(57) Abstract: The elevator system has a traveling vertically within a shaft, a plurality of landing doors disposed along said shaft, a drive system for driving the car, a controller for controlling the drive system, a power source, including at least one circuit breaker, for powering at least the driving system, and an emergency and inspection interface for allowing a user to control operations of the elevator. The emergency and inspection interface comprises a fixed port connected to the controller, a portable control unit having a user interface and an access port for associating with the fixed port, and a switch for remotely controlling the circuit breaker which is located within the shaft.
PORTABLE EMERGENCY AND INSPECTION INTERFACE FOR ELEVATORS

FIELD OF THE INVENTION

The present invention relates to elevator systems provided with emergency and inspection control interfaces.

BACKGROUND OF THE INVENTION

Traditional elevator systems operating between a plurality of landing floors include power and drive systems, such as motor and brake, and control equipment, such as controller cabinets and all the interfaces therewith, located in a machine room typically situated above the elevator shaft. Such machine rooms, however, take up space which may not always be available for new installations.

Therefore, over recent years, manufacturers have been interested in completely removing or at least delocalizing such machine rooms to be able to utilize more efficiently the space available, for example the possible access to higher parts of the building. These efforts have led to so called machineroom-less elevator systems, whereby the controller, the drive and the power systems are placed within the shaft.

Parts of the control system providing an emergency and inspection (E&I) interface are still needed to be easily accessible to repair, inspect, troubleshoot, and maintain the elevator system. These are typically delocalized to a landing floor, in an E&I cabinet or panel.

The E&I panel is accessible to personnel servicing the elevator and includes functionalities such as Electrical Recall Operation (ERO) control, electrical brake release, etc. In many cases, for safety reasons, it includes a circuit breaker, i.e. a component of the power system by which the operator can, from the E&I panel, interrupt the elevator power supply.
For aesthetic reasons, efforts have been made to miniaturize known E&i panels and to integrate them into landing walls in order to make such panels as unnoticeable as possible by passengers on the landings. However, there are physical limitations to such miniaturization and integration.

5 SUMMARY OF THE INVENTION

The present invention proposes an elevator system disposed with a portable emergency and inspection interface.

In particular, exemplary embodiments of the invention comprise:

- at least one car traveling vertically within a shaft;
- a plurality of landing doors disposed along said shaft;
- a drive system for powering and driving said car along said shaft;
- a controller for controlling said drive system;
- a power source, including at least one circuit breaker, for powering at least said drive system; and
- an emergency and inspection interface for allowing a user to control operations of the elevator.

The emergency and inspection interface advantageously comprises at least one fixed port connected to said controller, a portable control unit having a user interface and an access port for associating with the at least one fixed port, and a switch for remotely controlling the circuit breaker, the circuit breaker being located within the shaft.

By means of these dispositions, one can limit the aesthetic impact of having a fixed cabinet on the landing. Only a fixed port such as a connector (a wireless port, RF or infrared, is also possible) and a switch have to be made accessible instead of a full E&I panel having significant dimensions.

Furthermore, these dispositions allow the transportability of the emergency and inspection interface to different places which, in some embodiments of the invention, may be provided with fixed ports for plugging
the portable control unit into. Alternatively, the fixed port and the access port of the portable control unit may be arranged to use wireless communications for exchanging information and commands.

The portable control unit can be stored in a safe place, for example at the bottom of the elevator shaft or in a guard room. It is then less exposed to degradation than when the E&I interface is fixedly installed on a landing.

In an embodiment of the present invention, the elevator system comprises a plurality of cars, each associated with a fixed port for coupling to at least one common portable control unit. The portable control unit is then shared between several elevators. There is no need to reproduce full E&I panel for each of them. A person who has to inspect more than one elevator, for example in the same building, may use just one portable unit to successively connect to different fixed ports. Alternatively, there may be just a single fixed port connected to each of the respective elevators, and the portable unit then has manual means (a switch for example) or electronic means (such as code addressing) for selecting which elevator one desires to interact with.

Another aspect of the present invention relates to a portable control unit for the above-disclosed elevator system, being connectable to at least one fixed port of the elevator system.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic view of an elevator system installed in a building, according to an exemplary embodiment of the invention; and

Figure 2 is a perspective illustration of a typical landing door area, according to an exemplary embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS
Figure 1 is a schematic illustration of a typical machineroom-less elevator system according to an exemplary embodiment of this invention. Such an elevator system 1 comprises a car 2 traveling vertically within an elevator shaft 3 between a plurality of landing floors, each landing floor being equipped with a landing door 4.

The elevator system 1 further comprises a power source 5 to power the drive system 6. The drive system 6 drives the motor 8 moving the car 2 vertically within the shaft 3, by way of cables or belts 8a, as a function of a control signal emitted by a controller 7. In an embodiment, the power from the power source 5 is routed to the drive system 6 via the controller 7.

The power source 5 comprises an overcurrent circuit breaker (OCB) 9 which is for example supplied with 3-phase 380 V AC voltage from the mains 5a.

The circuit breaker 9 is disposed to limit over-currents or current spikes in the system. It can also be tripped and reset between a first mode whereby the current is able to flow from the power source 5 to the controller 7 and the drive system 6 for normal elevator system operation, and a second mode ("tripped" mode) whereby current cannot flow, to permit power shutdown to the drive system 6 thus ensuring the complete immobilization of the car 2 in emergency situations. In conventional elevators, the OCB can be positioned anywhere convenient or according to local regulation. However, for convenience it is typically disposed adjacent to the landing door 4 of the highest landing level of the car 2.

The controller 7 outputs the control signal to the drive system 6 as a function of the state of the elevator system 1, for example, amongst other things, as a function of the passenger inputs at each floor and within the car 2, the position of the car 2 with respect to its destination, etc. The controller 7 contains all the control logic required for operating the elevator system 1, and can determine the exact state of the elevator system 1 to ensure safe operating conditions. The controller 7 further powers auxiliary systems of
the elevator such as the interior lighting for the car 2, the various ports, sensors, and so on.

In the illustrated embodiment, the controller 7 receives the 380V AC voltage from the power source 5 and relays it to the drive 6. It also includes power conversion components to obtain lower AC and/or DC voltages needed for the control functions. It may also be connected to the auxiliary power sources such as a 220V or 110V AC mains source 7b. It is also fitted with a backup battery 7a to power and keep alive vital modules of the controller 7 during power shutdown of the elevator 1 so as to permit essential diagnostic operations by the portable controller 11 (explicated further herebelow) to diagnose problems, as well as to maintain the car 2 lit for passengers, and to release emergency brakes if need be.

The elevator system 1 further comprises an emergency, inspection and remote control interface (E&I Interface) for repairing, inspecting, troubleshooting, and maintaining the elevator system.

In prior art systems it was common to dispose the OCB in the E&I panel accessible on a landing. However, in the present case, the circuit breaker 9 is located within the shaft 3 and interposed between the power source 5 and the controller 7.

In view of the power consumption of the motor 8, heavy gauge cables are used to connect the power source 5 to the controller 7 and to the drive system 6. Placing the OCB in an E&I cabinet, as in the prior art, necessitates substantial dimensions in order to accommodate not only the circuit breaker itself, but also the heavy-gauge wiring and their connections. In addition to requiring cumbersome runs of cable, such an arrangement makes it difficult to miniaturize known E&I interfaces.

Figure 2 illustrates more clearly the elevator system 1 comprising an E&I interface 10. In particular, the E&I interface 10 consists of a portable control unit 11, a fixed port 12 which is connected to the controller 7 and
which can be associated with the portable control unit 11, and a remote circuit breaker switch 13.

The remote circuit breaker switch 13 is connected to the OCB 9, and is typically located on a landing floor where prior-art circuit breakers are located. It is operated between two positions to remotely trip and reset the OCB 9, and as such does not require thick cabling as it has no power transmission function. Thanks to these dispositions, the OCB 9 and its associated heavy gauge cabling can remain located in the shaft, and only the much less voluminous remote circuit breaker switch 13 need be integrated in the E&I interface 10.

The E&I interface 10, and more particularly the portable control unit 11, allows a user, such as maintenance personnel, to control and monitor operations of the elevator system 1.

The portable control unit 11 comprises an access port 17 for associating with the fixed port 12. The access port 17 of the portable control unit 11 may be associated with the fixed port 12 by means of a physical plug and socket configuration, or alternatively by wireless transmission, for example by means of an infrared transceiver.

The portable control unit 11 comprises a user interface 14 allowing for a user to probe, set parameters, and generally interact and have feedback with the controller 7. In an embodiment, the user interface 14 comprises a display 15, preferably an LCD-type display, to be able to clearly and succinctly display the status of the elevator system 1 needed during maintenance. Of course, such a display 15 can be configured interactively to respond in different ways to the user depending on which mode the elevator system 1 is operating in, or what the user would like to see. Therefore, the information displayed will be different if the elevator system 1 is in normal operation mode, in inspection mode, in a rescue mode, etc.
User interaction with the portable control unit 11 may be through separate controls adjacent to the display 15, or even through the display 15 itself which may consist of a tactile screen that can be directly interacted with.

The portable control unit 11 can be powered by one or more batteries 16, preferably exchangeable, and represented in figure 2 as being external to the portable control unit 11. However, the battery 16 will generally be fitted internally to the control unit 16 in a permanent or removable form. In an alternative embodiment, the portable control unit 11 is powered directly from the controller 7 via the fixed port 12.

The portable control unit 11 is therefore in communication, by way of the fixed port 11, with the controller 7 to control or monitor operations of the elevator system 1.

The fixed port 12 is not limited to being positioned on a top landing floor. Additionally, while still keeping within the scope of the present invention, additional fixed ports may be positioned on each of the other landing floors adjacent the landing doors 4, inside the car 2, on the roof of the car 2, or even at a location in the pit at the bottom of the shaft 3. In fact, a fixed port 12 may be positioned wherever it is necessary and useful to have one. For example, a fixed port 12 on top of the car 2 or within the car 2 is advantageous as there often is other devices of the elevator in its proximity so that it may be convenient to control or conduct maintenance operations from there.

As is evident, the functionality of the present E&I interface 10 is similar to that of the E&I panels of the prior art which were housed in cabinets on a landing floor. However, because of the location of the circuit breaker 9 inside the shaft 3, cumbersome power cables do not need to be brought to a landing floor along with the control interface. This, of course, allows also the derealization of the control elements, which can then be made portable. As a result, the visual impact of the E&I interface 10 from prior art can be significantly reduced.
In a typical portable control unit 11, the following functionalities may be present through its user interface 14:

- information status display to show the car 2 motion direction and position within the shaft;
- an electrical brake release button in order to force car 2 movement during power failure;
- a battery charge indicator;
- buttons to manually force upwardly or downwardly movement of the car 2;
- a communication unit permitting communication between the inside of the car 2 and a fixed port 12 location, for example to allow communication between passengers and maintenance personnel operating the portable control unit 11;
- a switch to force open a particular landing door 4, for example to rescue passengers; and
- a user manual, preferably in electronic form, referencing all functionality and typical maintenance scenarios.

Of course, such functionalities are only indicative and are in no way limitative.

Furthermore, in elevator installations comprising a plurality of cars 2 in one or several shafts 3, and each car 2 having one or more fixed ports 12 associated therewith, it may be advantageous to use a common portable control unit 11 for each car and/or shaft. This is made possible by the derealization of the E&I interface afforded by the present invention. It has a positive impact on the cost of the installation and on the convenience for the user. This can thus permit the user to connect a single common portable control unit 11 to a plurality of cars and/or shafts.

In yet another embodiment, multi-car or multi-shaft elevator systems are provided with a common fixed port 12 able to communicate with each of the respective controllers 7 associated with the different cars 2. The fixed
port 12 may for example be fitted with a manual switch enabling the user to manually switch between elevator controllers 7. Alternatively, the user may be prompted to enter a code designating a particular car or elevator system, after which the user inputs are automatically directed to the addressed controller 7.

While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed, but that the invention will include all embodiments falling within the scope of the appended claims.
WE CLAIM:

1. An elevator system (1) comprising:
   - at least one car (2) traveling vertically within a shaft (3);
   - a plurality of landing doors (4) disposed along said shaft;
   - a drive system (6) for powering said car along said shaft;
   - a controller (7) for controlling said drive system;
   - a power source (5), including at least one circuit breaker (9), for powering at least said drive system; and
   - an emergency and inspection interface (10) for allowing a user to control operations of the elevator,

wherein the emergency and inspection interface (10) comprises:
   - at least one fixed port (12) connected to said controller;
   - a portable control unit (11) having a user interface (14) and an access port (17) for associating with the at least one fixed port; and
   - a switch (13) for remotely controlling the circuit breaker, the circuit breaker (9) being located within the shaft (3).

2. An elevator system according to claim 1, wherein the fixed port (12) comprises a plug-in connector.

3. An elevator system according to any one of the preceding claims, wherein the switch (13) is adjacent a fixed port (12).

4. An elevator system according to any one of the preceding claims, wherein the fixed port (12) and the switch (13) are adjacent a landing door (4).

5. An elevator system according to claim 4, further comprising an additional fixed port (12) inside the car (2) for associating with the portable control unit (11).
6. An elevator system according to claim 4 or 5, further comprising an additional fixed port (12) on top of the car for associating with the portable control unit (11).

7. An elevator system according to any one of the preceding claims, wherein the user interface (14) of the emergency and inspection interface (10) comprises a display (15).

8. An elevator system according to any one of the preceding claims, wherein the portable control unit (11) is powered from the fixed port (12).

9. An elevator system according to any one of claims 1-7, wherein the portable control unit (11) is powered from at least one battery (16).

10. An elevator system according to any one of the preceding claims, comprising a plurality of cars (2) each associated with a respective fixed port (12) for associating with at least one common portable control unit (11).

11. An elevator system according to any one of claims 1 to 9, comprising a plurality of cars (2), associated with a common fixed port (12) for associating with at least one common portable control unit (11).

12. A portable control unit (11) for an elevator system according to any of the preceding claims, the control unit being connectable to at least one fixed port (12) of the elevator system (1).
A. CLASSIFICATION OF SUBJECT MATTER

INV. B66B5/00

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)

B66B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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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

E: earlier document 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)

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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

Date of the actual completion of the international search

3 August 2007

Date of mailing of the international search report

17/08/2007

Name and mailing address of the ISA/

European Patent Office, P B 5818 Patentlaan 2 NL - 2280 HV RI/79/308
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Authorized officer

Nelis, Yves
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