

Description

Control apparatus for carrying out switching operations in a switchgear assembly

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The invention relates to a control apparatus for carrying out switching operations in a switchgear assembly, in particular in high-voltage or medium-voltage system.

10 In switchgear assemblies in a power supply network, switching operations often have to be carried out for supplying or disconnecting electrical assemblies. In this case, switching operations have to be carried out to a different extent, owing to the large
15 number of functions integrated in a switchgear assembly. One such switching operation is, for example, the connection or disconnection of a circuit-breaker, with corresponding connection or disconnection of voltage to or from an electrical equipment. Another switching
20 operation is the opening or closing of a switch-disconnector, with corresponding production or closing of an isolating gap required for safety reasons. Furthermore, a switching operation may be the connection or disconnection of an earthing switch, with
25 corresponding earthing and short-circuiting of a power supply section, for example for technical reasons.

During operation of such a switchgear assembly, it is absolutely essential that the switching operations be carried out in a specific sequence. This sequence of
30 switching operations is also known as a switching program. The extent of such a switching program may differ and may comprise, for example, only the switching of the circuit-breaker, of the switch-disconnector, of the earthing switch, or a combination of these switching
35 operations. In this case, the isolating and earthing

function are subject to particular conditions, on the basis of which isolation and non-energized earthing may be carried out only without power. Various interlock systems between the functions are used to guarantee
5 these conditions at all times.

In order to allow medium-voltage switchgear assemblies to be operated, the German Standard (DIN VDE, IEC) requires that operators be trained to become authorized switchgear operators, who may therefore carry out these switching operations. The respective operating states are monitored by a mechanic or a secondary technician, who identifies the switch positions and generates an appropriate message. In this case, the switching operations may be carried out manually, locally, or by remote control, the earthing normally being carried out locally. Control errors when carrying out switching operations manually can result in severe injuries to personnel and damage to equipment.

JP-A-06 195 101 (Abstract) discloses a control apparatus for controlling a device in a system having a magnetic memory card. The memory card is used to store control information and system control information, by means of which, in general, an enable signal and a control signal can be produced for the device.

US-PS 5,233,511 discloses a system for remote control of interrupters for interrupting an electrical power supply temporally during peak-load periods and for programmable lighting monitoring for industrial sites, that is to say in a low-voltage network. The system has a key card mechanism with an automatic interpreter, by means of which a coded message incorporated on a key card can be interpreted which, if required, allows an operator to have access to monitor the interrupter. The key card mechanism is used to prevent unauthorized access to system programming functions. The coded message is stored on the key card in the form of a hole pattern which is detected optically in a card reader.

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The prospectus from the Company Siemens AG, "Schaltfehlerschutz 8 TK" [Switching fault protection 8 TK], 1985, Order No. A19100-E135-B283 discloses a so-called switching fault protective device for high-voltage and medium-voltage systems, which is used, inter alia, for manual control of switchgear. In this case, the reliability of switching operations carried out manually is monitored in accordance with interlock conditions which can be specified in advance. In principle, these interlock conditions may be rendered ineffective via various buttons. In order to authorize the operation of the switching fault protective device, appropriate key-operated switches may be provided, which enable the operation of the device on the basis of switching authorization.

The invention is based on the object of specifying a control apparatus having a particularly high level of reliability and automation, for carrying out switching operations with a switchgear assembly.

This object is achieved according to the invention by the features of Claim 1.

The use of such a memory card or switching card allows the execution of the switching programs to be initiated, monitored and appropriately documented virtually without any faults, and thus particularly safely, automatically. At the same time, this switching card can carry out the function of authorization control. Switching operations independently of authorization control may therefore be carried out only by the holder of the memory card. This results in standardization of the design of the interlock technology.

In an expedient refinement, the memory card has a memory which can be read from for a switching program having a number of control data items which represent a sequence of switching operations. In order to read out

the control data for the switch or each switch in the switchgear assembly, the memory card can expediently be inserted in a card reader which is provided in a control interface of the switchgear assembly,

and a plurality of control interfaces with associated card readers may also be provided. The switching operations are then executed by sending the stored control data via control lines which lead to the
5 switches in the switchgear assembly and are connected to the card reader. The control data then initiate, for example, auxiliary voltages for the respective switching process. At the same time, each switching operation carried out may be indicated on the control panel by
10 visualization of the respective switch position. In addition, the switching operations carried out using the memory card may be recorded locally by means of an output device, for example a printer.

The memory card is expediently programmable. To
15 this end, a switching program with a specific sequence of switching operations can be written to the memory card. The stored switching program can be overwritten with a new switching program, by reprogramming. The essential feature in this case is the programming of the
20 respective switching operation to be carried out such as, in particular, the switching of a circuit-breaker, of a switch-disconnector and/or of an earthing switch, in a specific sequence. Any required combinations of individual switching operations may be programmed in
25 this case. Further information items, in particular coding of assemblies or system sections allocated to the system, a specific date and/or a specific time, may be programmed in the memory card as additional stored data.

The memory card is also advantageously used as
30 access authorization to the switchgear assembly, a door opener code for the switchgear assembly door then being stored in the memory card, as additional information. The programming process is carried out by automatically writing to the memory card by means of a computer, and

is ended with the switching program required for the respective purpose.

The advantages achieved by the invention are, in particular, that the use of an electronic memory card
5 for variable storage of control data which automatically initiate the switching operation or each switching operation ensures that the control process is simplified with, at the same time, a particularly low time and labour cost and a high level of safety. Incorrect
10 control operations are in consequence virtually precluded. Furthermore, a high level of standardization as well as high speed in the control sequences are achieved even over relatively long distances, with standard and reliable documentation of the switching
15 processes (responsibility) also being possible.

An exemplary embodiment of the invention will be explained in more detail with reference to a drawing. In the drawing, the figure shows schematically a control apparatus with an electronic memory card for carrying
20 out switching operations in a switchgear assembly.

The control apparatus 1, illustrated in the figure, for a switchgear assembly 3, for example a medium-voltage switchgear assembly, contains (in a control interface 5) a card reader 7 for accommodating
25 an electronic memory card 9, and a control panel 11 which symbolizes a switching panel 13 of the switchgear assembly 3. A plurality of control interfaces, with corresponding card readers, may also be provided in the switchgear assembly 3.

30 The switching panel 13 is composed of a switch-disconnector 17, connected to a busbar 15, and a circuit-breaker 19, connected downstream from said switch-disconnector 17, as well as an earthing switch 21. The circuit-breaker 19 and the earthing switch 21
35 lead to an outgoer 23 from the switchgear assembly 3 for

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electrical assemblies (which are not illustrated) in a power supply network.

In order to monitor the operational state of the switchgear assembly 3, the control panel 11 of the control interface 5 indicates the positions of the switches 17 to 21. In the illustrated switch positions, work may be carried out on an assembly connected to the outgoer 23. To do this, the circuit-breaker 19 is first of all switched to the illustrated "OFF" position, and the voltage to the equipment or to the assembly is interrupted. The switch-disconnector 17 is then opened ("OFF" position) to produce an isolating gap required for safety reasons. In addition, for technical reasons, a particular section including the assembly is short-circuited and earthed by switching the earthing switch 21 to the "ON" position.

The switchgear assembly 3 is controlled by means of the electronic memory card 9. To do this, the memory card 9 is inserted into the card reader 7, in the insertion direction 25. The desired switching operations are then carried out in an automatic sequence. To do this, appropriate control data SD are read from a memory 27 in the memory card 9 and are passed, in the form of auxiliary voltages, via control lines 29, 30 and 31 to the respective switches 17, 19 and, respectively, 31. The switching operations are carried out as a sequence in a specific, predetermined order, on the basis of a switching program stored in the memory card 9. The memory card is programmed with such a switching program, that is to say with a specific sequence of switching operations, in a manner which is not illustrated in more detail, by means of a computer or a computer system. The same memory card 9 may be used for programming various switching programs by writing new control data SD to the memory 27 in the memory cards 9.

The memory card 9 is expediently also used as access authorization for the switchgear assembly 3. This

is done by providing a further card reader 35 close to or in the vicinity of a switchgear assembly door 33, only part of which is illustrated.

The program stored in the memory card 9 then has added to it, as appropriate, a door opener code for the switchgear assembly door 33.

5 An output device in the form of a printer 37 connected to the control interface 5 is used to record all the switching operations carried out, starting, for example, with entry to the switchgear assembly 3 and ending on leaving the area for carrying out the switching operations.

10 Thus, in order to carry out the switching operations in the switchgear assembly (3), only a single, programmable electronic memory card (9) is required, for variable storage of control data (SD) which automatically initiate the switching operation or each
15 switching operation. All control operations are then carried out via the memory card (9), by inserting it into the card reader (7) in the switchgear assembly (3). After this, the desired switching operations are carried out in an automatic sequence, on the basis of a
20 switching program which has previously been stored in the memory card (9).

The automatic sequence, which is carried out on insertion of the memory card 9 into the card reader 7, of the switching operations programmed into the memory
25 card 9 may be monitored on the control panel 11, with each switching operation carried out being visualized. Since the memory card expediently in each case contains only one specific switching program, and other switching operations are therefore impossible, incorrect control
30 operations are virtually precluded. In the event of a defect in the automatic control sequence, control buttons 39, 41 and 43 are additionally provided on the control panel 11, in order to connect or disconnect the respective switch 17, 19 or 31 mechanically.



Patent Claims

1. Control apparatus for controlling a device in a system having a memory card for storage of control information and system control information, by means of which an enable signal and a control signal can be produced for the device, wherein
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- a) the system is designed as a high-voltage switchgear assembly or a medium-voltage switchgear assembly, which, if necessary, has further devices,
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- b) each device is designed as a power breaker, a switch disk connector or a grounding switch that is arranged inside a switch panel in the system,
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- c) the memory card is designed as an electronic memory card,
- d) the control information stored on the memory card represents operating authorization,
- e) the system control information stored on the memory card forms a switching program with a number of control data items representing a sequence of switching operations, in which case
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- f) control signals to initiate a switching operation or a plurality of switching operations within the switch panel can be produced automatically for at least one device using the control data.
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2. Control apparatus according to Claim 1, wherein the memory card (9) has a memory (27) which can be read from for the control data items (SD).
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3. Control apparatus according to Claim 1 or 2, wherein the memory card (9) for reading out the control data (SD) for at least one switch (17, 19, 21) can be inserted in a card reader (7) which is provided in a control interface (5) of the switchgear assembly (3),
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- wherein the card reader (7) is connected via a

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control line (29, 30, 31) to the switch, or each switch (17, 19, 21), of the switchgear assembly (3).

4. Control apparatus according to one of Claims 1 to 3, wherein each switching operation carried out can be indicated on a control panel (11) by visualization of the respective switch position.

5. Control apparatus according to one of Claims 1 to 4, wherein each switching operation carried out using the memory card (9) can be recorded by means of an output device (37).

6. Control apparatus according to one of Claims 1 to 5, wherein the memory card (9) can be programmed with a sequence of switching operations.

7. Control apparatus according to one of Claims 1 to 7, wherein the memory card (9) is additionally intended for use as access authorization to the switchgear assembly (3).

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