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

(11) **EP 4 528 777 A1**

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

(43) Date of publication:
26.03.2025 Bulletin 2025/13

(21) Application number: **23879041.4**

(22) Date of filing: **14.10.2023**

(51) International Patent Classification (IPC):
H01H 71/02 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
H01H 71/02; H01H 71/10

(86) International application number:
PCT/CN2023/124630

(87) International publication number:
WO 2024/083052 (25.04.2024 Gazette 2024/17)

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **20.10.2022 CN 202211283727**

(71) Applicant: **Chint Low Voltage Electrical Technology Co., Ltd.**
Shanghai 201620 (CN)

(72) Inventors:
- **LU, Dengyu**
  Shanghai 201620 (CN)
- **AO, Denggui**
  Shanghai 201620 (CN)
- **XU, Yongfu**
  Shanghai 201620 (CN)

(74) Representative: **Petraz, Gilberto Luigi et al**
GLP S.r.l.
Viale Europa Unita, 171
33100 Udine (IT)

(54) OPERATING MECHANISM OF CIRCUIT BREAKER, QUICK TRIPPING DEVICE, AND CIRCUIT BREAKER

(57) The present invention relates to the field of low-voltage electrical appliances, in particular to an operating mechanism of a circuit breaker. The operating mechanism includes a support, a rocker arm assembly, a jump catch, a lock catch and a re-buckling unit that are arranged rotatably on the support respectively, a first crank, an energy storage spring, a slide rail fixed with respect to the support, a slider, a first link, a second link, a second crank arranged rotatably around a sixth center, a third link and a third crank that is arranged rotatably around a seventh center; and the third crank is located on one side of the operating mechanism in a horizontal direction of the operating mechanism. The operating mechanism can be switched among three operating states without connecting a contact system, and can change the layout of the contact system and provide a larger installation space for an arc-extinguishing chamber.

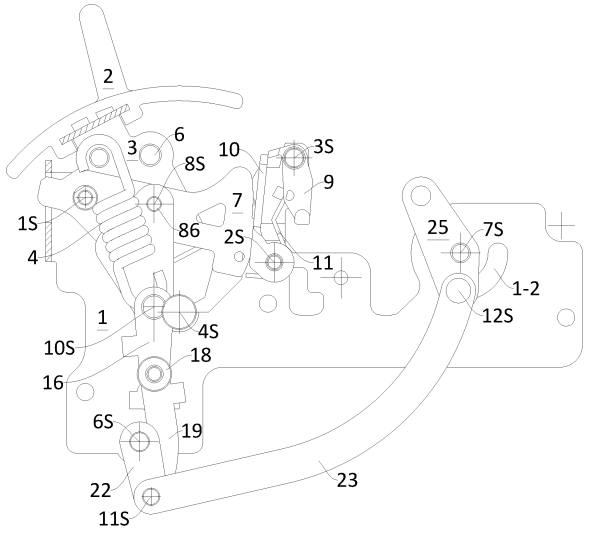

Fig.4b

EP 4 528 777 A1

Description

TECHNICAL FIELD

[0001] 1. The present invention relates to the field of low-voltage electrical appliances, in particular to an operating mechanism of a circuit breaker, a quick tripping device of the circuit breaker including the operating mechanism, and a circuit breaker including the operating mechanism.

BACKGROUND

[0002] 2. With the continuous development of photovoltaic technologies, performance requirements of a power distribution system for molded case circuit breakers have gradually improved, thereby promoting the continuous development of molded case circuit breaker products in the directions of small volume and high performance.

[0003] 3. In order to meet high-voltage breaking requirements of two poles DC1000V and DC1500V of a molded case circuit breaker in a photovoltaic distribution line, an arc voltage of an arc-extinguishing chamber is often increased to meet the above requirements. However, an operating mechanism of the traditional 250A molded case circuit breaker is a four-link - five-link conversion structure, and the operating mechanism and a rotating shaft of a moving contact mechanism are arranged in a vertical direction of the operating mechanism, so that an arc-extinguishing chamber can only be located on a side of the moving contact mechanism in a horizontal direction; and meanwhile, due to a limited external dimension of the product, the size of the arc-extinguishing chamber cannot be greatly increased, resulting in the arc voltage of the arc-extinguishing chamber being difficult to have a significant increase. Secondly, in an operating mechanism of the existing molded case circuit breaker, highly correlated components, under the premise of satisfying other parameters, neither conveniently increases an opening distance between a dynamic contact and a static contact by adjusting a matching size between various links, nor accommodates a large-size arc-extinguishing chamber.

[0004] 4. In addition, in the existing molded case circuit breaker, a quick tripping device has the problems of complex structure, large occupied space and poor reliability.

[0005] 5. In addition, the existing molded case circuit breaker often achieves short-circuit and overload protection by providing a thermomagnetic tripping mechanism, but a transmission structure between the thermomagnetic tripping mechanism and the operating mechanism has the problems of complex structure, large occupied space for installation, and poor reliability.

6. SUMMARY

[0006] 7. An object of the present invention is to overcome the defects of the prior art, and provide an operating mechanism of a circuit breaker, which can be switched among three operating states without connecting a contact system, and can change the layout of the contact system and provide a larger installation space for an arc-extinguishing chamber; and further provide a circuit breaker including the operating mechanism, which has good arc-extinguishing performance.

[0007] 8. In order to achieve the above object, the present invention adopts the following technical solutions:

[0008] 9. an operating mechanism of a circuit breaker, comprising a support, a rocker arm assembly, a jump catch, a lock catch and a re-buckling unit which are rotatably arranged on the support respectively, a first crank, an energy storage spring, a slide rail fixedly arranged with respect to the support, a slider, a first link, a second link and a second crank that is arranged rotatably around a sixth center, wherein the lock catch is in snap fit with the jump catch and is in limiting fit with the re-buckling unit; one end of the first crank is arranged rotatably on the jump catch around an eighth center, and another end of the first crank is rotatably connected to one end of the first link and one end of the energy storage spring around a tenth center, and another end of the energy storage spring is connected to the rocker arm assembly; another of the first link is rotatably connected to the slider, and the slider is slidably arranged on the slide rail; one end of the second link is rotatably connected to the slider, and another end of the second link is rotatably connected to the second crank around an eleventh center so as to drive the second crank to rotate; when the operating mechanism is in an opened or tripped state, the slide rail is in limiting fit with the slider to prevent the slider from sliding; the operating mechanism further includes a third link and a third crank that is arranged rotatably around a seventh center; one end of the second crank is rotatably connected to one end of the third link around the eleventh center, and another end of the third link is rotatably connected to the third crank around a twelfth center so as to drive the third crank to rotate; the rocker arm assembly and the second crank are respectively located at two ends of the operating mechanism in a vertical direction of the operating mechanism; and the third crank is located at one side of the operating mechanism in a horizontal direction of the operating mechanism.

[0009] 10. Preferably, the sixth center, the seventh center, the eleventh center and the twelfth center are arranged in parallel at intervals and are located at four vertices of a quadrilateral; the second crank is arranged rotatably on the support around the sixth center; and the third crank is arranged rotatably on the support around the seventh center.

[0010] 11. Preferably, the support is provided with a second crank guide hole; the second crank and the third

link are connected rotatably through an eleventh shaft; the eleventh shaft is inserted in the second crank guide hole; and the second crank guide hole has a shape matching a moving trajectory of the eleventh shaft.

[0011] 12. Preferably, the support is provided with a third crank guide hole; the third link and the third crank are connected rotatably through a twelfth shaft; the twelfth shaft is inserted in the third crank guide hole; and the third crank guide hole has a shape matching a moving trajectory of the twelfth shaft.

[0012] 13. Preferably, the second crank is of a strip-shaped plate structure; one end of the second crank is arranged rotatably around the sixth center; and another end of the second crank is rotatably connected to the third link and the second link around the eleventh center.

[0013] 14. Preferably, the third crank is of a triangular plate structure, wherein a first vertex angle is arranged rotatably around the seventh center, a second vertex angle is rotatably connected to the third link around the twelfth center, and a third vertex angle is used to be rotatably connected to the moving contact mechanism of the circuit breaker.

[0014] 15. Preferably, the third crank is an obtuse triangle plate structure, wherein a first vertex angle is an obtuse angle.

[0015] 16. Preferably, the support comprises two support side plates that are oppositely arranged; each support side plate comprises a side-plate first portion and a side-plate second portion which are connected to each other; the rocker arm assembly, the jump catch, the lock catch, the re-buckling unit and the second crank are arranged rotatably on the side-plate first portion respectively; a V-shaped groove and a slide rail are respectively arranged at two ends of the side-plate first portion in a vertical direction; the side-plate second portion is connected to one end of the side-plate first portion in a horizontal direction; the rocker arm assembly is arranged to swing in the V-shaped groove; and the third crank is arranged rotatably on the side-plate second portion.

[0016] 17. Preferably, each slide rail is of a groove-like structure or a hole-like structure.

[0017] 18. Preferably, the slide rail is arranged on the support.

[0018] 19. Preferably, the operating mechanism further comprising a first draw bar and a transmission jump catch that are in snap fit with each other and arranged rotatably respectively, wherein the first draw bar is driven to rotate when a circuit where the circuit breaker is located has a short-circuit or overload fault, so as to release snap fit with the first draw bar, and the transmission jump catch rotates to drive the operating mechanism to trip.

[0019] 20. Preferably, the operating mechanism further comprises a thermomagnetic tripping mechanism; and when the circuit breaker has short-circuit and overload faults, the thermomagnetic tripping mechanism drives the first draw bar to rotate to release snap fit with the transmission jump catch.

[0020] 21. Preferably, when the circuit where the circuit breaker is located has a short-circuit fault, the first draw bar is driven by the moving contact of the circuit breaker to release snap fit with the transmission jump catch.

[0021] 22. Preferably, the operating mechanism further comprises a test button that is slidably arranged; the test button is driven by an external force to slide, and the test button drives the first draw bar to act to release snap fit from the transmission jump catch.

[0022] 23. Preferably, when the operating mechanism is re-buckled from the tripped and opened state, the rocker arm assembly of the operating mechanism drives the transmission jump catch to reset to restore the snap fit with the first draw bar.

[0023] 24. A circuit breaker, comprising the operating mechanism of the circuit breaker, and at least one set of breaking units; wherein each breaking unit comprises a contact system and an arc-extinguishing chamber; the contact system comprises a moving contact mechanism and a static contact that are used cooperatively; the moving contact mechanism comprises a contact support which is arranged rotatably around the seventh center and a moving contact arranged on the contact support; the contact support is in driving connection with the third crank; and the rocker arm assembly, the second crank and the arc-extinguishing chamber are sequentially arranged along the vertical direction of the operating mechanism.

[0024] 25. In the operating mechanism of the present invention, a slide rail also serves as a support point to provide a support force for a first link and a slider while providing a guiding function for the slider, so that the operating mechanism has both a stable closing position, opening position and tripping position in a case that the operating mechanism is not connected to a moving contact mechanism of a breaking unit, so the operating mechanism becomes a component that can be operated independently, which is conducive to realizing modular assembly and production of the operating mechanism, and makes the distribution of the operating mechanism in the circuit breaker have more design space. In addition, in actual production, the operating mechanism does not need to cooperate with the moving contact mechanism of the breaking unit, which avoids the loss of the contact system of the breaking unit during the test process, and reduces the cost of R&D and production. In addition, in the operating mechanism, a third crank is used for being in driving connection with the moving contact mechanism of the circuit breaker, so that the moving contact mechanism and the operating mechanism are arranged side by side in a horizontal direction of the operating mechanism, so more space for an arc-extinguishing chamber to be arranged is provided on one side of the operating mechanism in a vertical direction of the operating mechanism, so as to arrange an arc-extinguishing chamber of larger specification and better arc-extinguishing performance, thereby improving the arc-extinguishing performance and breaking performance of the circuit breaker.

[0025] 26. In addition, the operating mechanism is re-

buckled, and meanwhile drives a transmission jump catch to reset to restore snap fit with a first draw bar, thereby ensuring the reliable resetting of the transmission jump catch and the first draw bar, and preparing for next tripping and opening operations.

[0026] 27. The circuit breaker of the present invention, which includes the operating mechanism, has good arc-extinguishing performance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

28. FIG. 1 is a schematic structural diagram of a circuit breaker in a switch-on state in the present invention, in which a quick tripping device and a test button are shown;

29. FIG. 2 is a schematic structural diagram of a breaking unit in a closed state in the present invention;

30. FIG. 3 is a schematic structural diagram of the breaking unit in the present invention, in which a moving contact is repulsed by an electric repulsion force between the moving contact and a static contact to drive a first transmission structure to rotate;

31. FIG. 4a is a schematic structural diagram of the circuit breaker in the switch-on state in the present invention, in which a cooperative relationship between the operating mechanism and a moving contact mechanism of the breaking unit is shown;

32. FIG. 4b is a schematic structural diagram of the operating mechanism in a switch-on state in the present invention;

33. FIG. 5a is a schematic diagram of a projection of the circuit breaker in a tripped and opened state in the present invention;

34. FIG. 5b is a schematic diagram of a three-dimensional structure of the circuit breaker in the tripped and opened state in the present invention;

35. FIG. 5c is a schematic structural diagram of the operating mechanism in a tripped and opened state in the present invention, in which a cooperative relationship between a first draw bar and a thermomagnetic tripping unit is shown;

36. FIG. 6 is a schematic structural diagram of the circuit breaker in a re-buckling process in the present invention;

37. FIG. 7 is a schematic structural diagram of the first transmission structure in the present invention;

38. FIG. 8 is a schematic structural diagram of a first-stage push rod in the present invention;

39. FIG. 9 is a schematic structural diagram of a second-stage push rod in the present invention;

40. FIG. 10 is a schematic structural diagram of the first draw bar in the present invention;

41. FIG. 11 is a schematic structural diagram of a transmission jump catch in the present invention; and

42. FIG. 12 is a schematic structural diagram of a second draw bar in the present invention.

43. Reference symbols represent the following components:

[0028] 1S--first center; 2S--second center; 3S--third center; 4S--fourth center; 5S--fifth center; 6S--sixth center; 7S--seventh center; 8S--eighth center; 9S--ninth center; 10S--tenth center; 11S--eleventh center; 12S--twelfth center; 1a--first connecting shaft; 2a--rocker arm driving portion; 3a--snap-fastening structure; 1b--second connecting shaft; 1c--third connecting shaft; 1--support; 1-0--slide rail; 1-1--second crank guide hole; 1-2--third crank guide hole; 4--energy storage spring; 2--handle; 3--rocker arm; 6--reset structure; 7--jump catch; 8--sliding shaft; 9--re-buckling unit; 10--lock catch; 11--cooperative torsion spring; 12--breaking unit housing; 14--first crank; 15--crank limiting portion; 16--first link; 18--slider; 19--second link; 22--second crank; 23--third link; 24--test button elastic resetting member; 25--third crank; 28--driving shaft; 32--transmission jump catch; 32-0--transmission jump catch pivoting end; 32-1--transmission jump catch driving face; 32-2--transmission jump catch snap-fastening end; 32-20--snap-fastening end hook; 32-3--transmission jump catch driven portion; 34--first draw bar; 34-0--first draw bar main body; 34-00--first draw bar shaft hole; 34-1--first draw bar driven portion; 34-2--first draw bar snap-fastening arm; 34-20--snap-fastening arm hook; 34-3--first draw bar connecting arm; 34-4--first draw bar spring arm; 36--first draw bar reset elastic member; 40--contact support; 41--moving contact; 42--static contact; 43--first transmission structure; 43-0--first transmission structure mounting portion; 43-00--first transmission structure shaft hole; 43-1--first transmission structure driven portion; 43-2--first transmission structure driving arm; 44--first-stage push rod; 44-0--first-stage push rod arm; 44-1--first-stage push rod shaft; 44-10--first-stage push rod shaft connecting portion; 45--second-stage push rod; 45-0--second-stage push rod arm; 45-00--second-stage push rod arm connecting hole; 45-1--second-stage push rod shaft; 46--test button; 47--contact spring; 47-0--first contact spring end; 47-1--contact spring main body; 47-2--second contact spring end; 48-0--first mounting shaft; 48-1--second mounting shaft; 49--second draw bar; 49-0--second draw bar main body; 49-1--second draw bar connecting arm; 49-2--second draw bar armature cooperating arm; 49-3--second draw bar bimetallic cooperating arm; 50--armature transmission member; 51--bimetallic element; 52-1--first hinging shaft; 52-2--second hinging shaft; 53--thermomagnetic tripping armature; 54--thermomagnetic tripping yoke; 55--connecting rod; 55-0--first hinging shaft; 55-1--second hinging shaft; 56--second draw bar shaft; 58--first draw bar shaft; 60--transmission jump catch elastic member; 61--transmission jump catch shaft; 62--torsion spring limiting shaft; 85--rocker arm rotating shaft; 86--crank jump catch hinging shaft; 97--fourth-link

structure; 2223--eleventh shaft; and 2325--twelfth shaft.

DETAILED DESCRIPTION OF THE INVENTION

[0029] 44. The specific implementation of a circuit breaker of the present invention will be further described below with reference to the embodiments given in FIGs. 1 to 12. The circuit breaker of the present invention is not limited to the description of the following embodiments.

[0030] 45. The circuit breaker of the present invention is preferably a circuit breaker with an energy-storage operating mechanism, such as a molded case circuit breaker.

[0031] 46. As shown in FIGs. 1-6, the circuit breaker of the present invention includes an operating mechanism and at least one set of breaking unit, wherein the operating mechanism is in driving connection with the breaking unit to drive the breaking unit to be closed or disconnected, so that the circuit breaker is switched on or switched off. Further, each breaking unit includes a contact system. The contact system includes a moving contact mechanism and a static contact that are used cooperatively. The moving contact mechanism includes a contact support 40 that is arranged rotatably and a moving contact 41 arranged on the contact support 40.

[0032] 47. The circuit breaker of the present invention preferably includes a plurality of sets of breaking units. The moving contact mechanisms of the respective breaking units are arranged side by side, are arranged coaxially and rotatably and are in driving connection with the operating mechanism so as to be synchronously closed or disconnected.

[0033] 48. As shown in FIGs. 1 and 4a-6, an embodiment of the operating mechanism is shown.

[0034] 49. The operating mechanism has three working states, which are a switch-off state, a switch-on state and a tripped state (tripped and opened state) respectively. The operating mechanism in the tripped state is switched to the switch-off state by being re-buckled.

[0035] 50. As shown in FIGs. 1 and 4a-6, the operating mechanism includes a support 1, a rocker arm assembly, a jump catch 7, a lock catch 10 and a re-buckling unit 9 which are arranged rotatably on the support 1 respectively, a first crank 14, an energy storage spring 4, a slide rail 1-0 fixedly arranged with respect to the support 1, a slider 18, a first link 16, and a second crank 22 that is arranged rotatably around a sixth center 6S; the lock catch 10 is in snap fit with the jump catch 7 and is then in limiting fit with the re-buckling unit 9; one end of the first crank 14 is arranged rotatably on the jump catch 7 around an eighth center 8S, and the other end of the first crank 14 is rotatably connected to one end of the first link 16 and one end of the energy storage spring 4 around a tenth center 10S, and the other end of the energy storage spring 4 is connected to the rocker arm assembly; the other end of the first link 16 is rotatably connected to the slider 18, and the slider 18 is slidably arranged on the slide rail 1-0; and when the operating mechanism in the switch-off or tripped state, the slide rail 1-0 is in limiting fit with the slider 18 to prevent the slider 18 from sliding. The slider 18 converts a position change of the first link 16 in the switch-on and switch-off motions into a displacement of the slider 18, which is conducive to the actual measurement and the adjustment of parameters such as a size of a structure connected to the slider 18. In addition, the switching of mechanism links and the transfer of a torque can be implemented by the first crank 14, the first link 16 and the slider 18 at this situation, and the operating mechanism can implement the switch-on, switch-off and tripping operations without connecting a rotating shaft (i.e., the moving contact mechanism), which is convenient for the modular production of the operating mechanism. That is, in the operating mechanism, the slide rail 1-0 provides a guiding function for the slider 18, and also serve as a support point to provide a support force for the first link 16 and the slider 18, so that the operating mechanism may have a stable switch-on position, switch-off position and tripping position without connecting the moving contact mechanisms of the breaking unit, making the operating mechanism become an independently operable component, which is conducive to the modular assembly and production of the operating mechanism, and provides more design space for the distribution of the operating mechanism in the circuit breaker. In addition, in actual production, the operating mechanism does not need to cooperate with the moving contact mechanism of the breaking unit, which avoids the loss of the contact system of the breaking unit during the test process and reduces R&D and production costs.

[0036] 51. Further, in this embodiment, the jump catch 7 is arranged rotatably on the support 1 around a first center 1S, the lock catch 10 is arranged rotatably on the support 1 around a second center 2S, the re-buckling unit 9 is arranged rotatably on the support 1 around a third center 3S, and the rocker arm assembly is arranged rotatably on the support 1 around a fourth center 4S.

[0037] 52. As shown in FIGs. 1 and 4a-5c, the jump catch 7 is arranged rotatably on the support 1 through a jump catch shaft, the lock catch 10 is arranged rotatably on the support 1 through a lock catch shaft, and the re-buckling unit 9 is arranged rotatably on the support 1 through a re-buckling unit shaft.

[0038] 53. As shown in FIGs. 1 and 4a-6, the slide rail 1-0 is preferably arranged in a long straight hole on the support 1, and the slider 18 reciprocates in the long straight hole along its extension direction. Further, one end of the long straight hole is open, the other end of the long straight hole is closed and is an opening position of the slider 18. It should be pointed out that the slide rail 1-0 may also not be arranged on the support 1, but on a supporting structure independent of the operating mechanism, e.g., a housing structure for accommodating the operating mechanism or a housing for accommodating the breaking unit (the breaking unit housing is referred to as a breaking unit housing 12, as shown in FIG. 2).

[0039] 54. As shown in FIGs. 1 and 4a-6, the rocker

arm assembly includes a synchronously acting handle 2, a rocker arm 3, and a reset structure 6 for driving the jump catch 7 to be re-buckled with the lock catch 10, wherein the rocker arm 3 is arranged rotatably on the support 1 around a fourth center 4S (as shown in FIG. 5c, the rocker arm 3 is preferably arranged rotatably on the support 1 through a rocker arm rotating shaft 85), and the rocker arm 3 are in limiting fit with the support 1 at two ends of the swing stroke of the rocker arm 3, respectively. Further, the reset structure 6 is a reset shaft arranged on the rocker arm 3 (two ends of the reset shaft are fixedly connected to two rocker arm supporting legs of the rocker arm 3 respectively). The jump catch 7 is of a strip-shaped structure, wherein one end of the jump catch 7 is in snap fit with the lock catch 10, and the other end of the jump catch 7 is arranged rotatably on the support 1. When the operating mechanism is in a tripped state, the rocker arm assembly swings in a switch-off direction to drive the jump catch 7 through the reset structure 6 to rotate and be re-buckled with the lock catch 10 (that is, restores snap fit therebetween), and the lock catch 10 restores limiting fit with the re-buckling unit 9.

[0040] 55. As shown in FIGs. 1 and 4a-6, the support 1 is provided with a V-shaped groove, and the rocker arm 3 are in limiting fit with two sidewalls of the V-shaped groove at two ends of the swing stroke of the rocker arm 3, respectively.

[0041] 56. As shown in FIGs. 1, 4b and 5a, the first crank 14 is of a triangular structure, which has a first vertex arranged rotatably on the jump catch 7 around an eighth center 8S (the first vertex is preferably connected to the jump catch 7 through a crank jump catch hinging shaft 86), a second vertex rotatably connected to one end of the first link 16 and one end of the energy storage spring 4 around a tenth center 10S respectively, and a third vertex at which a crank limiting portion 15 is provided. Further, the operating mechanism includes two first cranks 14 which are symmetrically arranged on both sides of the jump catch 7 and fixedly connected, wherein the two first cranks 14 act synchronously.

[0042] 57. As shown in FIGs. 1 and 4b, the operating mechanism further includes a cooperative torsion spring 11. The cooperative torsion spring 11 cooperates with the re-buckling unit 9 and the lock catch 10 respectively, such that the re-buckling unit 9 and the lock catch 10 keep in limiting fit with each other.

[0043] 58. As shown in FIGs. 1 and 4a-6, the operating mechanism further includes a second link 19, a second crank 22 arranged rotatably around a sixth center 6S, a third link 23 and a third crank 25 arranged rotatably around a seventh center 7S, wherein one end of the second link 19 is rotatably connected to the slider 18, and the other end of the second link 19 is rotatably connected to the second crank 22 around an eleventh center 11S to drive the second crank 22 to rotate; one end of the second crank 22 and one end of the third link 23 are also rotatably connected around an eleventh center 11S, and the other end of the third link 23 is rotatably connected to the third crank 25 around a twelfth center 12S to drive the third crank 25 to rotate; the third crank 25 is used for being in driving connection with the moving contact mechanism of the breaking unit; the rocker arm assembly and the second crank 22 are respectively located at both ends of the operating mechanism in a vertical direction; and the third crank 25 is located on one side of the operating mechanism in a horizontal direction. Further, the third crank 25 is in driving connection with the moving contact mechanism through a driving shaft 28, and a breaking unit housing is preferably provided with a driving shaft avoidance hole that matches a moving trajectory of the driving shaft 28. In the operating mechanism, the third crank 25 is used for being in driving connection with the moving contact mechanism of the circuit breaker, so that the moving contact mechanism and the operating mechanism are arranged side by side in the horizontal direction of the operating mechanism, so more space for an arc-extinguishing chamber to be arranged is provided on a side of the operating mechanism in a vertical direction, so as to arrange an arc-extinguishing chamber of larger specification and better arc-extinguishing performance, thereby improving the arc-extinguishing performance and breaking performance of the circuit breaker.

[0044] 59. According to the circuit breaker of the present invention, the operating mechanism is improved on the basis of the existing four-link - five-link conversion structure, and a rotating center of the operating mechanism and a rotating center of the moving contact mechanism are arranged on the same horizontal line (that is, the operating mechanism and the moving contact mechanism are arranged side by side in the horizontal direction of the operating mechanism). Under the premise of ensuring that the operating mechanism can reliably be switched off, switched on and tripped, a crank slider structure (composed of the first crank 14, the first link 16 and the slider 18) and a four-link structure (as shown in FIGs. 4a and 6, the four-link structure 97 is composed of the second crank 22, the third link 23 and the third crank 25) are added, which not only realizes the switch-off and switch-on actions of the operating mechanisms and moving contact mechanisms in 2P and 3P circuit breakers, but also reserves larger design space for the arc-extinguishing chamber, and finally can realize a horizontal arc-extinguishing chamber design of the circuit breaker.

[0045] 60. As shown in FIGs. 1, 4a-5a and 6, the sixth center 6S, the seventh center 7S, the eleventh center 11S and the twelfth center 12S are arranged in parallel at intervals and are located at four vertices of a quadrilateral.

[0046] 61. As shown in FIGs. 1 and 4b-5a, the second crank 22 is preferably arranged rotatably on the support 1 around a sixth center 6S. Further, the second crank 22 is of a strip-shaped plate structure, one end of which is arranged rotatably on the support 1 around the sixth center 6S, and the other end of which is rotatably connected to the third link 23 around the eleventh center 11S.

It should be pointed out that the second crack 22 may also not be arranged on the support 1, but on a housing structure independent of the operating mechanism, e.g., a housing structure for accommodating the operating mechanism 1 or a housing for accommodating the breaking unit.

[0047] 62. As shown in FIG. 5b, the support 1 is preferably provided with a second crank guide hole 1-1, the second crank 22 and the third link 23 are preferably connected rotatably through an eleventh shaft 2223, the eleventh shaft 2223 is inserted in the second crank guide hole 1-1, and the second crank guide hole 1-1, which is an arc-shaped hole, has a shape matching a moving trajectory of the eleventh shaft 2223.

[0048] 63. As shown in FIGs. 1 and 4b-5a, the third crank 25 is preferably arranged rotatably on the support 1 around the seventh center 7S. It should be pointed out that the third crank 25 may also not be arranged on the support 1, but on a housing structure independent from the operating mechanism, e.g., a housing structure for accommodating the operating mechanism 1 or a housing for accommodating the breaking unit.

[0049] 64. As shown in FIGs. 1 and 4b-5a, the third crank 25 is of a triangular plate structure, wherein a first vertex angle is arranged rotatably on the support 1 around the seventh center 7S, a second vertex angle is rotatably connected to the third link 23 around the twelfth center 12S, and a third vertex angle is rotatably connected to the moving contact mechanism of the breaking unit to drive the moving contact mechanism to rotate. Further, the third crank 25 is an obtuse triangle plate structure, wherein the first vertex angle is an obtuse angle.

[0050] 65. As shown in FIGs. 1 and 4a-4b, the support 1 is preferably provided with a third crank guide hole 1-2, the third link 23 and the third crank 25 are preferably connected rotatably through a twelfth shaft 2325, the twelfth shaft 2325 is inserted in the third crank guide hole 1-2, and the third crank guide hole 1-2, which is an arc-shaped hole, has a shape matching a moving trajectory of the twelfth shaft 2325.

[0051] 66. A switching process of the operating mechanism among an switch-off state, a switch-on state and a tripped state is described below in conjunction with FIGs. 1, 4a-5a and 6, and the details are as follows:

[0052] 67. as shown in FIGs. 1, 4a-5a and 6, two ends of the swing stroke of the rocker arm 3 of the rocker arm assembly are a first stroke end and a second stroke end, respectively; and two ends of the energy storage spring 4 are a first energy storage spring end and a second energy storage spring end, respectively, which are connected to the rocker arm assembly (the first energy storage spring end is preferably connected to the rocker arm 3) and the first crank 14, respectively. Specifically, as shown in FIGs. 1, 4a-5a and 6, the first stroke end and the second stroke end of the rocker arm 3 are a right end and a left end of the swing stroke of the rocker arm 3, respectively; the upper end of the energy storage spring 4 is the first energy storage spring end, and the lower end of the energy storage spring 4 is the second energy storage spring end.

[0053] 68. In conjunction with FIGs. 1 and 4a-4b, an action process of the operating mechanism switched from the switch-on state to the switch-off state is as follows:

69. as shown in FIGs. 1 and 4a-4b, when the operating mechanism is in the closed state, the rocker arm 3 swings toward the second stroke end and drives the first energy storage spring end to rotate around the second energy storage spring end for energy storage. The energy storage spring 4 achieves maximum energy storage while reaching a first dead center position, and the energy storage spring 4 rotates over the first dead center position, the energy storage spring 4 releases energy to drive the first crank 14 to rotate in a second direction and drives the rocker arm 3 to swing to the second stroke end, the first crank 14 drives the slider 18 along the slide rail 1-0 through the first link 16 to slide from the closing position to the opening position, the slider 18 is in limiting fit with the slide rail 1-0 at the closing position to prevent the slider 18 from sliding further, and meanwhile, the slider 18 drives the second crank 22 to rotate in the second direction, the second crank 22 drives the third crank 25 to rotate in the second direction through the third link 19, and the third crank 25 drives the moving contact mechanism to rotate in a breaking direction so as to be broken from the corresponding static contact 42. Specifically, as shown in FIGs. 1 and 4a-4b, in the case that the operating mechanism is switched from the switch-on position to the switch-off position, the slider 18 moves upward along the slide rail 1-0 till the slider 18 moves to and is in limiting with the upper end (i.e., the closing position of the slider 18) of the slide rail 1-0 so as to prevent the slider 18 from sliding further, the second direction is a counterclockwise direction. An axis of the energy storage spring 4 is a first axis. When the energy storage spring 4 is located at the first dead center position, the energy storage spring 4 reaches maximum energy storage and the eighth center 8S is located on the first axis. When the energy storage spring 4 rotates over the first dead center position around the second energy storage spring end, the first axis rotates over the eighth center 8S, so the eighth center 8S may also be regarded as the first dead center position. That is, the first axis of the energy storage spring 4 rotates over the eighth center 8S, namely, the energy storage spring 4 rotates over the first dead center position.

[0054] 70. An action process of the operating mechanism switched from the switch-off state to the switch-on state is as follows:

71. When the operating mechanism 100 is in the switch-on state, the rocker arm 3 swings toward the first stroke end and drives the first energy storage spring end of the energy storage spring 4 to rotate around the second energy storage spring end till the energy storage spring 4 rotate over the first dead center position. The energy storage spring 4 drives the first crank 14 to rotate in the

first direction, such that a crank limiting portion 15 is in limiting fit with the jump catch 7, thereby preventing the first crank 14 from rotating in the first direction; and meanwhile, the energy storage spring 4 drives the rocker arm 3 to swing to the first stroke end, and the first crank 14 drives the slider 18 to slide along the slide rail 1-0 through the first link 16 from the closing position to the opening position, and meanwhile the slider 18 drives the second crank 22 to rotate in the first direction through the second link 19. The second crank 22 drives the third crank 25 to rotate in the first direction through the third link 23, the third crank 25 drives the moving contact mechanism to rotate in a closing direction so as to be closed with the corresponding static contact 42; the first direction and the second direction are opposite to each other. Specifically, when the operating mechanism is switched from the switch-off state to the switch-on state, the slider 18 moves down to the closing position along the slide rail 1-0; the first direction is a clockwise direction.

[0055] 72. As shown in FIGs. 1 and 4a-5a, a process of the operating mechanism switched from theswitch-on state to the tripped state (that is, the tripped and opened state) is as follows:

73. as shown in FIGs. 1 and 4a-6b, when the operating mechanism is in the switch-on state, the re-buckling unit 9 is driven by an external force (e.g., an acting force exerted by a transmission jump catch 32 on the re-buckling unit 9 as described below) to rotate and release limiting fit with the lock catch 10. The lock catch 10 rotates and releases locking fit with the jump catch 7. Under the effect of the energy storage spring 4, the rocker arm of the rocker arm assembly swings to the second stroke end, and the jump catch 7 rotates to the second direction and drives the first crank 14 to rotate synchronously, until the jump catch 7 is in limiting fit with the reset structure 6 of the rocker arm assembly. The first crank 14 drives the slider 18 through the first link 16 to slide along the slide rail 1-0 from the closing position to the opening position. In the above process, the eighth center 8S is always kept on the same side of the axis of the energy storage spring 4, and meanwhile the slider 18 drives the second crank 22 to rotate in the second direction through the second link 19, the second crank 22 drives the third crank 25 to rotate in the second direction through the third link 23, the third crank 25 drives the moving contact mechanism to rotate in a breaking direction so as to be broken from the corresponding static contact 42, the operating mechanism is switched to the tripped state as shown in FIG. 5a, that is, the tripped and opened state. Specifically, when the operating mechanism is switched from the switch-on state to the tripped state, the slider 18 moves upward along the slide rail 1-0 from the closing position to an opening and tripping position.

[0056] 74. As shown in FIGs. 5a-6, a specific process of the operating mechanism which is re-buckled from the tripped state (that is, switched from the tripped state to the switch-off state) is as follows:

75. when the operating mechanism is in the tripped state as shown in FIGs. 5a-5c, as shown in FIG. 6, the rocker arm 3 is driven by an external force to swing to the second stroke end, so as to release the external force (e.g., an acting force exerted by the transmission jump catch 32 on the re-buckling unit 9 described below) exerted on the re-buckling unit 9 that release the re-buckling unit 9 from the limiting fit with the lock catch 10, the cooperative torsion spring 11 drives the lock catch 10 and the re-buckling unit 9 to reset and restore limiting fit with each other; and meanwhile, the rocker arm 3 drives the jump catch 7 to rotate in the first direction through the reset structure 6 till restoring snap fit with the lock catch 10, the jump catch 7 drives the slider 18 through the first crank 14 and the first link 16 to move from the opening position to the closing position on the slide rail 1-0 but does not reach the closing position, and then moves back to the opening position quickly; and meanwhile, the slider 18 drives the second crank 21 through the second link 19 and the second crank 21 drives the third crank 25 through the third link 23 to rotate in the first direction first and then to the second direction, respectively; the third crank 25 drives the moving contact mechanism to first rotate to the closing direction from the breaking position of the moving contact mechanism but will not be closed with the static contact 42, and then rotates to the breaking position in the breaking direction; after the external force that drives the rocker arm 3 to swing is removed, the operating mechanism 100 is switched to the switch-off state. Specifically, when the operating mechanism 100 is re-buckled from the tripped state, the rocker arm 3 is driven by an external force to rotate clockwise, the reset structure 6 of the rocker arm assembly drives the jump catch 7 to rotate clockwise around a first center 1S, and the jump catch 7 drives the slider 18 along the slide rail 1-0 slightly downward through the first crank 14 and the first link 16 but does not move to the closing position; then, the rocker arm 3 drives the energy storage spring 4 to rotate clockwise around the second energy storage spring end, so that the axis of the energy storage spring 4 rotates over the eighth center 8S, the energy storage spring 4 then drives the first crank 14 to rotate counterclockwise around the eighth center 8S, and the first crank 14 drives the slider 18 to slide upward along the slide rail 1-0 through the first link 15 to the opening position. Meanwhile, the slider 18 drives the second crank 22 through the second link 19, and the second crank 21 drives the third crank 25 through the third link 23 to rotate clockwise by a small angle and then counterclockwise to reset, respectively; the third crank 25 drives the moving contact mechanism to rotate from the breaking position to the closed direction by a small angle first, the moving contact mechanism will not be closed with the static contact 42, and then the moving contact mechanism rotates to the breaking position under the driving of the third crank 25.

[0057] 76. In theory, the operating mechanism 100 trips or switches off from the switch-on state, the eleventh shaft 2223 is limited by the second crank guide hole 1-1, the twelfth shaft 2325 is limited by the third crank guide

hole 1-2, and the slider 18 is limited by the slide rail 1-0, the above three processes occur at the same time, but are difficult to carry out at the same time due to actual processing errors. In the present embodiment, it is ensured that the eleventh shaft 2223 is limited before the other two (the twelfth shaft 2325 and the slider 18), which is conducive to increasing a torque of the energy storage spring 4 against a friction force of a rotating shaft (i.e., the contact support of the moving contact mechanism) in the closing process.

[0058] 77. As shown in FIG. 4b, the support 1 includes two support side plates that are oppositely arranged at intervals. Each support side plate includes a side-plate first portion and a side-plate second portion which are connected to each other. The rocker arm assembly, the jump catch 7, the lock catch 10, the re-buckling unit 9 and the second crank 22 are arranged rotatably on the side-plate first portion respectively. A V-shaped groove and a slide rail 1-0 are respectively arranged at two ends of the side-plate first portion in a vertical direction. The side-plate second portion is connected to one end of the side-plate first portion that in a horizontal direction. The rocker arm assembly is arranged to swing in the V-shaped groove. The third crank 25 is arranged rotatably on the side-plate second portion. Further, in a direction as shown in FIG. 4b, an up-down direction in FIG. 4b is a vertical direction of the side-plate first portion, and a left-right direction in FIG. 4b is a horizontal direction of the side-plate first portion.

[0059] 78. As shown in FIGs. 4b-5c, the support 1 preferably includes a support connecting plate, and two ends of the support connecting plate are respectively connected to the two support side plates in a bending manner, so that the support 1 is integrally formed into a U-shaped structure.

[0060] 79. **In** conjunction with FIGs. 1 and 4a-6, in the operating mechanism, two slide rails 1-0 are respectively arranged on the two support side plates. Two ends of each slider 18 are slidably arranged in the two slide rails 1-0, respectively. The two sliders 18 are preferably connected via a slider shaft 8. The two second cranks 22, the two second links 19, the two third links 23 and the two third cranks 25 are symmetrically arranged on both sides of the two support side plates. The rocker arm 3 includes two rocker arm supporting legs that are oppositely arranged, and the two rocker arm supporting legs are respectively arranged in the two V-shaped grooves. The first links 16 and the second links 19 are arranged symmetrically and connected in parallel, which effectively reduces a position error that occurs in the transmission process of left and right links, and reduces the number of parts, thereby ensuring the reliability of multi-link movement and the consistency in actions of left and right poles and achieving an important influence on improving the overall performance of the circuit breaker.

[0061] 80. As shown in FIGs. 4a, 5a-5b and 6, the operating mechanism is connected to each breaking unit via three connecting shafts which are arranged side by side, wherein the three connecting shafts are a first connecting shaft 1a, a second connecting shaft 1b and a third connecting shaft 1c respectively. Further, the operating mechanism is straddled on one breaking unit. The two support side plates of the support 1 are located on both sides of this breaking unit. One end of the operating mechanism in the vertical direction is connected to a breaking unit housing via three connecting shafts, and the three connecting shafts are distributed at intervals along a horizontal direction of the operating mechanism.

[0062] 81. As shown in FIGs. 1-3 and 7-11, the circuit breaker of the present invention further includes a quick tripping device. The quick tripping device is used for implementing a quick tripping operation of the circuit breaker when a circuit where the circuit breaker is located has a short-circuit fault, so as to realize short-circuit protection. Specifically, when the circuit where the circuit breaker is located has a short-circuit fault, the moving contact 41 of each breaking unit is repelled by an electric repulsion force to rotate with respect to the contact support 40. The moving contact 41 drives the re-buckling unit 9 of the operating mechanism to rotate through a transmission path, the re-buckling unit 9 releases limiting fit with the lock catch 10, the lock catch 10 rotates and releases snap fit with the jump catch 7, so that the operating mechanism trips. Further, a driving gap is arranged in the transmission path from the moving contact 41 to the operating mechanism; the driving gap causes the moving contact 41 to rotate a preset angle before starting to drive the operating mechanism to trip. Therefore, when the circuit breaker is closed normally, the operating mechanism is prevented from being triggered to trip as the moving contact 41 bounces due to a rigid contact between the moving contact 41 and the static contact 42.

[0063] 82. As shown in FIGs. 1-3, the quick tripping device includes an operating mechanism and a contact system (i.e., the contact system of the breaking unit). The moving contact mechanism of the contact system includes a contact support 40 which is arranged rotatably around the seventh center 7S, a moving contact 41 which is arranged on the contact support 40 and is arranged rotatably with respect to the contact support 40, a contact spring 47 both ends of which are respectively connected to the contact support 40 and the moving contact 41, a first transmission structure 43 arranged on the contact support 40 and in transmission fit with the moving contact 41, and a first draw bar 34 and a transmission jump catch 32 which are in snap fit with each other. When a short-circuit current flows through the contact system, that is, when the circuit where the circuit breaker is located has a short-circuit fault, the moving contact 41 is driven to rotate with respect to the contact support 40 by an electric repulsion force between the moving contact 41 and the static contact 42, the moving contact 41 drives the first draw bar 34 to act, through the first transmission structure 43, to release snap fit with the transmission jump catch

32, the transmission jump catch 32 acts to drive the operating mechanism to trip, and the operating mechanism is switched to the tripped and opened state. Further, after the transmission jump catch 32 releases snap fit with the first draw bar 34, the re-buckling unit 9 of the operating mechanism is driven to rotate to release the limiting fit with the lock catch 10.

[0064] 83. As shown in FIGs. 2-3, the moving contact 41 is arranged rotatably on the contact support 40 around the seventh center 7S. When the moving contact 41 and the static contact 42 are normally closed or disconnected, the contact spring 47 is located at a first position, and the first center 7S is located at one side of an axis of the contact spring 47. When the moving contact 41 is repulsed by the electric repulsion force between the moving contact 41 and the static contact 42 so that the moving contact 41 rotates to a repulsion position with respect to the contact support 40, the moving contact 41 drives the contact spring 47 to swing to a second position, the first center 7S is located at the other side of the contact spring 47, and the contact spring 47 exerts an acting force to the moving contact 41 such that the moving contact 41 is kept at the repulsion position, thereby avoiding the moving contact 41 from being closed with the static contact 42 again. Further, the repulsion position of the moving contact 41 is the same as a disconnection position.

[0065] 84. When the contact spring 47 is repulsed, the contact spring 47 swings from the first position, across the dead center position, to the second position; and when the contact spring 47 is located at the dead center position, the axis of the contact spring 47 coincides with the seventh center 7S, that is, the seventh center 7S is located on the axis of the contact spring 47.

[0066] 85. As shown in FIGs. 1-3, the moving contact mechanism, the transmission jump catch 32 and the first draw bar 34 are located on one side of the operating mechanism in the horizontal direction, the rocker arm assembly of the operating mechanism is arranged at one end of the operating mechanism in the vertical direction, and rotating axes of the rocker arm assembly, the moving contact mechanism, the transmission jump catch 32 and the first draw bar 34 are parallel to each other.

[0067] 86. In conjunction with FIGs. 5b and 6, when the operating mechanism is re-buckled from the tripped and opened state (the operating mechanism may be switched to the switch-off state after being re-buckled from the tripped and opened state), the rocker arm assembly drives the transmission jump catch 32 to reset to restore snap fit with the first draw bar 34, the lock catch 10 and the re-buckling unit 9 are reset respectively driven by the cooperative torsion spring 11 to reset to restore limiting fit with each other, and the jump catch 7 also rotates under the driving of the reset structure 6 of the rocker arm assembly till getting snap fit with the lock catch 10 again, so that the operating mechanism is re-buckled, the operating mechanism enters the switch-off state after being re-buckled. Further, the rocker arm assembly 3 includes a rocker arm driving portion 2a, the transmission jump catch 32 includes a transmission jump catch driven portion 32-3, and the rocker arm driving portion 2a is in transmission fit with the transmission jump catch driven portion 32-3 to drive the transmission jump catch 32 to reset. Further, as shown in FIG. 11, the transmission jump catch driven portion 32-3 is a boss that is arranged on one side of the transmission jump catch 32 in a protruding manner. As shown in FIGs. 5b and 6, the rocker arm driving portion 2a is a push plate that is in transmission fit with a boss.

[0068] 87. As shown in FIGs. 1-3, the quick tripping device further includes a tripping device housing and a second transmission structure. The tripping device housing is realized by the breaking unit housing. The operating mechanism, the first draw bar 34 and the transmission jump catch 32 are all arranged outside the tripping device housing. The contact system and the first transmission structure 43 are both arranged inside the tripping device housing (the breaking unit housing). One end of the second transmission structure is located in the tripping device housing (the breaking unit housing) and is in transmission fit with the first transmission structure 43, and the other end of the second transmission structure is located outside the tripping device housing (the breaking unit housing) and is in transmission fit with the first draw bar 34. The above structural design realizes the isolation of the operating mechanism of the circuit breaker from a conductive structure (the contact system), which is conducive to improving the safety and ensuring the safety of electricity utilization of an operator.

[0069] 88. As shown in FIGs. 1-3 and 8-9, the second transmission structure includes a first-stage push rod 44 and a second-stage push rod 45 which are arranged coaxially to rotate synchronously. The first-stage push rod 44 includes a first-stage push rod arm 44-0 and a first-stage push rod shaft 44-1. The second-stage push rod 45 includes a second-stage push rod arm 45-0 and a second-stage push rod shaft 45-1 arranged on the second-stage push rod arm 45-0. The first-stage push rod arm 44-0 is located in the tripping device housing (the breaking unit housing). The secondary push rod 45 is located outside the tripping device housing (the breaking unit housing). The push rod 44-0 is in transmission fit with the first transmission structure 43 and is fixedly connected to one end of the first-stage push rod 44-1. The first-stage push rod shaft 44-1 is rotatably inserted on the tripping device housing (the breaking unit housing), and the other end of the first-stage push rod shaft 44-1 passes through the tripping device housing (the breaking unit housing) and is then connected to the second-stage push rod arm 45-0. The second-stage push rod arm 45-0 is in transmission fit with the first draw bar 34 through the second-stage push rod shaft 45-1. Further, one end of the first-stage push rod arm 44-0 is in transmission fit with the first transmission structure 43, and the other end of the first-stage push rod arm 44-0 is connected to the first-stage push rod shaft 44-1; and one end of the second-stage push rod arm 45-0 is connected to the first-stage

push rod shaft 44-1, and the second-stage push rod shaft 45-1 is arranged at the other end of the second-stage push rod arm 45-0. Further, the second-stage push rod arm 45-0 is provided with a second-stage push rod arm connecting hole 45-00. The second-stage push rod arm connecting hole 45-00 is a polygonal hole. A first-stage push rod shaft connecting portion 44-10 is arranged at one end of the first-stage push rod shaft 44-1. The first-stage push rod shaft connecting part 44-10 is a polygonal column. The polygonal hole and the polygonal column are matched in shape and in pluggable fit with each other.

[0070] 89. The driving gap is preferably arranged between the first transmission structure 43 and the first-stage push rod arm 44-0.

[0071] 90. The driving gap is preferably formed between the second-stage push rod shaft 45-1 and the first draw bar 34.

[0072] 91. As shown in FIGs. 1-3, the first transmission structure 43 is arranged rotatably on the contact support 40.

[0073] 92. As shown in FIGs. 2-3, the first transmission structure 43 and the moving contact 41 can implement transmission fit through the prior art. For example: as shown in FIGs. 1-3, the first transmission structure 43 is in driving fit with the contact spring 47, and the first transmission structure 43 rotates with the rotation of the contact spring 47. Further, the first transmission structure 43 and the contact spring 47 are coaxially arranged to rotate synchronously. Further, as shown in FIG. 7, the first transmission structure 43 includes a first transmission structure mounting portion 43-0 and a first transmission structure driven portion 43-1. The first transmission structure mounting portion 43-0 is preferably provided with a first transmission structure shaft hole 43-00. The first transmission structure 43 is arranged rotatably to sleeve the first mounting shaft 48-0 through the first transmission structure shaft hole 43-00. The contact spring 47 includes a contact spring main body 47-1, and a first contact spring end 47-0 and a second contact spring end 47-2 which are respectively connected to two ends of the contact spring main body 47-1. The first contact spring end 47-0 includes a first end hanging portion and a first end connecting portion. Two ends of the first end connecting portion are connected to the first end hanging portion and the contact spring main body 47-1 respectively. The first transmission structure mounting portion 43-0 is arranged rotatably on the contact support 40 through the first mounting shaft 48-0. The first end hanging portion is rotatably hung on the first mounting shaft 48-0. The first transmission structure driven portion 43-1 is arranged on the first end connecting portion. The second contact spring end 47-2 is connected to the moving contact 41 through the second mounting shaft 48-1. Furthermore, the first transmission structure driven portion 43-1 is provided with a first transmission structure connecting hole, and the first transmission structure driven portion 43-1 is arranged to sleeve the first end connecting portion through the first transmission structure connecting hole.

[0074] 93. Alternatively, when the moving contact 41 is repulsed, it rotates and presses against the first transmission structure 43, such that the first transmission structure 43 rotates. Further, the moving contact 41 is provided with a moving contact boss, the first transmission structure 43 is provided with a first transmission structure driven arm, and the moving contact boss is in transmission fit with the first transmission structure driven arm. Further, the driving gap is preferably arranged between the first transmission structure 43 and the moving contact 41.

[0075] 94. As other embodiments, the first transmission structure 43 is slidably arranged on the contact support 40; and when the moving contact 41 is repulsed, the first transmission structure 43 is driven to slide with respect to the contact support 40 and the first draw bar 34 is triggered, such that the first draw bar 34 releases snap fit with the transmission jump catch 32.

[0076] 95. As shown in FIG. 7, the first transmission structure 43 further includes a first transmission structure driving arm 43-2 connected to the first transmission structure mounting portion 43-0, and the first transmission structure driving arm 43-2 is in transmission fit with the first-stage push rod arm 44-0 of the first-stage push rod 44.

[0077] 96. As shown in FIGs. 1-3 and 5b, the first draw bar 34 is arranged rotatably around a fifth center 5S, and the first draw bar 34 is preferably arranged rotatably on the tripping device housing (the breaking unit housing) through a first draw bar shaft 58.

[0078] 97. As shown in FIGs. 1-3 and 5b, the transmission jump catch 32 is arranged rotatably around a ninth center 9S, and the transmission jump catch 32 is preferably arranged rotatably on the support 1 through a transmission jump catch shaft 61.

[0079] 98. As other embodiments, the transmission jump catch 32 is arranged rotatably on the tripping device housing (the breaking unit housing) around a ninth center 9S.

[0080] 99. As shown in FIGs. 1, 4a and 5b-6, when the first draw bar 34 is in snap fit with the transmission jump catch 32, both of which have a tendency to rotate in opposite directions, respectively, such that parts of the first draw bar 34 and the transmission jump catch 32 which are matched with each other have a tendency to be close to each other (a first draw bar snap-fastening arm 34-2 and a transmission jump catch snap-fastening end 32-2 have a tendency to be close to each other), and are thus be in snap fit more reliably.

[0081] 100. As shown in FIGs. 1, 4a and 5a-6, the quick tripping device further includes a first draw bar reset elastic member 36, and the first draw bar reset elastic member 36 applies an acting force to the first draw bar 34, so that the first draw bar 34 keeps in snap fit with the transmission jump catch 32. Further, as shown in FIG. 10, the first draw bar 34 includes a first draw bar main body 34-0 and a first draw bar spring arm 34-4 arranged on the

first draw bar main body 34-0. The first draw bar 34 is arranged rotatably around the fifth center 5S through the first draw bar main body 34-0 (preferably arranged rotatably on the tripping device housing). The first draw bar reset elastic member 36 is a tension spring, wherein one end of this tension spring is connected to the first draw bar spring arm 34-4, and the other end of this tension spring is fixedly arranged (preferably fixed on the tripping device housing).

[0082] 101.As other embodiments, the first draw bar reset elastic member 36 is a torsion spring, wherein the torsion spring is arranged to sleeve the first draw bar shaft 58, one end of the torsion spring is matched with the first draw bar 34, and the other end of the torsion spring is fixedly arranged on the tripping device housing.

[0083] 102. As shown in FIGs. 1 and 5c, the quick tripping device further includes a transmission jump catch elastic member 60. The transmission jump catch elastic member 60 applies an acting force to the transmission jump catch 32, such that the transmission jump catch 32 drives the operating mechanism to trip. Further, the transmission jump catch elastic member 60 is a torsion spring. This torsion spring is arranged to sleeve the transmission jump catch shaft 61. One end of this torsion spring is matched with the transmission jump catch 32, and the other end of this torsion spring is fixedly arranged (preferably fixedly arranged on the tripping device housing). Further, the quick tripping device further includes a torsion spring limiting shaft 62 spaced from the transmission jump catch shaft 61 side by side, and one fixed end of the torsion spring is matched with the torsion spring limiting shaft 62.

[0084] 103. As shown in FIGs. 1-3 and 10, the first draw bar 34 includes a first draw bar main body 34-0, and a first draw bar driven arm 34-1 and a first draw bar snap-fastening arm 34-2 respectively arranged on the first draw bar main body 34-0. The first draw bar 34 is arranged rotatably through the first draw bar main body 34-0. The first draw bar driven arm 34-1 is in transmission fit with the second transmission structure. The first draw bar snap-fastening arm 34-2 is in snap fit with the transmission jump catch 32. Further, the first draw bar driven arm 34-1 is in transmission fit with the second-stage push rod shaft 45-1 of the second-stage push rod 45. When the second-stage push rod 45 rotates around the first-stage push rod shaft 44-1, the second-stage push rod shaft 45-1 presses against the draw bar driven arm 34-1 to rotate the first draw bar 34. The first draw bar main body 34-0 is of a cylindrical structure. A first draw bar shaft hole 34-00 is formed in the middle of the first draw bar main body 34-0. The first draw bar main body 34-0 is arranged to sleeve the first draw bar shaft 58 through the first draw bar shaft hole 34-00. The first draw bar shaft 58 is arranged on the tripping device housing (the breaking unit housing).

[0085] 104. As shown in FIGs. 1, 4a, 5a-6 and 11, the transmission jump catch 32 includes a transmission jump catch pivoting end 32-0 and a transmission jump catch snap-fastening end 32-2 which are respectively arranged at both ends. The transmission jump catch 32 is arranged rotatably around a ninth center 9S through the transmission jump catch pivoting end 32-0, and is in snap fit with the first draw bar 34 through the transmission jump catch snap-fastening end 32-2. Further, the transmission jump catch pivoting end 32-0 is provided with a transmission jump catch shaft hole 32-00. The transmission jump catch pivoting end 32-0 is arranged to sleeve the transmission jump catch shaft 61 through the transmission jump catch shaft hole 32-00.

[0086] 105. As shown in FIGs. 1, 4a, 5a-6, 10 and 11, the first draw bar snap-fastening arm 34-2 of the first draw bar 34 is provided with a snap-fastening arm hook 34-20, the transmission jump catch snap-fastening end 32-2 is provided with a snap-fastening end hook 32-20, and the snap-fastening arm hook 34-20 is in snap fit with the snap-fastening end hook 32-20 to form a snap-fastening structure 3a. Further, the snap-fastening arm hook 34-20 and the snap-fastening end hook 32-20 each are a half-arrow type hook. When the snap-fastening arm hook 34-20 is in snap fit with the snap-fastening end hook 32-20, they have a tendency to move in opposite directions.

[0087] 106. As shown in FIGs. 1, 4a, 5a-6 and 11, the transmission jump catch 32 is of a C-type structure, wherein an opening of the C-type structure faces the seventh center 7S (the rotating center of the moving contact mechanism and the third crank 25), and a transmission jump catch driving face 32-1, which is in transmission fit with the re-buckling unit 9 of the operating mechanism, is arranged at the back of the C-shaped structure. After the transmission jump catch 32 releases snap fit with the first draw bar 34, the transmission jump catch 32 rotates, the re-buckling unit 9 is driven by the transmission jump catch driving face 32-1 to rotate to release the limiting fit with the lock catch 10, and finally the operating mechanism trips. The transmission jump catch 32 is designed as a C-type structure, which cleverly avoids the third crank 25 that is used for connecting the moving contact mechanism, and makes full use of an internal space of the circuit breaker.

[0088] 107. As shown in FIGs. 1, 4a, 5a and 6, a connecting line between two ends of the transmission jump catch 32 is a first connecting line. The first connecting line forms a D-shaped space with the transmission jump catch 32. The seventh center 7S is always located outside the D-shaped space. The seventh center 7S and the transmission jump catch 32 are located on both sides of the first connecting line. Further, an included angle between connecting lines of two ends of the transmission jump catch 32 and the seventh center 7S is an obtuse angle.

[0089] 108. As shown in FIGs. 1 and 5c, the circuit breaker of the present invention further includes a test button 46 that is slidably arranged on the tripping device housing (the breaking unit housing). The test button 46 is pressed by an external force, such that the test button

slides; the test button 46 drives the first draw bar 34 to rotate and releases the snap fit with the transmission jump catch 32. The test button 46 implements a manual operation, so that the operating mechanism trips and opens. Further, the test button 46 is in transmission fit with the first draw bar driven arm 34-1 of the first draw bar 34, and one end of the test button 46 is preferably opposite and fit with a free end of the first draw bar driven arm 34-1. When the test button 46 is pressed to make it slide, the test button 46 presses against the first draw bar driven arm 34-1 and the first draw bar 34 rotates, and a sliding direction of the test button 46 is preferably perpendicular to a rotation axis of the first draw bar 34. Further, a first design distance is arranged between the test button 46 and the first draw bar driven arm 34-1 to avoid accidentally touching the test button 46 and triggering the operating mechanism to trip.

[0090] 109. The circuit breaker of the present invention further includes a test button elastic resetting member 24. The test button elastic resetting member 24 applies an acting force to the test button 46, such that the test button slides in a direction of avoiding the first draw bar driven arm 34-1. The test button elastic resetting member 24 is preferably a linear spring, which is arranged to sleeve the test button 46, wherein one end of the spring is matched with the test button 46, and the other end of the spring is matched with the tripping device housing (the breaking unit housing).

[0091] 110. As shown in FIG. 5c, the circuit breaker of the present invention also includes a thermomagnetic tripping mechanism. When the circuit where the circuit breaker is located has a short-circuit or overload fault, the thermomagnetic tripping mechanism drives the operating mechanism to trip to achieve a short-circuit or overload protection function. Further, in the circuit breaker of the present invention, each breaking unit is matched with a set of thermomagnetic tripping mechanisms; or, when the circuit breaker of the present invention is of a type of nP+N ($n \geq 1$), each P-pole breaking unit is matched with a set of thermomagnetic tripping mechanisms, and N-pole breaking unit is not provided with a corresponding thermomagnetic tripping mechanism. Further, the thermomagnetic tripping mechanism is arranged in the housing of the corresponding breaking unit.

[0092] 111.In this embodiment, as shown in FIG. 5c, the thermomagnetic tripping mechanism includes a second draw bar 49 that is arranged rotatably. The second draw bar 49 is in driving connection with the first draw bar 34. When the circuit where the circuit breaker is located has a short-circuit or overload fault, the thermomagnetic tripping mechanism drives the first draw bar 34 to act through the second draw bar 49 and release the snap fit with the transmission jump catch 32, and the transmission jump catch 32 acts and drives the operating mechanism to trip. That is, when the circuit where the circuit breaker is located has a short-circuit or overload fault, the thermomagnetic tripping mechanism drives the second draw bar 49 to rotate, and the second draw bar 49 drives the first draw bar 34 to rotate simultaneously and release the snap fit with the transmission jump catch 32.

[0093] 112. As shown in FIG. 5c, the operating mechanism, the transmission jump catch 32, the first draw bar 34 and the thermomagnetic tripping mechanism are arranged sequentially along the horizontal direction of the operating mechanism.

[0094] 113. As shown in FIG. 5c, rotation axes of the second draw bar 49, transmission jump catch 32 and first draw bar 34 are parallel to each other.

[0095] 114. As shown in FIGs. 5c and 10, the first draw bar 34 further includes a first draw bar connecting arm 34-3 arranged on the first draw bar main body 34-0. The second draw bar 49 includes a second draw bar main body 49 and a second draw bar connecting arm 49-1 arranged on the second draw bar main body 49. The second draw bar connecting arm 49-1 is in driving connection with the first draw bar 34-3 through a connecting rod 55. Further, two ends of the connecting rod 55 are hinged with the second draw bar connecting arm 49-1 and the first draw bar connecting arm 34-3 through a first hinging shaft 55-0 and a second hinging shaft 55-1, respectively.

[0096] 115. As shown in FIG. 10, an embodiment of the first draw bar 34 is shown: the first draw bar 34 includes a first draw bar main body 34-0, and a first draw bar driven arm 34-1, a first draw bar snap-fastening arm 34-2 and a first draw bar connecting arm 34-3 arranged on the first draw bar main body 34-0 respectively; the first draw bar body 34-0 is of a cylindrical structure; and the first draw bar driven arm 34-1, the first draw bar snap-fastening arm 34-2 and the first draw bar connecting arm 34-3 are sequentially distributed along a circumferential direction of the first draw bar main body 34-0. Further, an included angle between the first draw bar snap-fastening arm 34-2 and the first draw bar driven arm 34-1 is an obtuse angle.

[0097] 116.Preferably, as shown in FIG. 10, the first draw bar 34 further includes a first draw bar spring arm 34-4. The first draw bar driven arm 34-1, the first draw bar spring arm 34-4, the first draw bar snap-fastening arm 34-2 and the first draw bar connecting arm 34-3 are sequentially distributed along the circumferential direction of the first draw bar main body 34-0.

[0098] 117. In the circuit breaker of the present invention, the first draw bar 34 can be in transmission fit with the moving contact 41, the test button 46 and the second draw bar 49 at the same time, such that the operating mechanism opens and trips through three different modes.

[0099] 118.As shown in FIG. 5c, an embodiment of the thermomagnetic tripping mechanism is shown: the thermomagnetic tripping mechanism includes a thermomagnetic tripping yoke 54, a thermomagnetic tripping armature 53, a bimetallic element 51 and an armature transmission member 50. The thermomagnetic tripping armature 53 is arranged rotatably on the thermomagnetic tripping yoke 54 through the armature shaft 52-1 and the armature transmission member 50 is arranged rota-

tably on the thermomagnetic tripping yoke 54 via a transmission member shaft 52-2. The thermomagnetic tripping armature 53 is in transmission fit with the second draw bar 49 through the armature transmission member 50 to drive the second draw bar 49 to rotate when the circuit where the circuit breaker is located has a short-circuit fault. The bimetallic element 51 is also in transmission fit with the second draw bar 49 to drive the second draw bar 49 to rotate when the circuit where the circuit breaker is located has an overload fault. The thermomagnetic tripping yoke 54, the thermomagnetic tripping armature 53, the bimetallic element 51 and the armature transmission member 50 can all be implemented by the prior art, and are not described one by one here.

[0100] 119. As shown in FIG. 12, the second draw bar 49 further includes a second draw bar armature cooperating arm 49-2 and a second draw bar bimetallic cooperating arm 49-3 which are respectively arranged on the second draw bar main body 49-0 and are respectively in transmission fit with the armature transmission member 50 and the bimetallic element 51; and the second draw bar main body 49-0 is arranged rotatably on the breaking unit housing through the second draw bar shaft 56. Furthermore, a second design distance is arranged between the armature transmission member 50 and the second draw bar armature cooperating arm 49-2 to avoid triggering the operating mechanism to trip due to product vibration.

[0101] 120. We have made further detailed description of the present invention mentioned above in combination with specific preferred embodiments, but it is not deemed that the specific embodiments of the present invention is only limited to these descriptions. A person skilled in the art can also, without departing from the concept of the present invention, make several simple deductions or substitutions, which all be deemed to fall within the protection scope of the present invention.

Claims

1. An operating mechanism of a circuit breaker, comprising a support (1), a rocker arm assembly, a jump catch (7), a lock catch (10) and a re-buckling unit (9) which are rotatably arranged on the support (1) respectively, a first crank (14), an energy storage spring (4), a slide rail (1-0) fixedly arranged with respect to the support (1), a slider (18), a first link (16), a second link (19) and a second crank (22) that is arranged rotatably around a sixth center (6S); wherein the lock catch (10) is in snap fit with the jump catch (7) and is in limiting fit with the re-buckling unit (9); one end of the first crank (14) is arranged rotatably on the jump catch (7) around an eighth center (8S), and another end of the first crank (14) is rotatably connected to one end of the first link (16) and one end of the energy storage spring (4) around a tenth center (10S), and another end of the energy storage spring (4) is connected to the rocker arm assembly; another end of the first link (16) is rotatably connected to the slider (18), and the slider (18) is slidably arranged on the slide rail (1-0); one end of the second link (19) is rotatably connected to the slider (18), and another end of the second link (19) is rotatably connected to the second crank (22) around an eleventh center (11S) so as to drive the second crank (22) to rotate; when the operating mechanism is in an opened or tripped state, the slide rail (1-0) is in limiting fit with the slider (18) to prevent the slider (18) from sliding; the operating mechanism further includes a third link (23) and a third crank (25) that is arranged rotatably around a seventh center (7S); one end of the second crank (22) is rotatably connected to one end of the third link (23) around the eleventh center (11S), and another end of the third link (23) is rotatably connected to the third crank (25) around a twelfth center (12S) so as to drive the third crank (25) to rotate; the rocker arm assembly and the second crank (22) are respectively located at two ends of the operating mechanism in a vertical direction of the operating mechanism; and the third crank (25) is located at one side of the operating mechanism in a horizontal direction of the operating mechanism.

2. The operating mechanism of the circuit breaker according to claim 1, wherein the sixth center (6S), the seventh center (7S), the eleventh center (11S) and the twelfth center (12S) are arranged in parallel at intervals and are located at four vertices of a quadrilateral; the second crank (22) is arranged rotatably on the support (1) around the sixth center (6S); and the third crank (25) is arranged rotatably on the support (1) around the seventh center (7S).

3. The operating mechanism of the circuit breaker according to claim 1, wherein:

   the support (1) is provided with a second crank guide hole (1-1); the second crank (22) and the third link (23) are connected rotatably through an eleventh shaft (2223); the eleventh shaft (2223) is inserted in the second crank guide hole (1-1); and the second crank guide hole (1-1) has a shape matching a moving trajectory of the eleventh shaft (2223); and/or

   the support (1) is provided with a third crank guide hole (1-2); the third link (23) and the third crank (25) are connected rotatably through a twelfth shaft (2325); the twelfth shaft (2325) is inserted in the third crank guide hole (1-2); and the third crank guide hole (1-2) has a shape matching a moving trajectory of the twelfth shaft (2325).

4. The operating mechanism of the circuit breaker ac-

cording to claim 1, wherein the second crank (22) is of a strip-shaped plate structure; one end of the second crank (22) is arranged rotatably around the sixth center (6S), and another end of the second crank (22) is rotatably connected to the third link (23) and the second link (19) around the eleventh center (11S); and/or

the third crank (25) is of a triangular plate structure, wherein a first vertex angle is arranged rotatably around the seventh center (7S), a second vertex angle is rotatably connected to the third link (23) around the twelfth center (12S), and a third vertex angle is used to be rotatably connected to the moving contact mechanism of the circuit breaker.

5. The operating mechanism of the circuit breaker according to claim 2, wherein the support (1) comprises two support side plates that are oppositely arranged; each support side plate comprises a side-plate first portion and a side-plate second portion which are connected to each other; the rocker arm assembly, the jump catch (7), the lock catch (10), the re-buckling unit (9) and the second crank (22) are arranged rotatably on the side-plate first portion respectively; a V-shaped groove and a slide rail (1-0) are respectively arranged at two ends of the side-plate first portion in a vertical direction; the side-plate second portion is connected to one end of the side-plate first portion that in the horizontal direction; the rocker arm assembly is arranged to swing in the V-shaped groove; and the third crank (25) is arranged rotatably on the side-plate second portion.

6. The operating mechanism of the circuit breaker according to claim 1, wherein each slide rail (1-0) is of a groove-like structure or a hole-like structure; and/or the slide rail (1-0) is arranged on the support (1).

7. The operating mechanism of the circuit breaker according to claim 1, further comprising a first draw bar (34) and a transmission jump catch (32) that are in snap fit with each other and arranged rotatably respectively, wherein the first draw bar (34) is driven to rotate when a circuit where the circuit breaker is located has a short-circuit and/or overload fault, so as to release snap fit with the transmission jump catch (32), and the transmission jump catch (32) rotates to drive the operating mechanism to trip.

8. The operating mechanism of the circuit breaker according to claim 7, wherein the operating mechanism further comprises a thermomagnetic tripping mechanism; and when the circuit breaker has short-circuit and overload faults, the thermomagnetic tripping mechanism drives the first draw bar (34) to rotate to release snap fit with the transmission jump catch (32); and/or

when the circuit where the circuit breaker is located has a short-circuit fault, the first draw bar (34) is driven by a moving contact (41) of the circuit breaker to release snap fit with the transmission jump catch (32); and/or

the operating mechanism further comprises a test button (46) that is slidably arranged; the test button (46) is driven by an external force to slide, and the test button (46) drives the first draw bar (34) to act to release snap fit with the transmission jump catch (32).

9. The operating mechanism of the circuit breaker according to claim 7, wherein when the operating mechanism is re-buckled from a tripped and opened state, the rocker arm assembly of the operating mechanism drives the transmission jump catch (32) to reset to restore the snap fit with the first draw bar (34).

10. A quick tripping device of a circuit breaker, the quick tripping device comprising the operating mechanism according to any one of claims 1 to 9 and a contact system, wherein the contact system comprises a moving contact mechanism and a static contact (42) which are used cooperatively; the moving contact mechanism comprises a contact support (40) which is arranged rotatably around the seventh center (7S), a moving contact (41) which is arranged on the contact support (40) and is arranged rotatably with respect to the contact support (40), and a contact spring (47) both ends of which are respectively connected to the contact support (40) and the moving contact (41); the quick tripping device further comprises a first transmission structure (43) arranged on the contact support (40) and in transmission fit with the moving contact (41), and a first draw bar (34) and a transmission jump catch (32) which are in snap fit with each other; and during short circuiting, the moving contact (41) is driven by an electric repulsion force to rotate with respect to the contact support (40), and the moving contact (41) drives the first draw bar (34) to act, through the first transmission structure (43), to release snap fit with the transmission jump catch (32), and the transmission jump catch (32) acts to drive the operating mechanism to trip.

11. The quick tripping device of the circuit breaker according to claim 10, wherein the first transmission structure (43) is arranged rotatably on the contact support (40); the first draw bar (34) and the transmission jump catch (32) are respectively arranged rotatably around a fifth center (5S) and a ninth center (9S); and the first draw bar (34) is driven by the first transmission structure (43) to rotate to release snap fit from the transmission jump catch (32).

12. The quick tripping device of the circuit breaker according to claim 10, further comprising a tripping device housing and a second transmission structure, wherein the operating mechanism, the first draw bar (34) and the transmission jump catch (32) are all arranged outside the tripping device housing; the contact system and the first transmission structure (43) are both arranged inside the tripping device housing; one end of the second transmission structure is located inside the tripping device housing and is in transmission fit with the first transmission structure (43); and another end of the second transmission structure is located outside the tripping device housing and is in transmission fit with the first draw bar (34).

13. The quick tripping device of the circuit breaker according to claim 10, wherein a transmission path from the moving contact (41) to the operating mechanism is provided with a driving gap, and the driving gap makes the moving contact (41) rotate to a preset angle and then begins to drive the operating mechanism to trip.

14. The quick tripping device of the circuit breaker according to claim 10, wherein the moving contact (41) is arranged rotatably on the contact support (40) around the seventh center (7S); when the moving contact (41) and the static contact (42) are normally closed or disconnected, the contact spring (47) is located at a first position, and the first center (7S) is located at one side of the contact spring (47); when the moving contact (41) is repulsed by an electric repulsion force between the moving contact (41) and the static contact (42) so that the moving contact (41) rotates to a repulsion position with respect to the contact support (40), the moving contact (41) drives the contact spring (47) to swing to a second position, the first center (7S) is located at another side of the contact spring (47), and the contact spring (47) exerts an acting force to the moving contact (41) such that the moving contact (41) is kept at the repulsion position.

15. A circuit breaker, comprising the operating mechanism of the circuit breaker according to any one of claims 1 to 9, and at least one set of breaking units; wherein each breaking unit comprises a contact system and an arc-extinguishing chamber; the contact system comprises a moving contact mechanism and a static contact (42) that are used cooperatively; the moving contact mechanism comprises a contact support (40) which is arranged rotatably around the seventh center (7S) and a moving contact (41) arranged on the contact support (40); the contact support (40) is in driving connection with the third crank (25); and the rocker arm assembly, the second crank (22) and the arc-extinguishing chamber are sequentially arranged along the vertical direction of the operating mechanism.

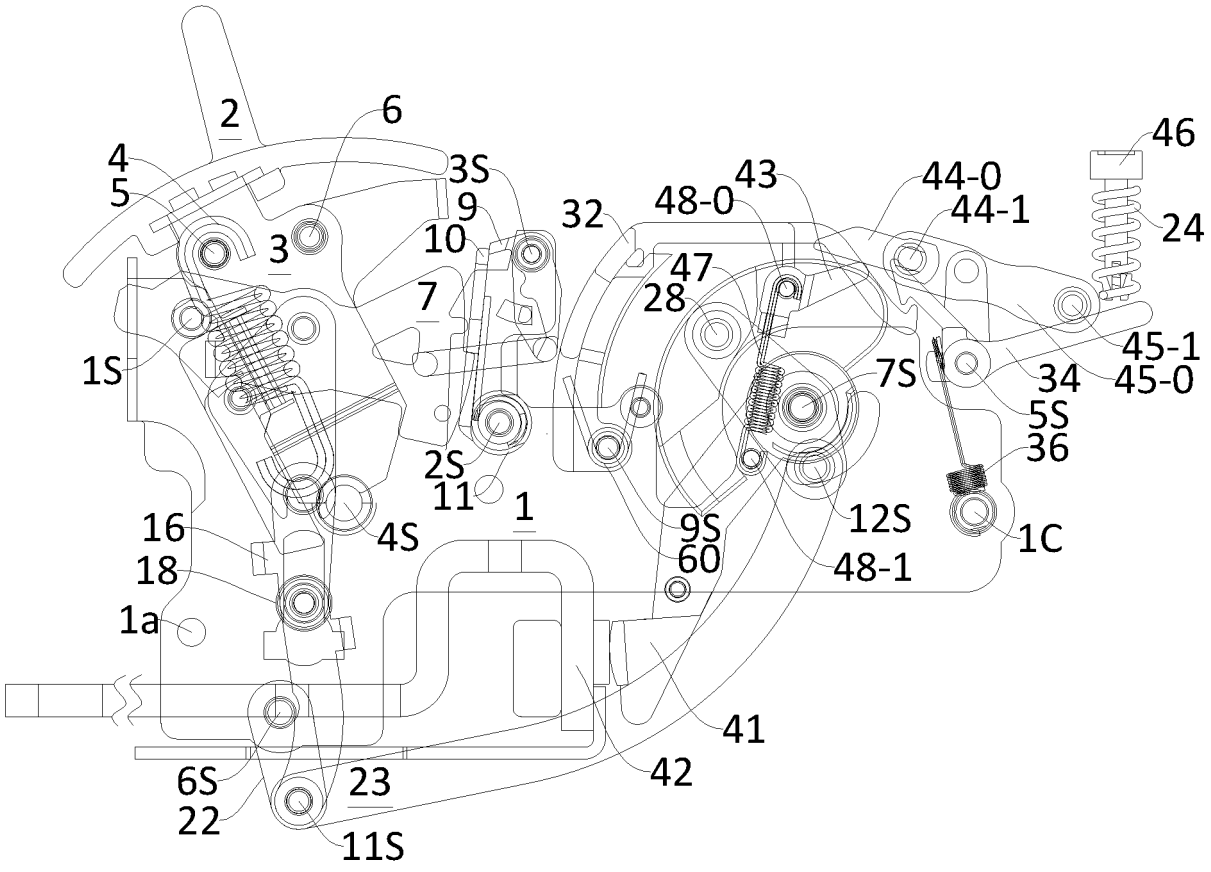
2
6
4
5
3S
9
10
3
32
48-0
43
44-0
44-1
46
24
47
28
7
1S
7S
45-1
34
45-0
5S
36
2S
11
1
16
4S
9S
12S
1C
60
18
48-1
1a
41
42
6S
23
22
11S

Fig.1

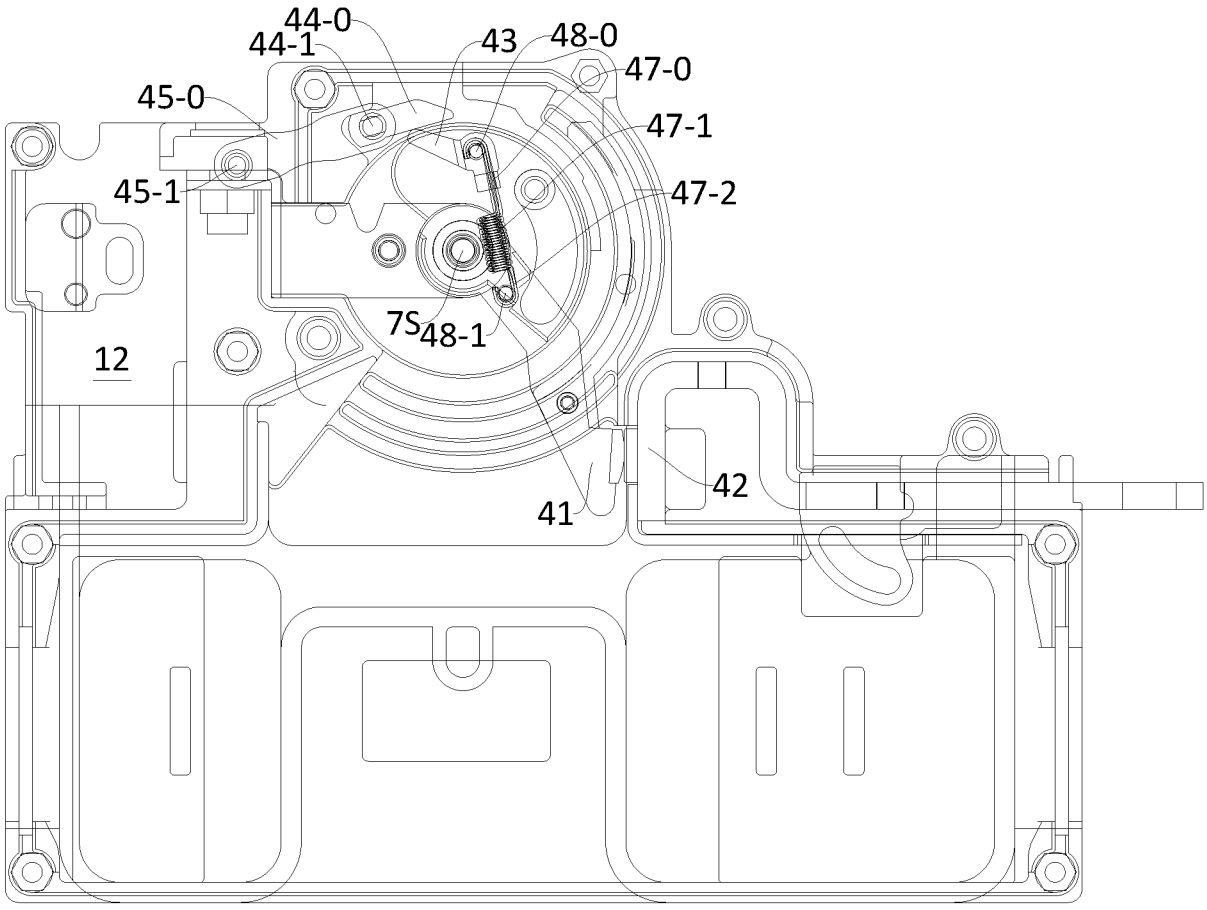

Fig.2

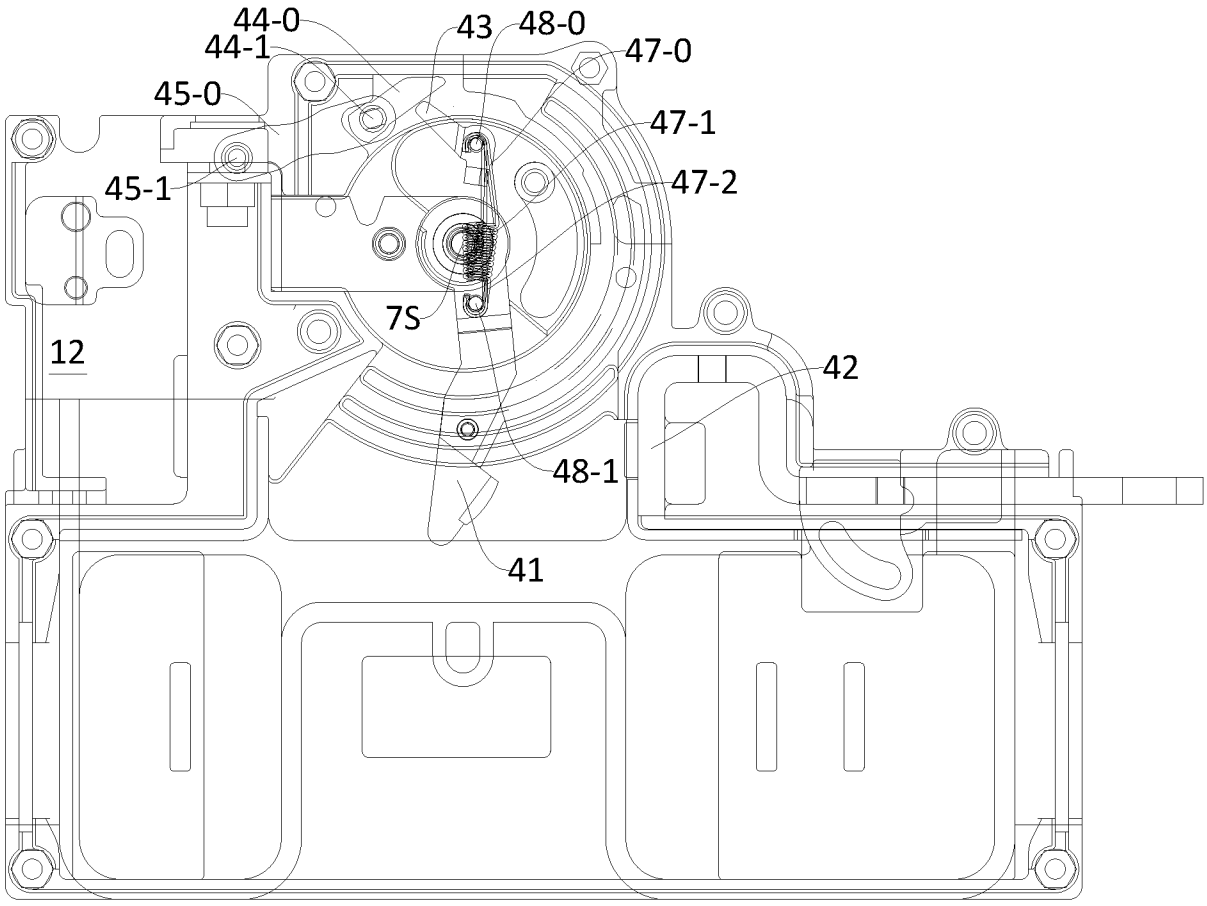

Fig.3

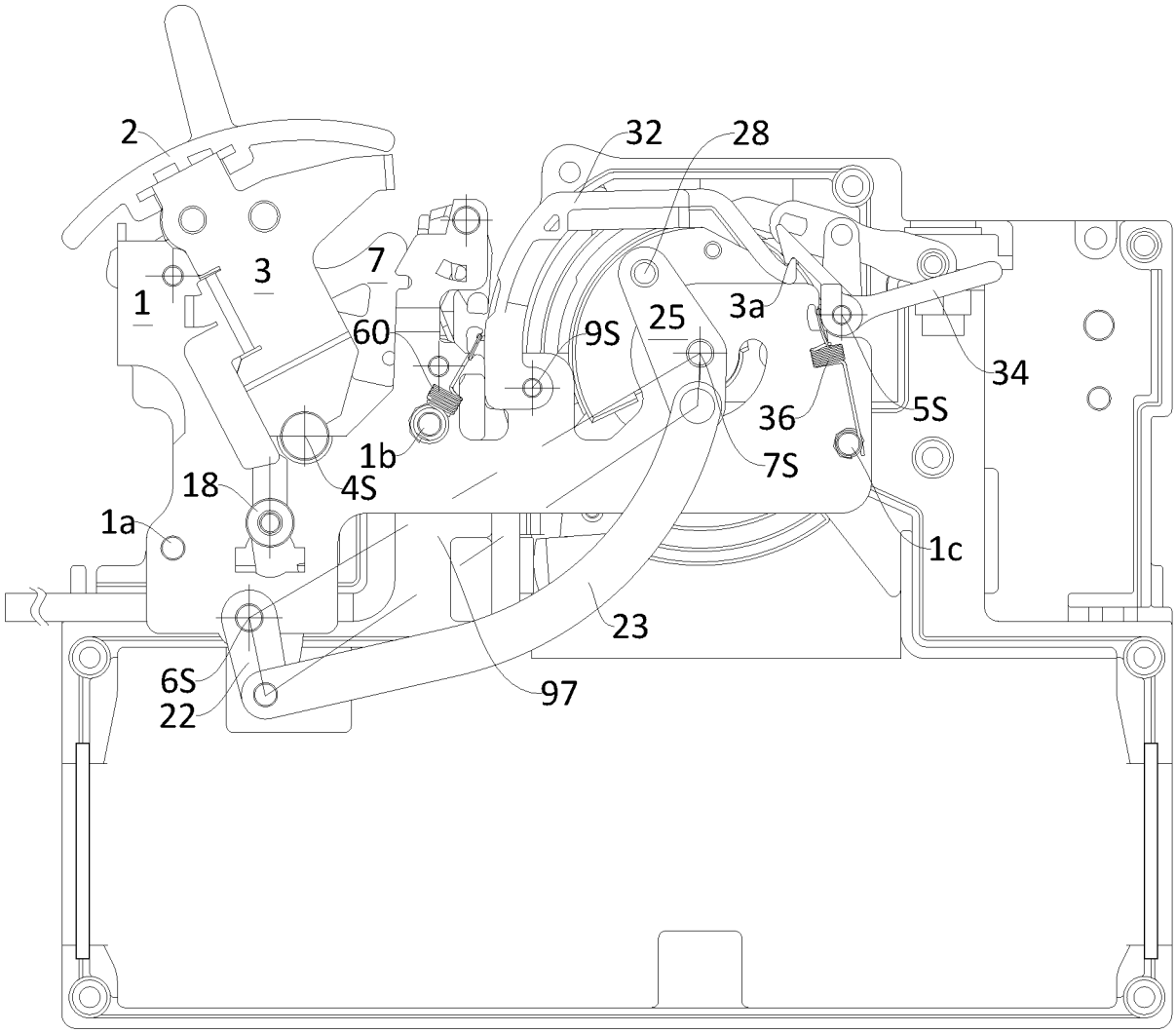

Fig.4a

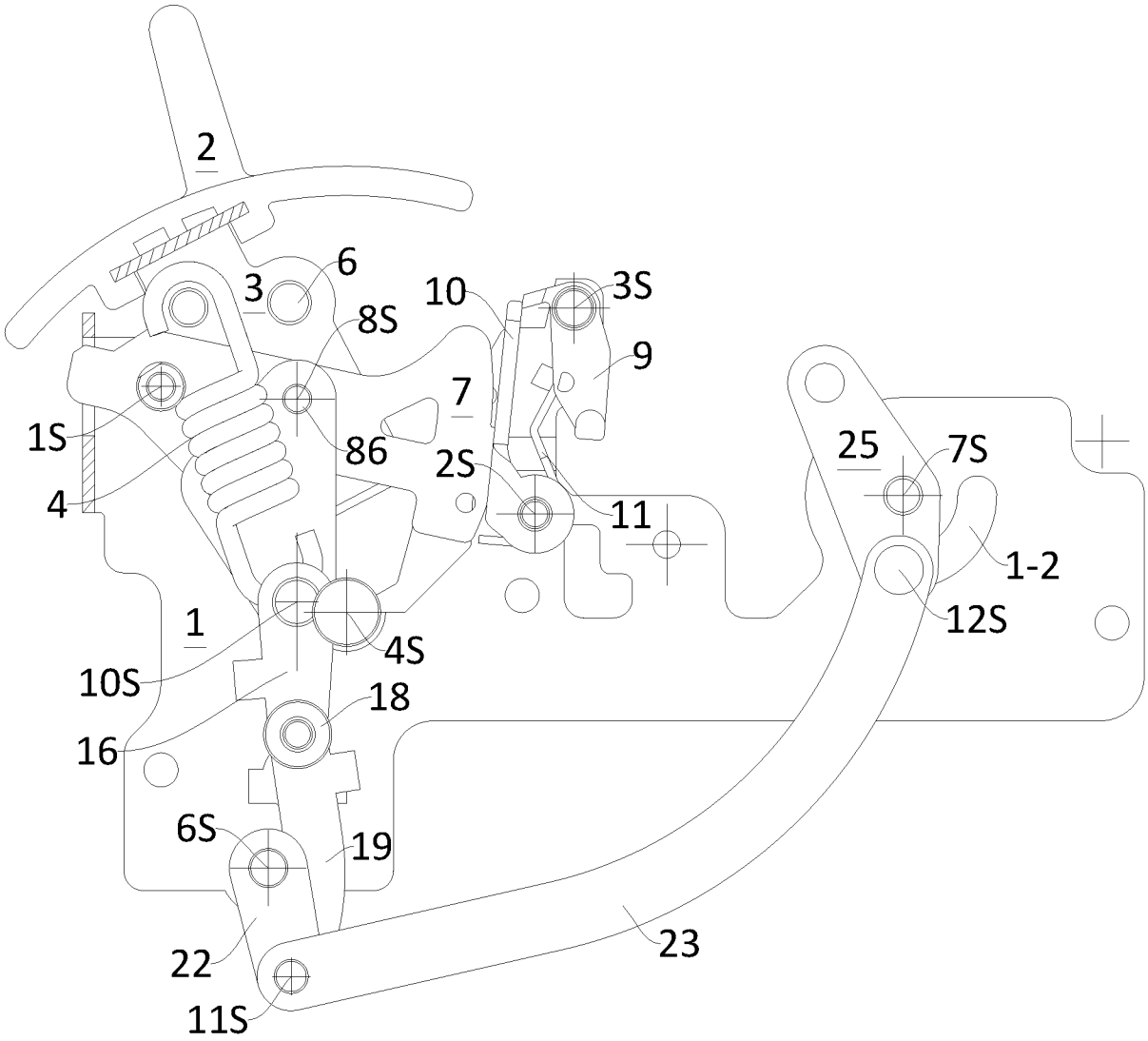
2
6
3
10
3S
8S
9
7
1S
86
2S
25
7S
4
11
1-2
1
4S
12S
10S
18
16
6S
19
22
23
11S

Fig.4b

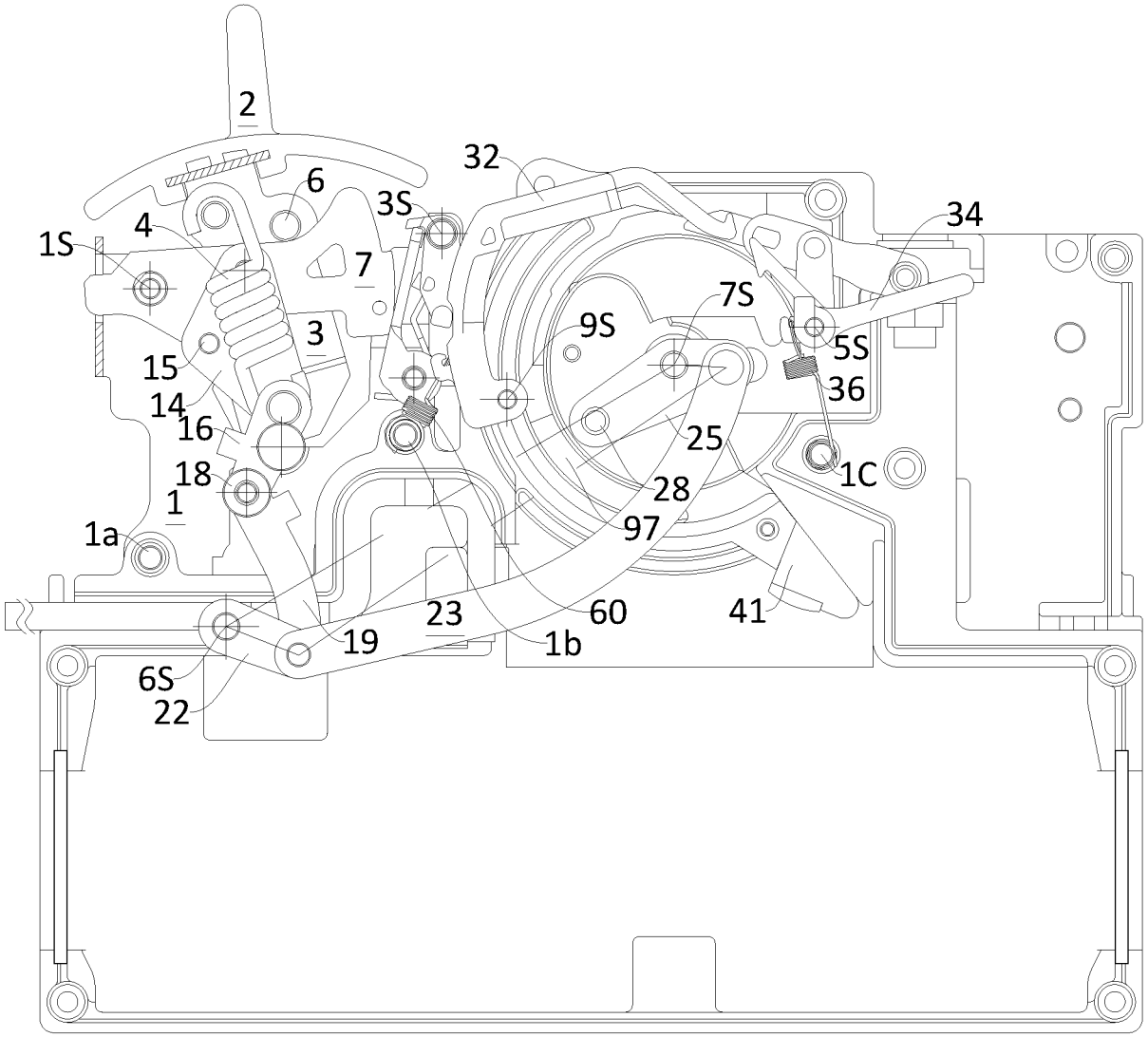
2
32
6
3S
34
1S
4
7
7S
9S
3
5S
15
36
14
16
25
18
1C
28
1
97
1a
23
60
41
19
1b
6S
22

Fig.5a

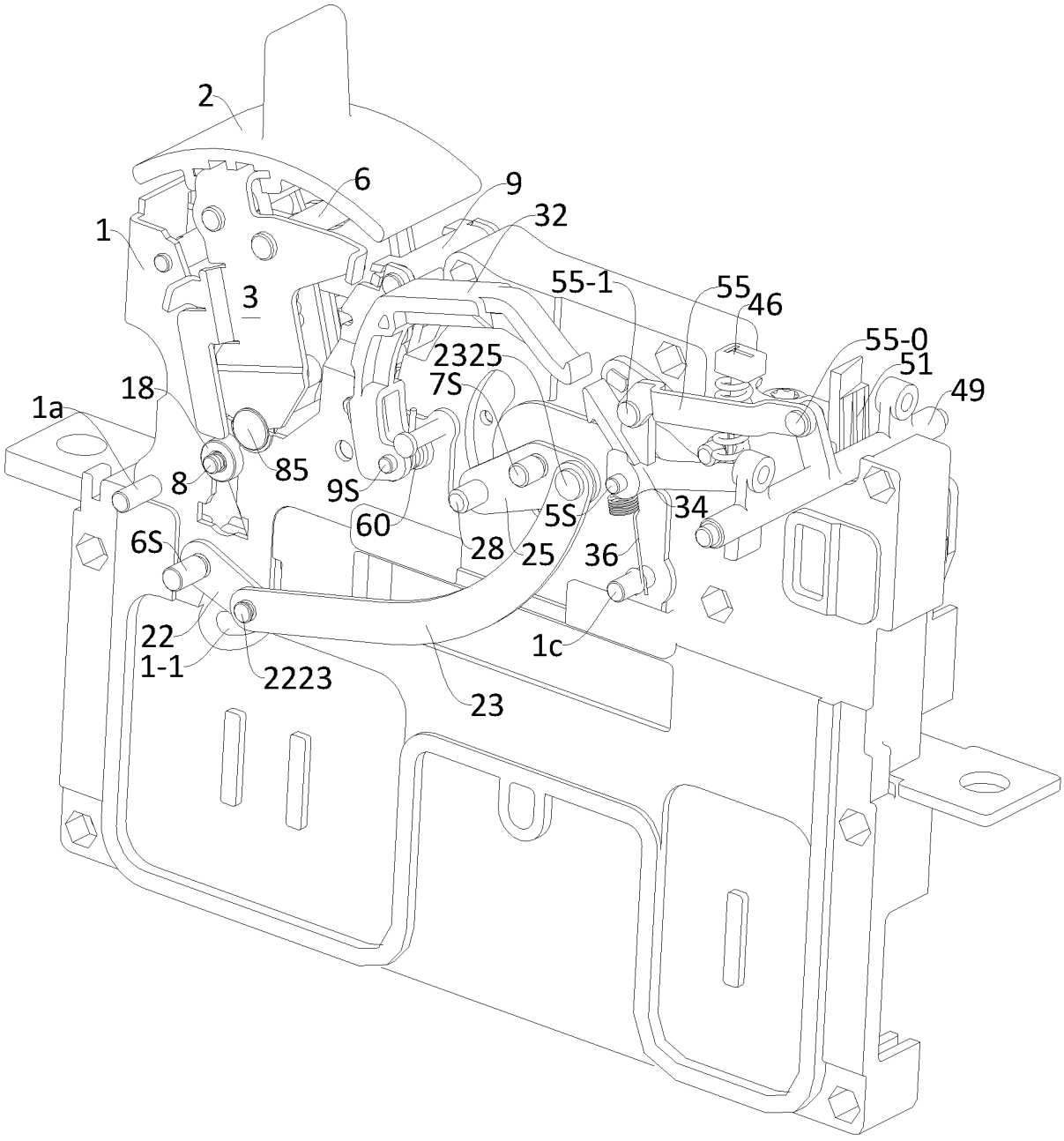
2
6
9
32
1
3
55-1
55
46
55-0
51
49
2325
7S
18
1a
85
8
9S
60
5S
34
6S
28
25
36
22
1-1
2223
1c
23

Fig.5b

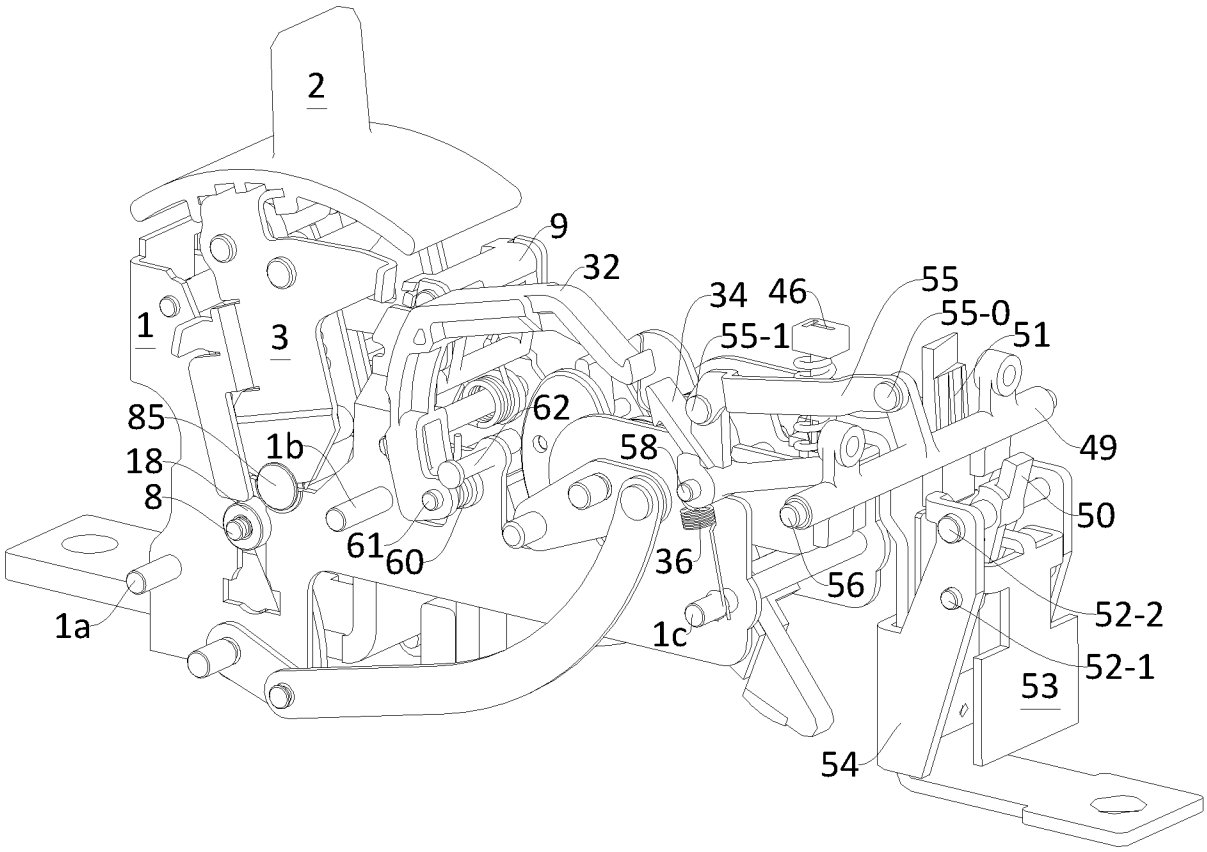
2
9
32
34
46
55
55-0
51
1
3
55-1
85
62
58
49
18
1b
8
50
61
60
36
56
52-2
1a
1c
52-1
53
54

Fig.5c

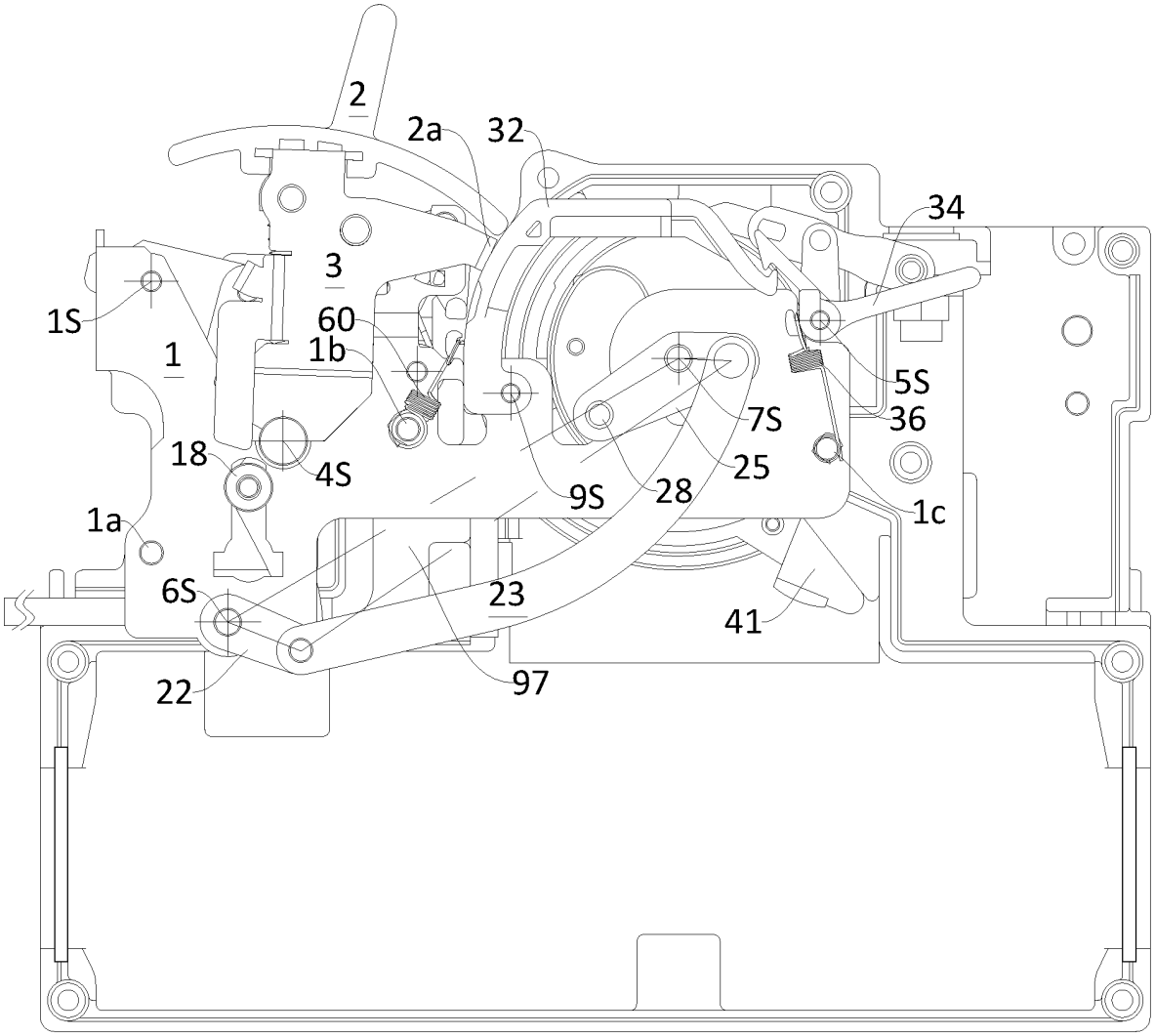
2
2a
32
34
3
1S
60
1b
1
5S
7S
36
18
4S
25
9S
28
1c
1a
6S
23
41
22
97

Fig.6

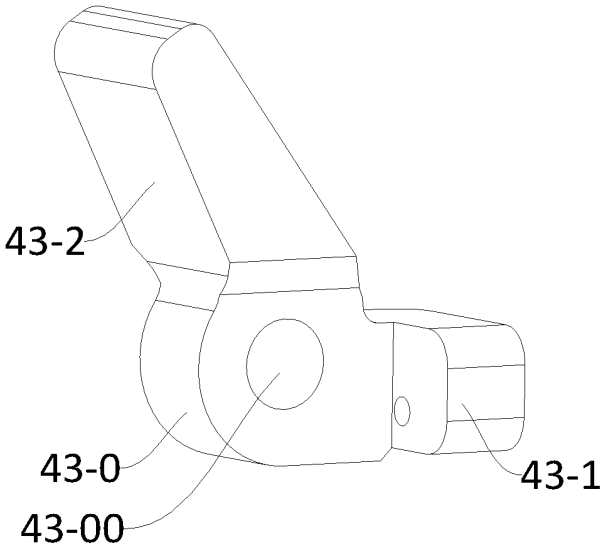
43-2
43-0
43-00
43-1

Fig.7

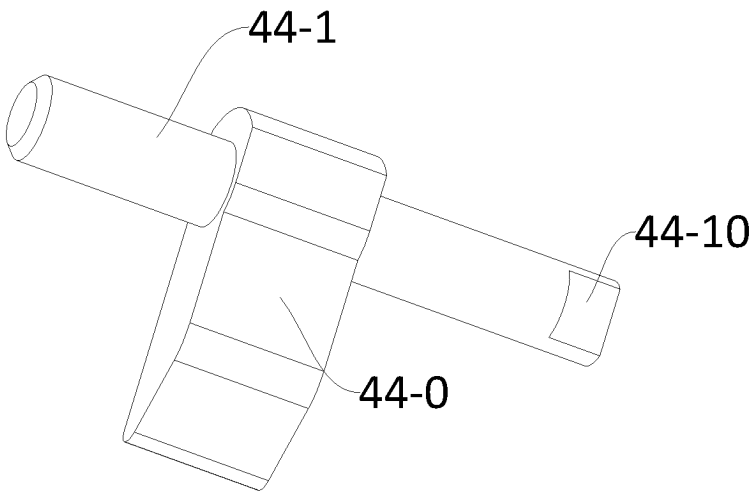

Fig.8

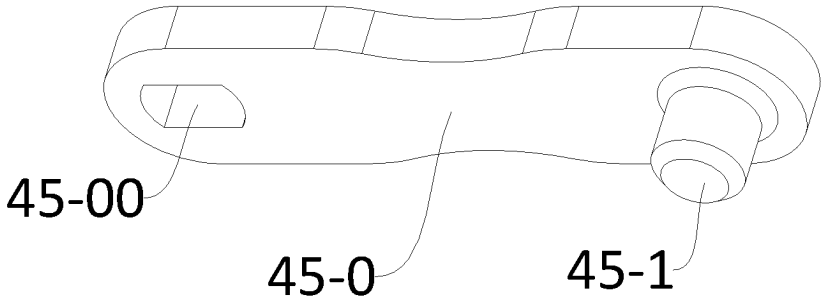

Fig.9

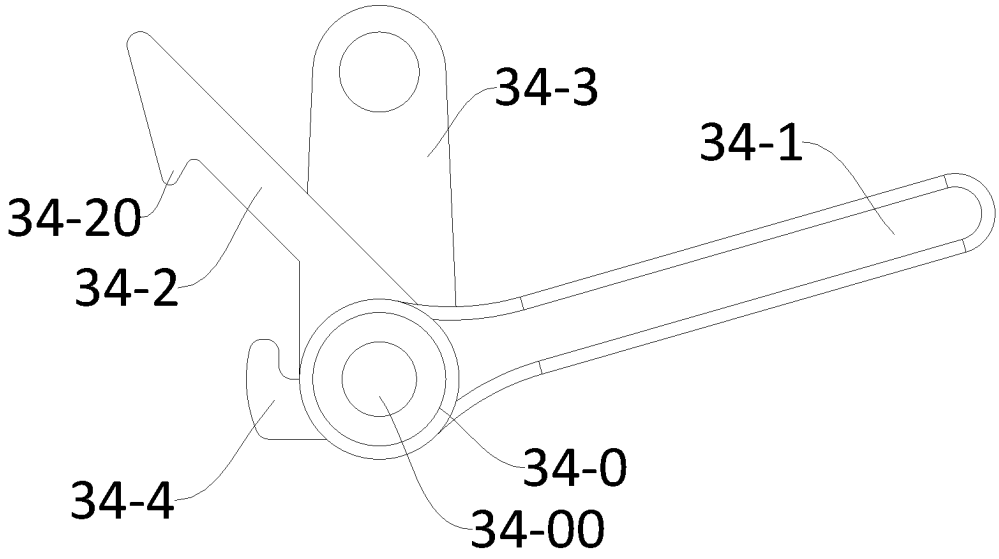

Fig.10

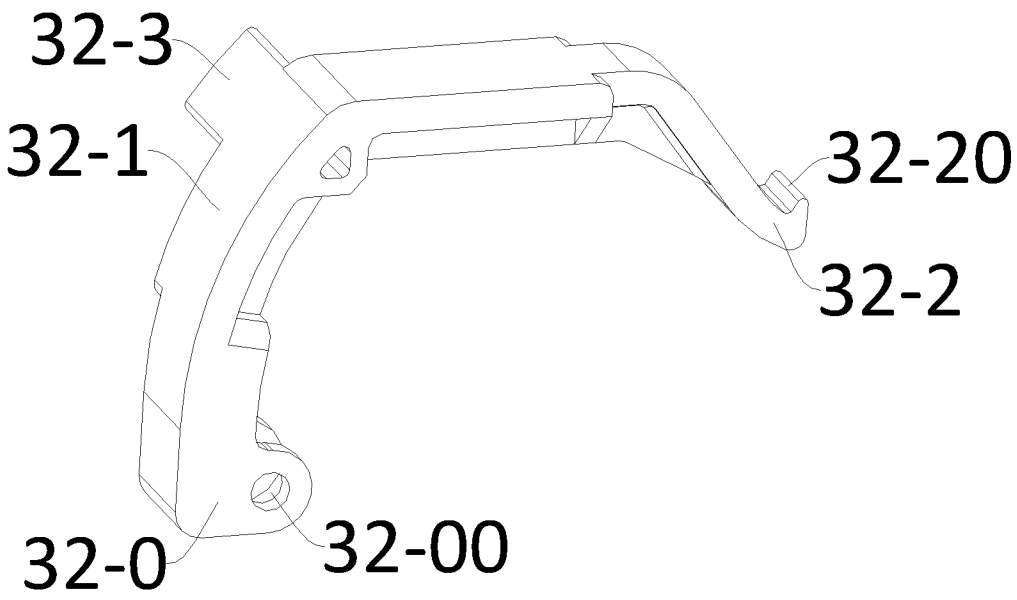

Fig.11

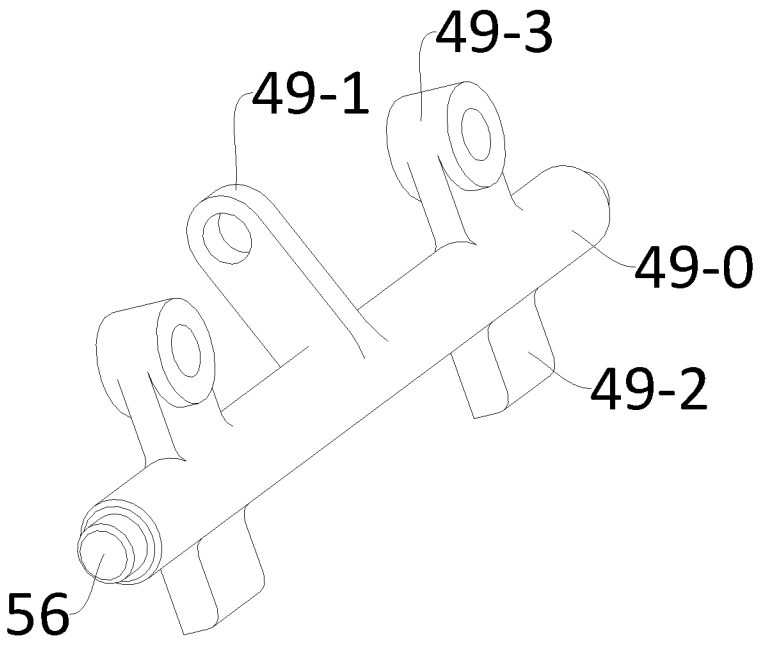

Fig.12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/124630

A. CLASSIFICATION OF SUBJECT MATTER

H01H71/02(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)

IPC: 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)

CNKI, CNTXT, DWPI: 上海正泰智能科技, 陆登宇, 敖登贵, 徐永富, 断路器, 灭弧, 曲柄, 动触头, 连杆, breaker, arc extinguishing, arc extinction, crank, contact

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 218957657 U (SHANGHAI ZHENGTAI INTELLIGENT TECHNOLOGY CO., LTD.) 02 May 2023 (2023-05-02) description, paragraphs 0050-0083, and figures 1-13	1-15
Y	CN 215869217 U (SHANGHAI ZHENGTAI INTELLIGENT TECHNOLOGY CO., LTD.) 18 February 2022 (2022-02-18) description, paragraphs 0070-0222, and figures 1-47	1-15
Y	CN 112216550 A (NANJING SIFANG ZHIJIE SWITCH CO., LTD. et al.) 12 January 2021 (2021-01-12) description, paragraphs 0038-0045, and figures 1-14	1-15
A	CN 211150471 U (SHANGHAI LIANGXIN ELECTRICAL CO., LTD.) 31 July 2020 (2020-07-31) entire document	1-15
A	US 4323743 A (SIEMENS-ALLIS, INC.) 06 April 1982 (1982-04-06) entire document	1-15

☐ 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
"D" document cited by the applicant in the international application
"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
12 December 2023	**22 December 2023**

Name and mailing address of the ISA/CN	Authorized officer
China National Intellectual Property Administration (ISA/CN) **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/124630

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 218957657 U	02 May 2023	None	
CN 215869217 U	18 February 2022	AU 2022248027 A1	18 May 2023
		EP 4207237 A1	05 July 2023
		WO 2022206892 A1	06 October 2022
CN 112216550 A	12 January 2021	None	
CN 211150471 U	31 July 2020	None	
US 4323743 A	06 April 1982	None	

Form PCT/ISA/210 (patent family annex) (July 2022)