

SWITCH

TECHNICAL FIELD

[0001] Embodiments of the present disclosure generally relate to the field of power supply and distribution, and more particularly relate to a switch.

5 BACKGROUND

[0002] Expeditious development of industrialization and urbanization boosts a continuous growth of power demands in a long run, which poses a heavy and complicated task on grid development; therefore, it is particularly urgent to build up a robust smart grid. Currently, the smart grid is developing towards extra-high voltage and ultra-high voltage, and
10 developing high-performance and high-reliability circuit breakers matched thereto may provide a strong technical support to the security and reliability for power supply of smart grids.

[0003] A circuit breaker is a switch, which may close, carry, and break current in a normal loop condition and may close, carry and break current under abnormal loop conditions within
15 a specified time. The circuit breaker may be applied to distribute electrical energy without the asynchronous motor being actuated frequently, thereby protecting the power supply wire and the motor; besides, the circuit breaker may automatically cut off the electrical circuit in case of serious overload, short circuit, and undervoltage.

[0004] Studies show that when a fault occurs to an electrical circuit, an upstream circuit
20 breaker is generally opened to clear the fault. However, the opening action is slow. If the fault is cleared within 30ms ~ 40ms after the occurrence of arc fault, the voltage sensitivity load will be shut down (e.g., a variable-frequency speed-governing device), which will incur a severe economic loss to users; besides, serious damages to a system transformer and a fault point may be caused. Further, faults sometimes occurring to medium-voltage circuit
25 breakers are mostly caused by breaker operation failure. Incomplete statistics show that in 2016, more than 85% of medium-voltage circuit breaker faults were caused by breaker operation failure. The causes include: mechanism deadlock, crash of the control part, short circuit of the control loop, and failure of energy-storage motor, etc.

SUMMARY

30 [0005] Embodiments of the present disclosure provide a switch that may lower the odds of

occurrence of circuit breaker operation failures and enhance security of a smart grid system.

[0006] In one aspect, embodiments of the present disclosure provide a switch, comprising a control system, a first manipulating mechanism, and a second manipulating mechanism, wherein:

5 **[0007]** the control system emits a first action instruction to the first manipulating mechanism, and a second action instruction to the second manipulating mechanism, respectively;

[0008] and wherein the first action instruction is configured for instructing the first manipulating mechanism to perform a first action;

[0009] the second action instruction is configured for instructing the second manipulating
10 mechanism to perform a second action; and

[0010] the time taken by the first manipulating mechanism to implement the first action is different from the time taken by the second manipulating mechanism to implement the second action.

[0011] In another aspect, embodiments of the present disclosure provide a switch,
15 comprising: a control system, a first manipulating mechanism, and a second manipulating mechanism, wherein:

[0012] the control system emits an action instruction to the first manipulating mechanism and the second manipulating mechanism, respectively;

[0013] and wherein the action instruction is configured for instructing the first manipulating
20 mechanism to perform a first action; then, the second manipulating mechanism performs a second action;

[0014] the time taken by the first manipulating mechanism to implement the first action is different from the time taken by the second manipulating mechanism to implement the second action.

25 **[0015]** The embodiments of the present disclosure may achieve the following advantageous effects:

[0016] Embodiments of the present disclosure provide a switch, comprising a control system, a first manipulating mechanism, and a second manipulating mechanism, wherein the control system emits a first action instruction to the first manipulating mechanism and a second action
30 instruction to the second manipulating mechanism, respectively; the first action instruction

being configured for instructing the first manipulating mechanism to perform a first action, and the second action instruction being configured for instructing the second manipulating mechanism to perform a second action; and the time taken by the first manipulating mechanism to implement the first action is different from the time taken by the second manipulating mechanism to implement the second action. According to the solution provided in the embodiments of the present disclosure, by adopting a control system that may control different manipulating mechanisms, opening-closing actions at different speeds may be implemented, short-circuit accidents occurring in a grid may be promptly cleared, and grid operating stability may be improved; with cooperative actions between the first manipulating mechanism and the second manipulating mechanism to implement redundancy of switch operating, so that the odds of switch operation failure may be effectively lowered, and security of the whole smart grid system may be enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] To elucidate the technical solutions of the embodiments of the present disclosure, the drawings used in describing the embodiments will be briefly introduced below. It is apparent that the drawings as described only relate to some embodiments of the present disclosure. To those skilled in the art, other drawings may be derived based on these drawings without exercise of inventive work, wherein:

[0018] Fig. 1 is a structural schematic diagram of a switch according to an embodiment of the present disclosure; and

[0019] Fig. 2 is a structural schematic diagram of a switch according to an embodiment of the present disclosure; and

[0020] Fig. 3 is a structural schematic diagram of a switch according to an embodiment of the present disclosure; and

[0021] Fig. 4 is a structural schematic diagram of a switch according to an embodiment of the present disclosure; and

[0022] Fig. 5 is a structural schematic diagram of a switch according to an embodiment of the present disclosure; and

[0023] Fig. 6 is a structural schematic diagram of a switch according to an embodiment of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0024] In practical applications, circuit breakers may be divided into fast circuit breakers and typical circuit breakers. A typical circuit breaker has a slow opening action. A fast circuit breaker has a relatively motion intensity when being opened and closed as it is mainly
5 actuated by an electromagnetic repulsion mechanism, so that a long-term use thereof tends to cause fatigue and damage, thereby shortening the service life of the whole equipment and lowering the security of the smart grid system.

[0025] To make the objects, technical solutions, and advantages of the present disclosure much clearer, embodiments of the present disclosure provide a switch, comprising a control
10 system, a first manipulating mechanism, and a second manipulating mechanism, wherein the control system emits a first action instruction to the first manipulating mechanism and a second action instruction to the second manipulating mechanism, respectively; the first action instruction being configured for instructing the first manipulating mechanism to perform a first action, and the second action instruction being configured for instructing the second
15 manipulating mechanism to perform a second action; and the time taken by the first manipulating mechanism to implement the first action is different from the time taken by the second manipulating mechanism to implement the second action. According to the solution provided in the embodiments of the present disclosure, by adopting the control system that may control different manipulating mechanisms, opening-closing actions at different speeds
20 may be implemented, short-circuit accidents occurring in a grid may be promptly cleared, and grid operating stability may be improved; with cooperative actions between the first manipulating mechanism and the second manipulating mechanism to implement redundancy of the switch operating, the odds of switch operation failure may be effectively lowered, and security of the whole smart grid system may be enhanced.

[0026] Hereinafter, various embodiments of the present disclosure will be described in further detail with reference to the accompanying drawings. Apparently, the embodiments described herein are only part of the embodiments of the present disclosure, not all of them. All other embodiments obtained by those skilled in the art without exercise of inventive work based on the examples in the embodiments all fall within the protection scope of the present
30 disclosure.

[0027] Fig. 1 is a structural schematic diagram of a switch according to an embodiment of the present disclosure. The switch comprises a control system 101, a first manipulating

mechanism 102, and a second manipulating mechanism 103, wherein

[0028] the control system 101 emits a first action instruction to the first manipulating mechanism 102, and a second action instruction to the second manipulating mechanism 103, respectively;

5 **[0029]** and wherein the first action instruction is configured for instructing the first manipulating mechanism to perform a first action;

[0030] the second action instruction is configured for instructing the second manipulating mechanism to perform a second action; and

[0031] the time taken by the first manipulating mechanism to implement the first action is
10 different from the time taken by the second manipulating mechanism to implement the second action.

[0032] Preferably, the time taken by the first manipulating mechanism to implement the first action is shorter than the time taken by the second manipulating mechanism to implement the second action, i.e., the time taken by the first manipulating mechanism to perform an opening
15 action may be shorter than the time taken by the second manipulating mechanism to perform an opening action. Supposing that the time taken by the second manipulating mechanism to perform the opening action is the time taken by a typical circuit breaker to perform the opening action, namely 30ms ~ 40ms, the time taken by the first manipulating mechanism to perform the opening action may be between 1ms ~ 30ms (not included).

20 **[0033]** Preferably, the time taken by the first manipulating mechanism to implement the first action is shorter than the time taken by a typical circuit breaker to implement the opening action; the specific time length for the first manipulating mechanism to implement the opening action is not limited herein.

[0034] Preferably, upon a fault occurring to a wire, the control system 101 emits a first
25 action instruction to the first manipulating mechanism 102 and a second action instruction to the second manipulating mechanism 103, respectively;

[0035] It needs to be noted that a wire condition may be autonomously monitored by a control system or other device; then, a monitoring result is transmitted to the control system. The way for the control system to obtain the wire condition is not specifically limited herein.

30 **[0036]** When a short-circuit accident occurs in the smart grid system, an embodiment of the present disclosure may implement first half-wave synchronized switching and quickly clear

the short-circuit accident, thereby further improving a breaking capacity and service life of the switch; besides, a phase-controlled circuit closing of the switch may be implemented so as to reduce the impact caused by the switch closing action to the smart grid system, e.g., limiting the inrush current when an empty-load transformer is switched on.

- 5 **[0037]** According to the solution in the embodiments of the present disclosure, by adopting the control system to control different manipulating mechanisms, opening-closing actions at different speeds may be implemented when the wire fails, short-circuit accidents occurring in a grid may be promptly cleared, and grid operating stability may be improved; besides, the odds of switch operation failure may be effectively lowered, reliability of actions may be improved, and security of the whole smart grid system may be enhanced.

[0038] In another embodiment of the present disclosure, the control system 101 is further configured to emit an operating instruction to the second manipulating mechanism 103 when the wire works normally, the operating instruction being configured for instructing the second manipulating mechanism to perform an opening action or a closing action.

- 15 **[0039]** It needs to be noted that the operating instruction is configured for instructing the second manipulating mechanism to perform normal opening/closing actions. The “normal” herein may be construed as a normal condition of the circuit in the prior art.

- [0040]** In the solution provided by the embodiments of the present disclosure, the control system selectively controls different manipulating mechanisms dependent on different wire conditions. In other words, when the wire works normally, a normal opening speed is selected, which may effectively avoid fatigue and damage caused by only using one fast circuit breaker in a long term, prolong the service life of the whole apparatus, and effectively enhance the security of the smart grid system.

- 25 **[0041]** In another embodiment of the present disclosure, Fig. 2 is a schematic diagram of a switch according to an embodiment of the present disclosure. On the basis of Fig. 1, the switch further comprises an arc extinguishing component 104, wherein the arc extinguishing component comprises a movable contact 1041 and a stationary contact 1042.

[0042] Connections among the first manipulating mechanism 102, the second manipulating mechanism 103, and the arc extinguishing component 104 include one of the followings:

- 30 **[0043]** the connection between the first manipulating mechanism 102 and the movable contact 1041 and the connection between the second manipulating mechanism 103 and the

first manipulating mechanism 102;

[0044] the connection between the first manipulating mechanism 102 and the stationary contact 1042 and the connection between the second manipulating mechanism 103 and the movable contact 1041;

5 [0045] the connection between the second manipulating mechanism 103 and the stationary contact 1042 and the connection between the first manipulating mechanism 102 and the movable contact 1041;

[0046] the connection between the second manipulating mechanism 103 and the movable contact 1041 and the connection between the second manipulating mechanism 103 and the first manipulating mechanism 102.

[0047] In a further embodiment of the present disclosure, Fig. 3 is a structural schematic diagram of a switch according to an embodiment of the present disclosure. It may be seen from Fig. 3 that the connection between the first manipulating mechanism and the movable contact and the connection between the second manipulating mechanism and the first manipulating mechanism specifically comprise:

[0048] the connection between a motion lever 301 of the first manipulating mechanism and the movable contact 1041 and the connection between a motion lever 302 of the second manipulating mechanism and a housing 303 of the first manipulating mechanism.

[0049] Based on the structure of the switch shown in Fig. 3, the working principle of the switch is described as follows:

[0050] When performing a fast opening action, the first manipulating mechanism and the second manipulating mechanism are in a closed position; when the control system determines a need to quickly open or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the movable contact to implement fast opening to cut off the circuit; the time taken by the second manipulating mechanism to perform the opening action is longer than the time taken by the first manipulating mechanism to perform the opening action, and after the circuit is cut off, the movable contact is continued to be pulled to make an opening motion and the first manipulating mechanism is reset to cause the first manipulating mechanism to resume the closed position, thereby guaranteeing normal operations of the next fast opening action,

implementing a redundant action (the redundant here may be construed as such: the first manipulating mechanism is opened to act once to separate the contact, thereby implementing circuit break; the second manipulating mechanism acts to separate the contact, implementing circuit break; the two actions implement the same function, so that when one mechanism fails, normal actions can still be guaranteed), and guaranteeing normal operations of the switch. During this period, the circuit is always in an opening state.

[0051] When performing a fast closing action, the first manipulating mechanism and the second manipulating mechanism are in an opening position; when the control system determines a need to quickly close or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the movable contact to implement fast closing to conduct the circuit; the time taken by the second manipulating mechanism to perform the closing action is longer than the time taken by the first manipulating mechanism to perform the closing action, and after the circuit is conducted, the movable contact is continued to be pushed to make a closing motion and the first manipulating mechanism is reset to resume the opening position, thereby guaranteeing normal operations of the next fast closing action, implementing a redundant action, and guaranteeing normal operations of the switch. During this period, the circuit is always in a conducting state.

[0052] Upon a normal action, the first manipulating mechanism does not act, which may be regarded as a rigid linkage, and the movable contact is actuated by the second manipulating mechanism to act, thereby implementing normal closing and opening of the switch. In this way, fatigue and damage caused by fast action is avoided in normal operations, thereby prolonging the service life.

[0053] In a further embodiment of the present disclosure, Fig. 4 is a structural schematic diagram of a switch according to an embodiment of the present disclosure. It may be seen from Fig. 4 that the connection between the first manipulating mechanism to the movable contact and the connection between the second manipulating mechanism and the first manipulating mechanism specifically comprises:

[0054] The connection between the motion lever 301 of the first manipulating mechanism and the movable contact 1041 and the connection between the motion lever 302 of the second manipulating mechanism and the housing 303 of the first manipulating mechanism via the

linkage 304.

[0055] Based on the switch structure shown in Fig. 4, the working principle of the switch is described as follows:

[0056] When performing a fast opening action, the first manipulating mechanism and the second manipulating mechanism are in a closed position; when the control system determines a need to quickly open or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the movable contact to implement fast opening to cut off the circuit; the time taken by the second manipulating mechanism to perform the opening action is longer than the time taken by the first manipulating mechanism to perform the opening action, and after the circuit is cut off, the movable contact is continued to be pulled to make an opening motion and the first manipulating mechanism is reset to resume the closed position, thereby guaranteeing normal operations of the next fast opening action, implementing a redundant action, and guaranteeing normal operations of the switch. During this period, the circuit is always in an opening state.

[0057] When performing a fast closing action, the first manipulating mechanism and the second manipulating mechanism are in an opening position; when the control system determines a need to quickly close or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the movable contact to implement fast closing to conduct the circuit; the time taken by the second manipulating mechanism to perform the closing action is longer than the time taken by the first manipulating mechanism to perform the closing action, and after the circuit is conducted, the movable contact is continued to be pushed to make a closing motion and the first manipulating mechanism is reset to resume the opening position, thereby guaranteeing normal operations of the next fast closing action, implementing a redundant action, and guaranteeing normal operations of the switch. During this period, the circuit is always in a conducting state.

[0058] Upon a normal action, the first manipulating mechanism does not act, which may be regarded as a fixed connection, and the movable contact is actuated by the second manipulating mechanism to act via a linkage, thereby implementing normal closing and opening of the switch. In this way, fatigue and damage caused by fast action is avoided in

normal operations, thereby prolonging the service life.

[0059] In a further embodiment of the present disclosure, Fig. 5 is a structural schematic diagram of a switch according to an embodiment of the present disclosure. It may be seen from Fig. 5 that the connection between the first manipulating mechanism and the movable contact and the connection between the second manipulating mechanism and the first manipulating mechanism specifically comprises:

[0060] The connection between the motion lever 301 of the first manipulating mechanism and the stationary contact 1042 and the connection between the motion lever 302 of the second manipulating mechanism and the movable contact 1041.

[0061] Based on the switch structure shown in Fig. 5, the working principle of the switch is described as follows:

[0062] When performing a fast opening action, the first manipulating mechanism and the second manipulating mechanism are in a closed position; when the control system determines a need to quickly open or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the stationary contact to implement fast opening to cut off the circuit; the time taken by the second manipulating mechanism to perform the opening action is longer than the time taken by the first manipulating mechanism to perform the opening action, and after the circuit is cut off, the movable contact is continued to be pulled to make an opening motion and the first manipulating mechanism is reset to resume the closed position, thereby guaranteeing normal operations of the next fast opening action, implementing a redundant action, and guaranteeing normal operations of the switch. During this period, the circuit is always in an opening state.

[0063] When performing a fast closing action, the first manipulating mechanism and the second manipulating mechanism are in an opening position; when the control system determines a need to quickly close or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the stationary contact to implement fast closing to conduct the circuit; the time taken by the second manipulating mechanism to perform the closing action is longer than the time taken by the first manipulating mechanism to perform the closing action, and after the circuit is conducted, the movable contact is continued to be pushed to make a closing motion and the

first manipulating mechanism is reset to resume the opening position, thereby guaranteeing normal operations of the next fast closing action, implementing a redundant action, and guaranteeing normal operations of the switch. During this period, the circuit is always in a conducting state.

5 **[0064]** Upon a normal action, the first manipulating mechanism does not act, which may be regarded as a fixed connection, and the movable contact is actuated by the second manipulating mechanism to act, thereby implementing normal closing and opening of the switch. In this way, fatigue and damage caused by fast action is avoided in normal operations, thereby prolonging the service life.

10 **[0065]** In a further embodiment of the present disclosure, Fig. 6 is a structural schematic diagram of a switch according to an embodiment of the present disclosure. It may be seen from Fig. 6 that the connection between the first manipulating mechanism and the movable contact and the connection between the second manipulating mechanism and the first manipulating mechanism specifically comprises:

15 **[0066]** the connection between the motion lever 301 of the first manipulating mechanism and the movable contact 1041 and the connection between the motion lever 302 of the second manipulating mechanism and the stationary contact 1042;

[0067] Based on the structure of the switch shown in Fig. 6, the working principle of the switch is described as follows:

20 **[0068]** When performing a fast opening action, the first manipulating mechanism and the second manipulating mechanism are in a closed position; when the control system determines a need to quickly open or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the movable contact
25 to implement fast opening to cut off the circuit; the time taken by the second manipulating mechanism to perform the opening action is longer than the time taken by the first manipulating mechanism to perform the opening action, and after the circuit is cut off, the stationary contact is continued to be pulled to make an opening motion and the first manipulating mechanism is reset to resume the closed position, thereby guaranteeing normal
30 operations of the next fast opening action, implementing a redundant action, and guaranteeing normal operations of the switch. During this period, the circuit is always in an opening state.

[0069] When performing a fast closing action, the first manipulating mechanism and the

second manipulating mechanism are in an opening position; when the control system determines a need to quickly close or receives an instruction from an upstream control system, the control system issues an action instruction to the first manipulating mechanism and the second manipulating mechanism, and the first manipulating mechanism actuates the movable
5 contact to implement fast closing to conduct the circuit; the time taken by the second manipulating mechanism to perform the closing action is longer than the time taken by the first manipulating mechanism to perform the closing action, and after the circuit is conducted, the stationary contact is continued to be pushed to make a closing motion and the first
10 manipulating mechanism is reset to resume the opening position, thereby guaranteeing normal operations of the next fast closing action, implementing a redundant action, and guaranteeing normal operations of the switch. During this period, the circuit is always in a conducting state.

[0070] Upon a normal action, the first manipulating mechanism does not act, which may be regarded as a fixed connection, and the stationary contact is actuated by the second
15 manipulating mechanism to act, thereby implementing normal closing and opening of the switch. In this way, fatigue and damage caused by fast action is avoided in normal operations, thereby prolonging the service life.

[0071] In a still further embodiment of the present disclosure, the first manipulating mechanism 102 is configured for actuating the movable contact 1041 and the stationary
20 contact 1042 to perform an opening action or a closing action, respectively, when receiving the first action instruction emitted by the control system.

[0072] When a short-circuit accident occurs in the system, the present disclosure may implement first half-wave synchronized switching and quickly clear the short-circuit accident, thereby improving a breaking capacity and service life of the switch; besides, it may also
25 implement a phase-controlled circuit closing of the switch so as to reduce the impact caused by the switch closing action to the system, e.g., limiting the inrush current when an empty-load transformer is switched on. Meanwhile, the first manipulating mechanism and the second manipulating mechanism may separately actuate the stationary contact to perform functions of opening and closing the circuit; in addition to a cluster of action instructions
30 issued by the control system having an independent control unit, multiple opening and closing may be implemented to execute redundancy, thereby greatly reducing the odds of operation failure; when it is solely needed to perform normal opening and closing actions of the circuit,

only the second manipulating mechanism needs to be manipulated, which may avoid fatigue and damage caused by fast actions and prolong the service life of the whole apparatus.

[0073] Preferably, an embodiment of the present disclosure provides a switch, comprising a control system, a first manipulating mechanism, and a second manipulating mechanism,
5 wherein:

[0074] the control system emits an action instruction to the first manipulating mechanism and the second manipulating mechanism, respectively;

[0075] and wherein the action instruction is configured for instructing the first manipulating mechanism to perform a first action; then, the second manipulating mechanism performs a
10 second action; and

[0076] the time taken by the first manipulating mechanism to implement the first action is different from the time taken by the second manipulating mechanism to implement the second action.

[0077] Preferably, the time taken by the first manipulating mechanism to implement the first
15 action is shorter than the time taken by the second manipulating mechanism to implement the second action.

[0078] Those skilled in the art should understand that the embodiments of the present disclosure may be provided as a method, an apparatus (device), or a computer program product. Therefore, the present disclosure may adopt a form of complete hardware
20 embodiment, a complete software embodiment, or an embodiment combining software and hardware. Moreover, the present disclosure may adopt a form of a computer program product implemented on one or more computer-adaptable storage media including computer-adaptable program code (including, but not limited to, a magnetic disc memory, CD-ROM, and optical memory, etc.).

[0079] The present disclosure is described with reference to the flow diagram and/or block diagram of the method, apparatus (device) and computer program product according to the
25 embodiments of the present disclosure. It should be understood that each flow and/or block in the flow diagram and/or block diagram, and a combination of the flow and/or block in the flow diagram and/or block diagram, may be implemented by computer program instructions.
30 These computer program instructions may be provided to a processor of a general-purpose computer, a dedicated computer, an embedded processor, or other programmable data

processing device to generate a machine, so that an apparatus for implementing the functions specified in one or more flows of the flow diagram and/or one or more blocks in the block diagram.

5 [0080] These computer program instructions may also be stored in a computer readable memory that may boot the computer or other programmable data processing device to work in a specific manner, so that the instructions stored in the computer readable memory to produce a product including an instruction apparatus, the instruction apparatus implementing the functions specified in one or more flows of the flow diagram and/or in one or more blocks in the block diagram.

10 [0081] These computer program instructions may be loaded on the computer or other programmable data processing device, so that a series of operation steps are performed on the computer or other programmable device to generate a processing implemented by the computer, and that the instructions performed on the computer or other programmable device provide steps for implementing the functions specified in one or more flows of the flow
15 diagram and/or one or more blocks in the block diagram is implemented via the computer or the processor of other programmable data processing device.

[0082] Although the preferred embodiments of the present disclosure have been described. However, once those skilled in the art obtain the basic inventive idea, they may make alternative changes and modifications to these embodiments. Therefore, the appended
20 claims are intended to be construed as including the preferred embodiments and all changes and modifications falling into the scope of the present disclosure.

[0083] Apparently, those skilled in the art may make various alterations and transformations to the present disclosure without departing from the spirit and scope of the present disclosure. In this way, if such modifications and transformations to the present disclosure fall within the
25 scope of the claims of the present disclosure and their equivalent technologies, the present disclosure is also intended to include these changes and transformations.

CLAIMS

[Claim 1] A switch comprising a control system for conducting a circuit through a wire, a first manipulating mechanism, and a second manipulating mechanism, wherein:

the control system emits an operating instruction to the second manipulating mechanism when the wire works normally, the operating instruction being configured for instructing the second manipulating mechanism to perform an opening action or a closing action;

the control system emits a first action instruction to the first manipulating mechanism and a second action instruction to the second manipulating mechanism, respectively, when the wire fails;

and wherein the first action instruction is configured for instructing the first manipulating mechanism to perform a first action;

the second action instruction is configured for instructing the second manipulating mechanism to perform a second action, the cooperative action between the first manipulating mechanism and the second manipulating mechanism implements redundancy of the switch operating; and

the time taken by the first manipulating mechanism to implement the first action is different from the time taken by the second manipulating mechanism to implement the second action.

[Claim 2] The switch according to claim 1, wherein the time taken by the first manipulating mechanism to implement the first action is shorter than the time taken by the second manipulating mechanism to implement the second action.

[Claim 3] The switch according to claim 2, wherein the switch further comprises an arc extinguishing component, wherein the arc extinguishing component comprises a movable contact and a stationary contact; connections among the first manipulating mechanism, the second manipulating mechanism, and the arc extinguishing component include one of the followings:

the connection between the first manipulating mechanism and the movable contact and the connection between the second manipulating mechanism and the first manipulating mechanism.

the connection between the first manipulating mechanism and the stationary contact and the connection between the second manipulating mechanism and to the movable contact;

the connection between the second manipulating mechanism and the stationary contact

and the connection between the first manipulating mechanism and the movable contact; and
the connection between the second manipulating mechanism and the movable contact and the
connection between the first manipulating mechanism and the second manipulating mechanism.

[Claim 4] The switch according to claim 3, wherein the connection between the first manipulating mechanism and the movable contact and the connection between the second manipulating mechanism and the first manipulating mechanism specifically comprises:

the connection between a first motion lever of the first manipulating mechanism and the movable contact and the connection between a second motion lever of the second manipulating mechanism and a housing of the first manipulating mechanism;

or,

the connection between the first motion lever of the first manipulating mechanism and the movable contact and the connection between the second motion lever of the second manipulating mechanism and the housing of the first manipulating mechanism via a linkage.

[Claim 5] The switch according to claim 3, wherein the connection between the first manipulating mechanism and the stationary contact and the connection between the second manipulating mechanism and the movable contact specifically comprises:

the connection between a first motion lever of the first manipulating mechanism and the stationary contact and the connection between a second motion lever of the second manipulating mechanism and the movable contact.

[Claim 6] The switch according to claim 3, wherein the connection between the second manipulating mechanism and the stationary contact and the connection between the first manipulating mechanism and the movable contact specifically comprises:

the connection between a first motion lever of the first manipulating mechanism and the movable contact and the connection between a second motion lever of the second manipulating mechanism and the stationary contact.

[Claim 7] The switch according to any one of claim 1 or 2, wherein the switch further comprises an arc extinguishing component, wherein the arc extinguishing component comprises a movable contact and a stationary contact;

when performing a fast opening action, the first manipulating mechanism actuates the movable contact and the stationary contact to implement fast opening to cut off the circuit;

after the circuit is cut off, the movable contact or the stationary contact is continued to be pulled by the second manipulating mechanism to make an opening motion and the first

manipulating mechanism is reset to cause the first manipulating mechanism to resume the closed position, implementing a redundant action.

[Claim 8] The switch according to any one of claim 1 or 2, wherein the switch further comprises an arc extinguishing component, wherein the arc extinguishing component comprises a movable contact and a stationary contact;

when performing a fast closing action, the first manipulating mechanism actuates the movable contact and the stationary contact to implement fast closing to conduct the circuit;

after the circuit is conducted, the movable contact or the stationary contact is continued to be pushed by the second manipulating mechanism to make a closing motion and the first manipulating mechanism is reset to cause the first manipulating mechanism to resume the opening position, implementing a redundant action.

[Claim 9] A switch, comprising a control system for conducting a circuit through a wire, a first manipulating mechanism, and a second manipulating mechanism, wherein:

the control system emits an operating instruction to the second manipulating mechanism when the wire works normally, the operating instruction being configured for instructing the second manipulating mechanism to perform an opening action or a closing action;

the control system emits an action instruction to the first manipulating mechanism and the second manipulating mechanism, respectively, when the wire fails;

and wherein the action instruction is configured for instructing the first manipulating mechanism to perform the first action; then, the second manipulating mechanism performs the second action, the cooperative action between the first manipulating mechanism and the second manipulating mechanism implements redundancy of the switch operating;

the time taken by the first manipulating mechanism to implement the first action is different from the time taken by the second manipulating mechanism to implement the second action.

[Claim 10] The switch according to claim 9, wherein the time taken by the first manipulating mechanism to implement the first action is shorter than the time taken by the second manipulating mechanism to implement the second action.

[Claim 11] The switch according to any one of claim 9 or 10, wherein the switch further comprises an arc extinguishing component, wherein the arc extinguishing component comprises a movable contact and a stationary contact;

when performing a fast opening action, the first manipulating mechanism actuates the

movable contact and the stationary contact to implement fast opening to cut off the circuit;

after the circuit is cut off, the movable contact or the stationary contact is continued to be pulled by the second manipulating mechanism to make an opening motion and the first manipulating mechanism is reset to cause the first manipulating mechanism to resume the closed position, implementing a redundant action.

[Claim 12] The switch according to any one of claim 9 or 10, wherein the switch further comprises an arc extinguishing component, wherein the arc extinguishing component comprises a movable contact and a stationary contact;

when performing a fast closing action, the first manipulating mechanism actuates the movable contact and the stationary contact to implement fast closing to conduct the circuit;

after the circuit is conducted, the movable contact or the stationary contact is continued to be pushed by the second manipulating mechanism to make a closing motion and the first manipulating mechanism is reset to cause the first manipulating mechanism to resume the opening position, implementing a redundant action.