

OPERATING DEVICE FOR AN ELECTRICAL APPARATUS

The present invention relates to an operating device for an electrical apparatus housed in an insulating case containing a pair of stationary and movable contacts, said movable contact
5 being able to be actuated either manually by a hand lever mounted rotatable between a closed position and an open position of the contacts, or automatically in case of an electrical fault, said device comprising a mechanism performing manual opening and automatic opening of the contacts in case of an electrical fault, and performing closing of the contacts and keeping the contacts in the closed position, said mechanism
10 communicating with peripheral accessories.

Known electrical protection devices, in particular differential switches, comprise a single operating mechanism for performing closing and opening of the contacts by manual action on a lever or a handle, for automatic opening of the contacts in case of an electrical fault,
15 for communicating the state of the apparatus to removable auxiliaries and for commanding opening via other removable auxiliaries, said auxiliaries being mechanically and laterally associated with said apparatus.

The same mechanism thus keeps the contacts closed, which involves a high mechanical load, and performs communication with the peripheral accessories, which involves a low
20 mechanical load. However, the flow of a large mechanical flux in the sensitive communication components disturbs information input and output, and therefore disturbs the general operation of the apparatus.

In addition, in the case of a differential switch, management of the energy of the switch contacts by a single mechanism does not enable common auxiliaries to be had with the
25 circuit breakers. The pressures of all the contacts in particular in the case of differential switches with a high operating current do in fact lead to mechanical systems that are incompatible with the auxiliaries. This problem is currently overcome by specific auxiliaries communicating with standard auxiliaries.

The present invention solves these problems and proposes an operating device for an
30 electrical apparatus enabling common auxiliaries to be had with the circuit breakers, wherewith the communication means are not subjected to a high mechanical load.

For this purpose, it is an object of the present invention to provide an operating device for an electrical apparatus of the above-mentioned kind, this device being characterized in that it comprises a first mechanism, called the power mechanism, for performing manual opening and closing of the contacts and for keeping the contacts in the closed position, and a second mechanism, called the indicating mechanism, said second mechanism being designed to command automatic opening of the contacts and to communicate with the above-mentioned peripheral accessories.

- 10 According to a particular embodiment of the invention, the above-mentioned peripheral accessories comprise at least one tripping auxiliary and/or an indicating device for indicating the state of the contacts of the apparatus.

- 15 According to a particular feature of the invention, the two mechanisms are kinematically connected in such a way that when the contacts are closed by the operator or by a remote control, the two mechanisms are operated at the same time by the hand lever so as to transmit the information on the open or closed state of the apparatus to the indicating auxiliaries.

- 20 According to another feature, the two mechanisms are kinematically connected in such a way that automatic opening of the contacts by tripping of the operating and indicating mechanism is performed with the hand lever remaining in the closed position.

- 25 According to another feature, the first mechanism comprises a support device of the movable contact mounted rotatable between the above-mentioned two positions and connected to the hand lever by a transmission means so as to form a breakable mechanical link between the support device and the hand lever.

- 30 According to another feature, the transmission means comprise a toggle connected in articulated manner via one of the ends thereof to the hand lever, and latched in a position corresponding to a closed state of the contacts by a mechanical latching system.

According to another feature, the second mechanism comprises a tripping means controlled by a trip device to cause automatic opening of the contacts independently from the hand lever, and a return means to return the tripping means to a loaded position enabling
5 automatic resetting of the operating and indicating mechanism.

This tripping means is designed to cause the above-mentioned mechanical link to be broken, in the event of an electrical fault occurring.

10 Advantageously, the tripping means comprise an electromagnetic relay.

According to another feature, the second mechanism comprises a rotary bar actuated by the tripping means and releasing a rotary plate operating in conjunction with the above-mentioned latching system.

15 According to another feature, the plate comprises a part designed to operate in conjunction with the indicating auxiliaries indicating the state of the apparatus.

According to another feature, the bar comprises a part designed to operate in conjunction with the tripping auxiliaries.

20 Advantageously, the tripping auxiliaries comprise auxiliaries called under-voltage or shunt releases.

Advantageously, the indicating auxiliaries comprise auxiliaries indicating a fault and the
25 open or closed state of the contacts.

According to another feature, the control axes are aligned with the axes of the auxiliaries common to other control and/or electrical protection and/or electrical distribution apparatuses.

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It is a further object of the present invention to provide a differential switch comprising an operating device comprising the above features taken alone or in combination.

But other advantages and features of the invention will become more clearly apparent from the following detailed description which refers to the accompanying drawings given for example purposes only and in which:

-Figure 1 is a side view of a differential switch according to the invention illustrating the internal part of the switch, the contacts being in a closed position,

-Figure 1a is a partial cross-sectional view illustrating a part of the operating mechanism and of a tripping auxiliary,

-Figure 2 is a partial view of the previous figure illustrating the mechanism of a switch according to the invention, seen from the front, in the closed position of the contacts,

-Figure 3 is a similar view to the previous one illustrating the mechanism of the switch, seen from behind, in the closed position of the contacts,

-Figure 4 is a side view of a differential switch according to the invention, similar to figure 1, in an open position of the contacts.

In figures 1 and 4, a differential switch I can be seen designed to be connected to the electrical conductors of an AC power system by means of a connection terminal to protect the system in the even of a differential fault.

This apparatus I is housed in a narrow case made up of two parts one whereof has been removed to be able to see the internal mechanism of the switch I.

In figures 1 and 4, it can be seen that this switch I comprises two contacts 1,2 respectively stationary and movable. This movable contact 2 is supported by a contact support 3 mounted rotatable between a closed position of the contacts and a separated position of the contacts 1,2.

This switch I comprises two distinct mechanisms 4,5, respectively a mechanism called the power mechanism 4 and a mechanism called the operating and indicating mechanism 5. The power mechanism 4 is designed to perform manual opening and closing of the contacts 1,2 by means of the hand lever 6, and to ensure that the contacts 1,2 are kept in the closed position.

The operating and indicating mechanism 5 is designed to command automatic opening of the contacts 1,2 in the even of an electrical fault to ensure safety of people, by the action of a differential protection device, and to communicate with the peripheral accessories 8.

These accessories 8 comprise indicating auxiliaries and tripping auxiliaries. The indicating auxiliaries are designed to indicate the state of the contacts 1,2 of the switch I, which contacts can be closed, open following manual opening, or open following opening on a fault. The tripping auxiliaries enable opening of the contacts 1,2 of the switch I to be performed independently from the trip device of the switch I, as will be explained in greater detail further on.

10 The first mechanism 4 comprises a toggle 9 formed by two rods 10,11 articulated on one another, one of the rods 10 being connected in articulated manner to the hand lever 6, whereas the other rod 11 is connected in articulated manner to the support 3 of the movable contact 2, the assembly forming a breakable mechanical link. This toggle 9 is kept in a state corresponding to a closed state of the contacts 1,2 by a latching system 12.

15 The second mechanism 5, called the operating and indicating mechanism, comprises a rotary bar 13 able to be driven by a tripping means 14 and able to release a rotary plate 15, which plate 15 is designed to operate in conjunction with the above-mentioned latching system 12 in a way that will be explained further on. This tripping means 14 is an electromagnetic relay 16 actuated by a fault detection means (not shown). The rotary plate
20 15 is connected in articulated manner to the hand lever 6. This plate 15 also comprises a part 15a designed to operate in conjunction with the indicating auxiliaries, and the bar 13 comprises a part 13a designed to operate in conjunction with the tripping auxiliaries.

Operation of the device according to the invention will be described in the following with reference to the figures.

25 In figures 1 to 3, the switch I is in a loaded position, with the contacts 1,2 closed, corresponding to normal operation of the power system. In this state, the contacts 1,2 are kept in a closed position by a latching system 12 forcing the assembly 3,6,9 to a stable equilibrium position.

When manual opening is performed, the hand lever 6 is moved to the right with respect to
30 the position of figure 1. This movement annuls the stable equilibrium position between the toggle 9 and the hand lever 6 thus releasing the contacts 1,2. In the opposite way, the same

will be the case for manual closing or closing by the remote control. The two mechanisms 4,5 are operated at the same time by the hand lever 6 ensuring the kinematic coherence necessary for operation of the auxiliaries situated in general to the left of the apparatus I. Open-closed indication of the state of the contacts will thus be activated by the hand lever 6.

When a differential fault occurs as illustrated in figure 3, the trip device actuates the relay 16. The pin 16a of the relay 16 then drives a resetting blade 17. The blade 17 then drives the bar 13, which unlatches the latching between the bar 13 and the part 7 releasing the plate 15. The plate 15 then actuates the latching system 12 which unlatches the toggle 9, resulting in opening of the contacts 1,2.

During this operation, the part 15a of the plate 15 communicates with the indicating auxiliaries, so that the latter indicates a tripped on a fault state.

It should be noted that the kinematics of the assembly enable the contacts 1,2 to be opened by tripping of the mechanism 5, the hand lever 6 remaining in the closed position (free tripping).

In the case of tripping by a tripping auxiliary as illustrated in figure 2, a needle 18 of the auxiliary trips the mechanism 5 thereby driving the bar 13, which bar 13 unlatches the latching between the part 7 and the bar 13 releasing the plate 15 which acts on the latching system 12. The needle 18 of the auxiliary operates in conjunction with the part 13a of the bar 13.

An operating device of an electrical apparatus has therefore been achieved according to the invention, which device is of simple design making it possible to use auxiliaries that are common with other apparatuses arranged next to said apparatus, such as circuit breakers. The invention therefore enables a differential switch mechanism to be achieved that is compatible with the auxiliaries of electrical apparatuses of the same kind.

With the device according to the invention, the structure of the operating and indicating mechanism is dissociated from that of the power mechanism while being kinematically linked thereto. The operating mechanism has kinematics suited to auxiliaries common to circuit breakers.

The position of the control and indication axes to the auxiliaries is independent from the position of the power mechanism. It is then possible to align the control and indication axes

with those of the auxiliaries that are common to other control and/or electrical protection and/or electrical distribution apparatuses.

The device according to the invention enables the open or closed states of the switch to be transmitted on the same axis as the control axes.

- 5 This device also eliminates the stresses linked to the large loads of the contact closing and opening mechanism, induced on the operating and indicating mechanism. Adaptability to the auxiliaries is then industrially achievable, which was not possible with monoblock design.

- Another advantage lies in the fact that it is possible to use the same operating and
10 indicating mechanism as those of the differential units associated with the circuit breakers. Thus, whatever the apparatus, the relay works in an environment with identical static and dynamic loads.

- This same relay previously used to be subjected to larger stresses in a differential switch than in a differential unit, which meant that a relay able to operate with two different
15 systems had to be provided, which gave rise to difficulties.

The invention therefore enables a differential switch to be provided using a common mechanical sub-assembly with differential units associated with circuit breakers. A single differential relay is used for a differential switch and for a differential unit.

- The communication means are not subjected to a high mechanical load associated with the
20 125A rating, which means that suitability to the auxiliaries is respected.

- The invention applies to any apparatus comprising a stationary contact and a movable contact, said movable contact being able to be actuated either manually or automatically, and a mechanism for performing manual opening and closing, for automatic opening and for keeping the contacts in the closed position, said mechanism communicating with
25 peripheral accessories. The invention therefore advantageously applies to switches, circuit breakers, contactors and any apparatus for electrical distribution, control, protection, etc. presenting the above-mentioned features.

Naturally the invention is not limited to the embodiments described and illustrated which have been given for example purposes only.

On the contrary, the invention encompasses all the technical equivalences of the means described as well as combinations thereof if the latter are performed according to the spirit of the invention.

CLAIMS

1. Operating device for an electrical apparatus housed in an insulating case containing a pair of stationary and movable contacts, said movable contact being able to be actuated either manually by a hand lever mounted rotatable between a closed position and an open position of the contacts, or automatically in case of an electrical fault, said device comprising a mechanism performing manual opening and automatic opening of the contacts in case of an electrical fault, and performing closing of the contacts and keeping the contacts in the closed position, said mechanism communicating with peripheral accessories, characterized in that it comprises, housed in the above-mentioned case, a first mechanism (4), called the power mechanism, performing manual opening and closing of the contacts (1,2) and keeping the contacts (1,2) in the closed position, and a second mechanism (5), distinct from the first one, called the operating and indicating mechanism, said second mechanism (5) commanding automatic opening of the contacts (1,2) and communicating with the above-mentioned peripheral accessories (8).
2. Device according to claim 1, characterized in that the above-mentioned peripheral accessories (8) comprise at least one tripping auxiliary and/or a device for indicating the state of the contacts (1,2) of the apparatus I.
3. Device according to claim 1 or 2, characterized in that the above-mentioned two mechanisms (4,5) are kinematically linked in such a way that when closing of the contacts (1,2) is performed by the operator or by a remote control, the two mechanisms (4,5) are operated at the same time by the hand lever (6) so as to transmit the information on the open or closed state of the apparatus I to the indicating auxiliaries.

4. Device according to any one of the claims 1 to 3, characterized in that the above-mentioned two mechanisms (4,5) are kinematically linked in such a way that automatic opening of the contacts (1,2) by tripping of the operating and indicating mechanism (5) is performed with the hand lever (6) remaining in the closed position.
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5. Device according to any one of the foregoing claims, characterized in that the first mechanism (4) comprises a support device (3) of the movable contact (2) mounted rotatable between the above-mentioned two positions and connected to the hand lever (6) by a transmission means (9) so as to form a breakable mechanical link between
- 10 the support device (3) and the hand lever (6).
6. Device according to claim 5, characterized in that the above-mentioned transmission means (9) comprise a toggle (10,11) connected in articulated manner via one of the ends thereof to the hand lever (6), and latched in a position corresponding to a closed
- 15 state of the contacts (1,2) by a mechanical latching system (12).
7. Device according to any one of the claims 1 to 6, characterized in that the second mechanism (5) comprises a tripping means (14) controlled by a trip device to cause automatic opening of the contacts (1,2) independently from the hand lever (6), and a
- 20 return means to return the tripping means (14) to a loaded position enabling automatic resetting of the operating and indicating mechanism (5).
8. Device according to claims 5 and 7, characterized in that the above-mentioned tripping means (14) are able to cause the above-mentioned mechanical link to be
- 25 broken, in the event of an electrical fault occurring.
9. Device according to claims 7 or 8, characterized in that the above-mentioned tripping means (14) comprise an electromagnetic relay (16).
- 30 10. Device according to any one of the claims 7 to 9, characterized in that the second mechanism (5) comprises a rotary bar (13) actuated by the above-mentioned tripping

means (14) and releasing a rotary plate (15) operating in conjunction with the above-mentioned latching system (12).

5 11. Device according to claim 10, characterized in that the above-mentioned plate (15) comprises a part (15a) designed to operate in conjunction with the auxiliaries indicating the state of the apparatus I.

12. Device according to claim 10 or 11, characterized in that the bar (13) comprises a part (13a) designed to operate in conjunction with the tripping auxiliaries.

10 13. Device according to any one of the claims 2 to 12, characterized in that the tripping auxiliaries comprise auxiliaries called under-voltage or shunt releases.

15 14. Device according to any one of the claims 2 to 13, characterized in that the indicating auxiliaries comprise auxiliaries indicating a fault and the open or closed state of the contacts.

20 15. Device according to any one of the foregoing claims, characterized in that the control axes are aligned with the axes of the auxiliaries common to other control and/or electrical protection and/or electrical distribution apparatuses.

25 16. Differential switch comprising an operating device according to any one of the claims 1 to 15.