus, the structure or the process involved in the method have been described above with reference to Figs. 1-5, and the details will not be described hereinafter for the sake of brevity.

[0058] Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

WHAT IS CLAIMED IS:

1. An apparatus (1) for use with electrical equipment, comprising:

a housing (10);

an actuating component (20) arranged outside the housing (10) and rotatable about an axis (22) perpendicular to an outer surface of the housing (10);

a first drive member (30) arranged inside the housing (10) and adapted to rotate with the rotation of the actuating component (20); and

a second drive member (50) arranged inside the housing (10) and adapted to block a rotation of a handle (40) arranged outside the housing (10),

wherein the actuating component (20) can be switched to a lock position where the first drive member (30) is rotated to rest against the second drive member (50) and block the movement of the second drive member (50) and the rotation of the handle (40).

2. The apparatus (1) of claim 1, further comprising:

a lock arranged outside the housing (10) and comprising:

a tongue (60) adapted to move to a lock position when the lock is in a lock state; and

a rotating member (70) arranged inside the housing (10) and adapted to rotate with the rotation of the handle (40);

wherein the tongue (60) rests against the rotating member (70) and blocks the rotation of the rotating member (70) when the tongue (60) is in the lock position, thereby blocking the rotation of the handle (40).

3. The apparatus (1) of claim 1, further comprising:

a base plate (12) arranged on a first side of the housing (10), wherein the handle (40) is arranged on a second side of the housing (10), the first and second sides being opposite to one another;

a sliding member (54) coupled to the base plate (12) and adapted to slide with the base plate (12) along a first direction (L1) perpendicular to the axis (22); and

a linkage (56) adapted to rotate about a shaft (14) fixed to the housing (10) and rest against the second drive member (50).

4. The apparatus (1) of claim 3, further comprising:

a toggle (92) adjacent to the base plate (12) and adapted to control an operation of a circuit breaker associated with the apparatus (1), wherein the toggle (92) has a gap with the linkage (56) along the first direction (L1), the gap being greater than a sliding stroke of the sliding member (54).

5. The apparatus (1) of claim 3, wherein the linkage (56) further comprising:

a first level (562) hinged to a surface of the rotating member (70) on one end (561) and adapted to rotate around the end (561);

a second level (564) hinged with the first level (562) and adapted to rotate with the shaft (14); and

a third level (566) hinged with the second level (564) and adapted to move along the first direction (L1).

6. The apparatus (1) of claim 2, wherein

the rotating member (70) is disk-shaped and comprises a notch (74) recessed from an edge (72) of the rotating member (70) toward the center; and

the tongue (60) is adapted to enter the notch (74) to block the rotation of the rotating member (70).

7. The apparatus (1) of claim 3, wherein

the actuating component (20) can be switched to a unlock position where the linkage (56) is moved to disengage from the second drive member (50) and the linkage (56) can be moved freely with the handle (40).

8. Electrical equipment comprising a circuit breaker and an apparatus (1) of any of claims 1 to 7.

9. A method of producing an apparatus (1) for use with electrical equipment, comprising:

providing a housing (10);

arranging an actuating component (20) outside the housing (10) and the actuating component (20) being rotatable about an axis (22) perpendicular to an outer surface of the

housing (10);

arranging a first drive member (30) inside the housing (10) and the first drive member (30) being adapted to rotate with the rotation of the actuating component (20); and

5 arranging a second drive member (50) inside the housing (10) and the second drive member (50) being adapted to block a rotation of a handle (40) arranged outside the housing (10),

10 wherein the actuating component (20) can be switched to a lock position where the first drive member (30) is rotated to rest against the second drive member (50) and block the movement of the second drive member (50) and the rotation of the handle (40).

10. Use of an apparatus (1) of any of claims 1 to 7.

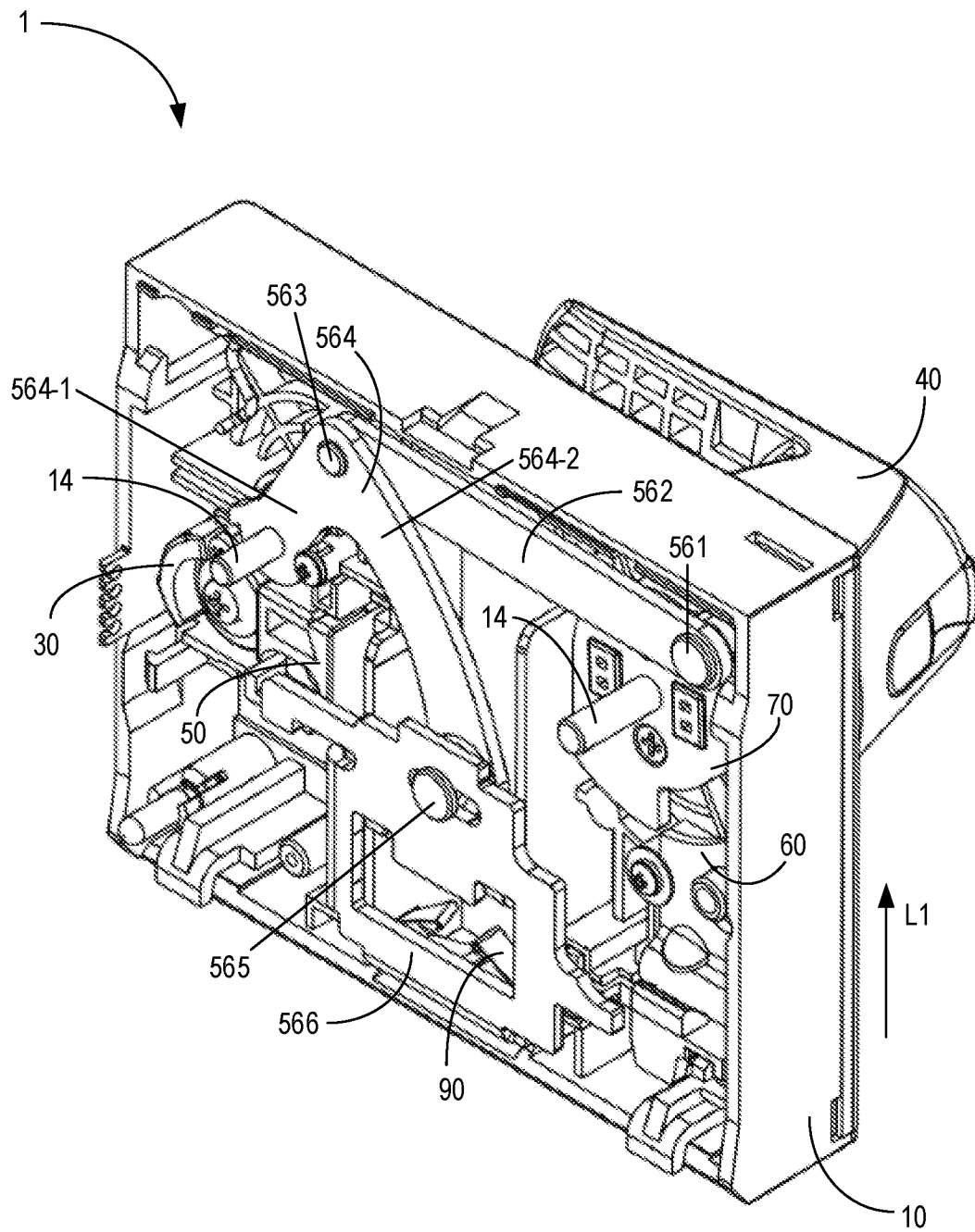


Fig. 1

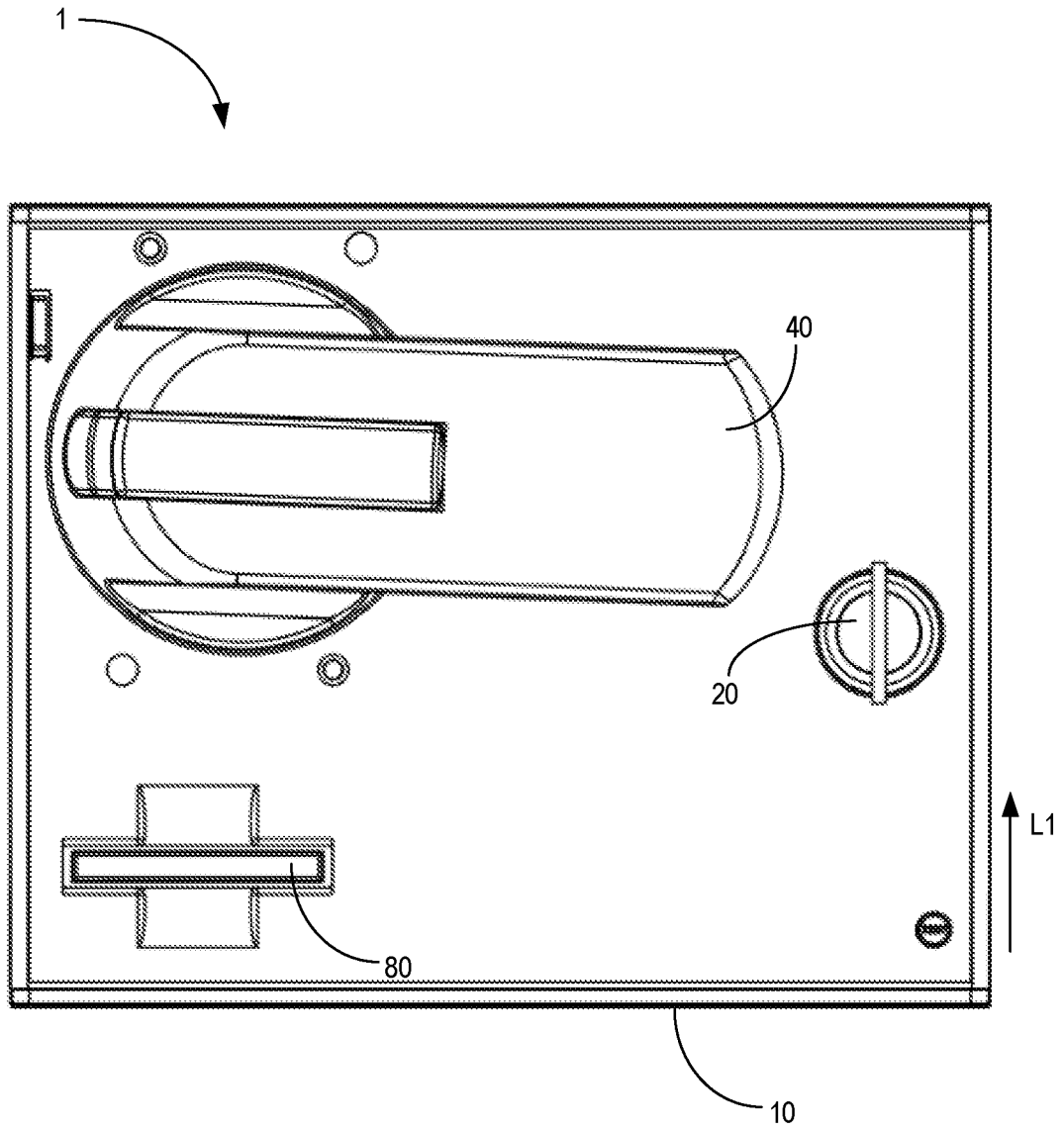


Fig. 2

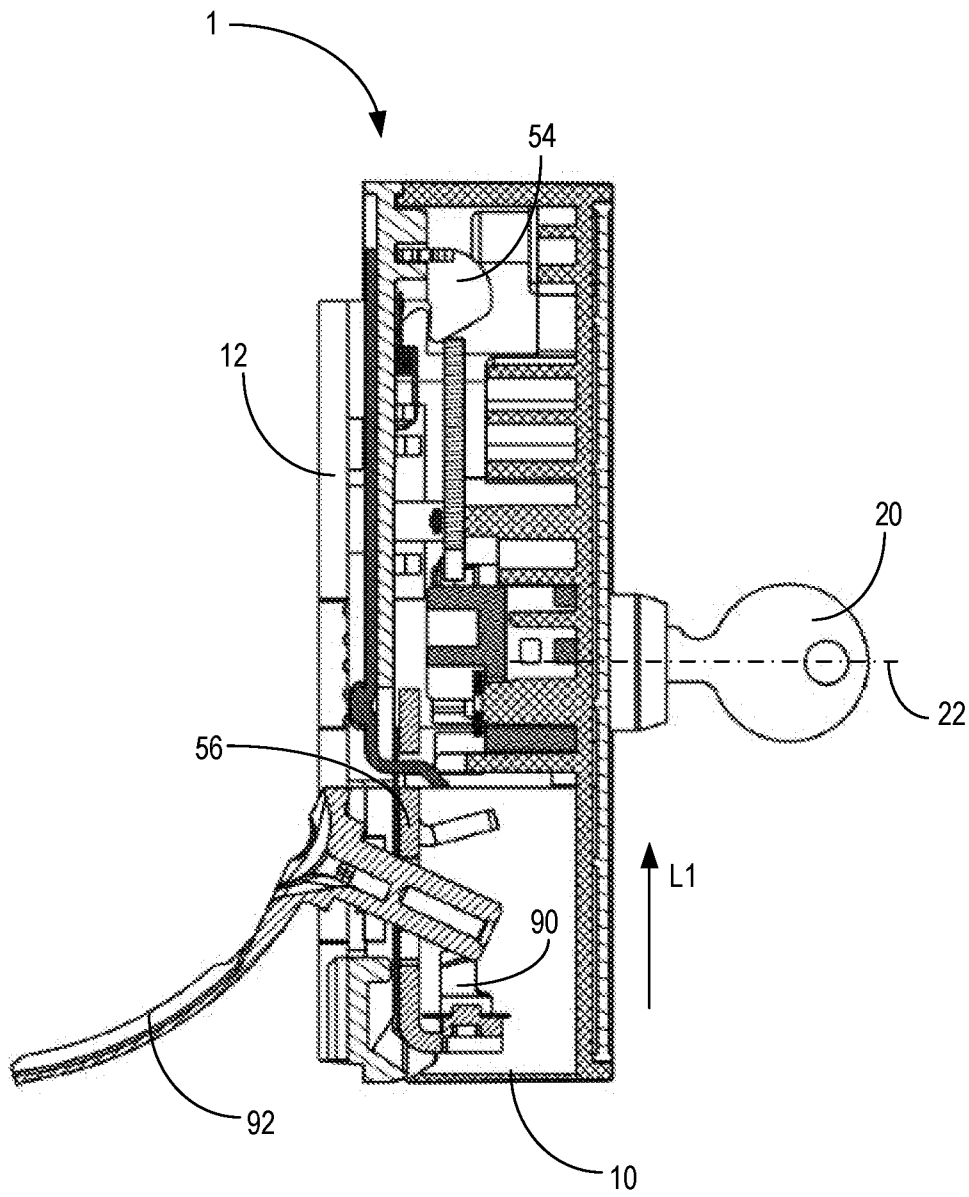


Fig. 3

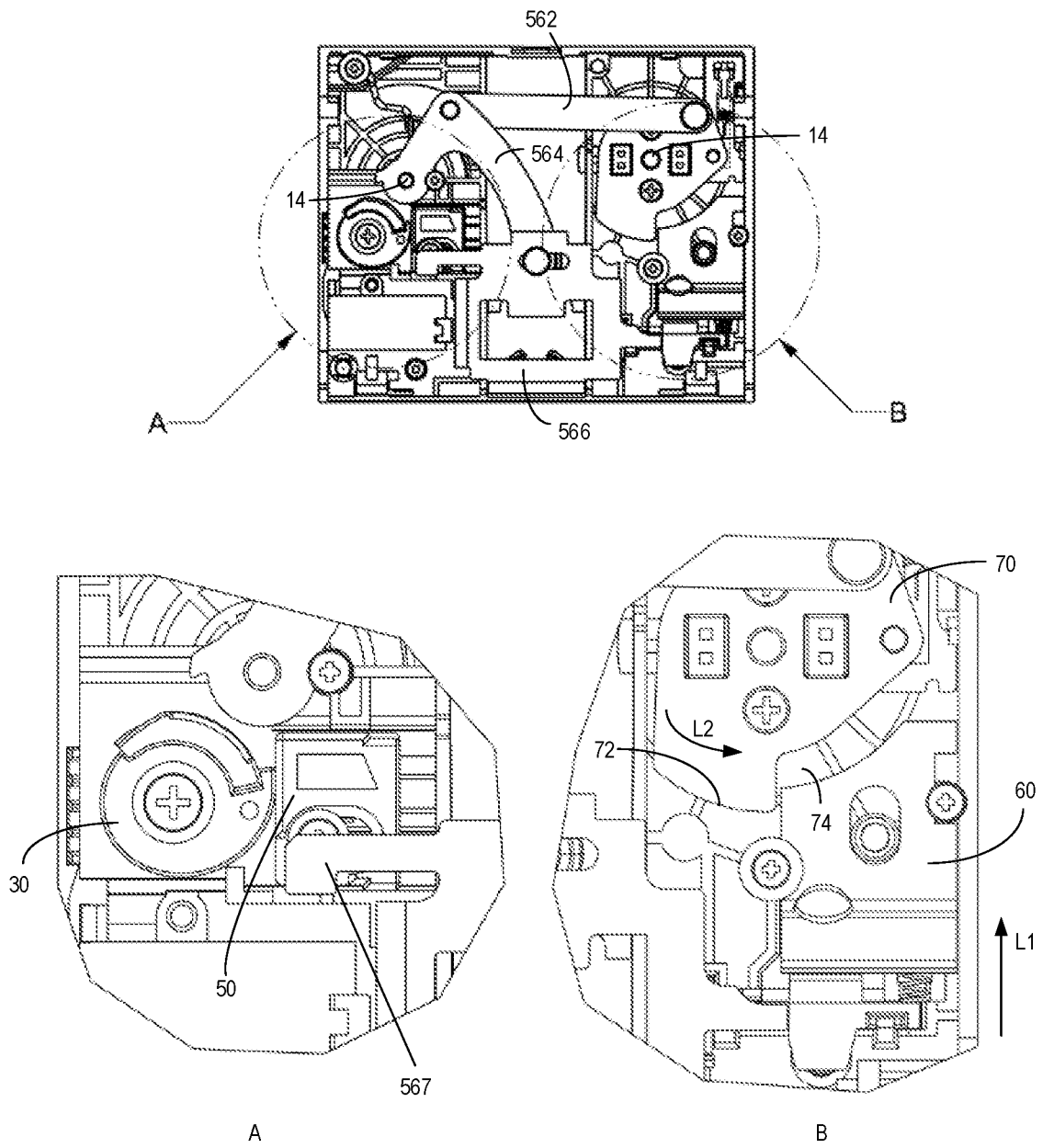


Fig. 4

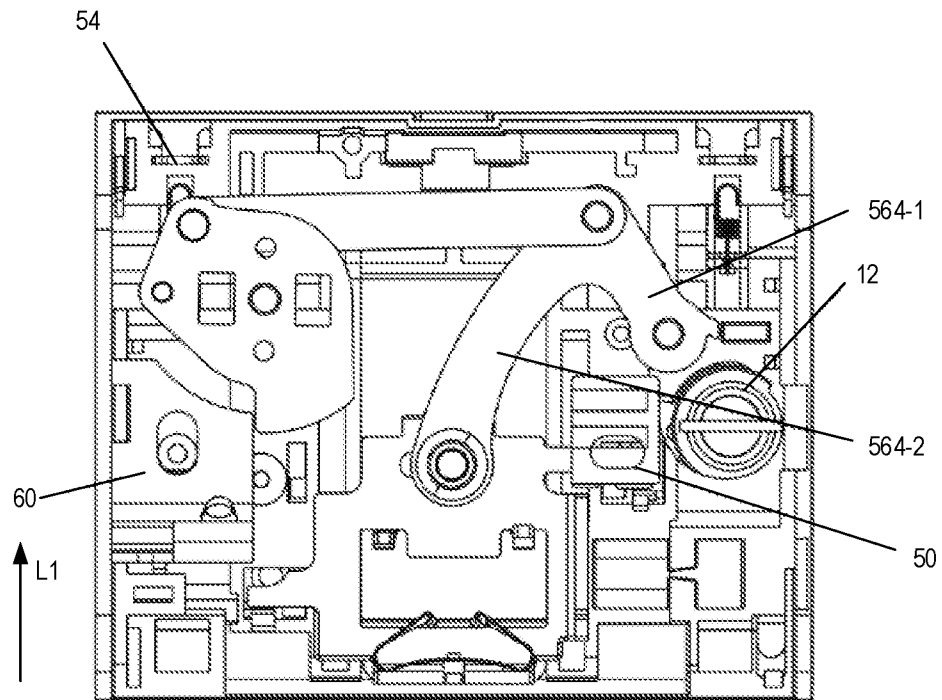


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/093655

A. CLASSIFICATION OF SUBJECT MATTER

H02B 11/133(2006.01)i; H01H 3/02(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)

H02B; H01H

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)

CNPAT,CNABS,DWPI CABINET, HANDLE, LOCK+, HOUSING, DRIVE, ROTAT+, ACTUAT+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 109216096 A (ASIA ELECTRICAL POWER EQUIP SHENZHEN CO) 15 January 2019 (2019-01-15) pages 4-6, figures 1-5	1, 8-10
A	CN 109036887 A (GUANGDIAN ELECTRIC GROUP CO LTD) 18 December 2018 (2018-12-18) the whole document	1-10
A	CN 108183419 A (WUHU JINNIU ELECTRIC CO LTD) 19 June 2018 (2018-06-19) the whole document	1-10
A	DE 10106884 A1 (MOELLER GMBH) 05 September 2002 (2002-09-05) the whole document	1-10
A	CN 108963848 A (ABB SCHWEIZ AG) 07 December 2018 (2018-12-07) the whole document	1-10
A	US 4295054 A (ESTINGHOUSE ELECTRIC COR) 13 October 1981 (1981-10-13) the whole document	1-10



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

11 November 2019

Date of mailing of the international search report

19 February 2020

Name and mailing address of the ISA/CN

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SONG,Yiqun

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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