

REMOTE GROUP CONFIGURATION FOR ELEVATOR SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

This application is related to commonly-owned copending application serial No. 08/363,152, filed December 12, 1994, entitled Remote Hall Call Registration for Elevator System, by D. Richard Schafer.

BACKGROUND OF THE INVENTION

Technical Field

This invention relates to elevator control systems and, more particularly, to such systems including a remote control for transmitting elevator command signals.

Description of the Prior Art

Remote control arrangements for transmitting command signals in elevator systems are known. See, for example, U.S. Patent 4,673,911, issued June 16, 1987, entitled "Elevator Remote-Control Apparatus" to K. Yoshida; U.S. Patent 4,979,594, issued December 25, 1990, entitled "Method and Equipment for the Secure and Convenient Input of Control Commands, in Particular in Lift Installations" to G. Begle, et al.; U.S. Patent 4,655,324, issued April 7, 1987 entitled "Method for Privately Controlling an Elevator" to G. Meguerdichian, et al.; and U.S. Patent 4,685,538, issued August 11, 1987, entitled "Remote Call Registration System for Elevator" to H. Kamaike, which are all hereby incorporated in their entireties by reference.

Also, elevator cars are typically installed and electronically controlled (configured) in groups. A group is a number of elevator cars available to answer hall calls registered through a particular set of hall call buttons. The buttons are located in halls at particular floors in a building. Electronic controllers for cars in a group are located typically in a machine room of the building. See U.S. Patent Nos.: 4,497,391; 5,202,540; 4,363,381, and 4,401,190 which are all hereby incorporated in their entireties by reference.

However, the present inventor believes that improvements in the prior art are achievable by providing to, for example, elevator maintenance or other authorized personnel a wireless remote capability to reconfigure a group of elevator cars.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to permit reconfiguration of an elevator car group via a remote wireless transmitter.

According to the present invention, an elevator control arrangement includes:

1. A remote control transmitter. The transmitter has, e.g., a telephone style keypad with 12 buttons: 0..9, *, and #. The transmission mode is, e.g., radio frequency (rf), optical (such as infrared) or even sonic.
2. A receiver located on the hall button fixture plate where the Up and Down buttons are currently located and/or on the Car Operating Panel (COP).
3. Group reconfiguration software stored in a controller (including, for example, a microprocessor) for an elevator car, and
4. A display (such as an electro-luminescent display - ELD) located either in the car, the lobby, or any hallway.

Pushing the, e.g., # button a first time on the transmitter keypad generates and sends a unique and encoded signal which is detected by the receiver. The signal is translated by the receiver to a correspondingly unique and encoded signal which is placed on, e.g., a remote serial link (RSL) of the elevator system and sent to the electronic controller for the elevator car. The controller is in an electronically communicative relationship with other controllers for other cars in all groups. Each controller includes decode logic to detect or recognize not only the unique # signal, but also all other command signals from that particular transmitter. When recognized by decode logic, the # signal is detected by and invokes the group reconfiguration software stored in the controller. The group reconfiguration software responds interactively to each of the command signals sent from the transmitter. A first response, e.g., causes a menu to be displayed on the ELD. The operator, thereafter, presses the appropriate 0..9 number key to select a menu item such as "RECONFIGURE GROUP." This selection is again passed

to the group reconfiguration software which suitably accesses known dispatcher software and which suitably causes display of the current group configuration on the ELD. Each group is displayed and numbered, and each car in a group is numbered. According to the invention, the user interacts with a series of menus and prompts generated by the reconfiguration software, with controls, to place car(s) into or remove car(s) from group(s). Upon completion, the user presses or selects the # key a second time to finalize the operation. The group reconfiguration request is queued, automatically communicated to all controllers for all groups and will occur or be executed the next time all cars in reconfigured groups are idle.

Further and still other objects of the present invention will become more readily apparent in view of the following detailed description when taken in conjunction with the following drawing, in which:

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a block schematic diagram of an elevator system according to the prior art;

Fig. 1A is a schematic diagram of an operational control subsystem (OCSS) shown in Fig. 1;

Fig. 2 is a diagram of another elevator system according to the prior art;

Fig. 3 is a block schematic diagram of an elevator system according to the present invention;

Fig 4 is a schematic diagram of a transmitter - receiver arrangement of the present invention;

Fig. 5 is a more detailed block diagram of a portion of the invention of Fig. 3;

Fig. 6 is a series of screen interactive displays caused by the reconfiguration software of the present invention, and

Fig. 7 is a high-level logic flow diagram explaining typical operations of the group reconfiguration software according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS AND BEST MODE

The disclosure of commonly owned U.S. Patent No. 4,363,381, issued December 14, 1982, entitled "Relative System Response Elevator Call Assignments" to J. Bittar is incorporated herein by reference in its entirety.

Fig. 1 is a block diagram that depicts an elevator system of a type described in commonly owned U.S. Patent No. 5,202,540 issued April 13, 1993, entitled "Two-Way Ring Communication System for Elevator Group Control" to B. Auer, et al., which is hereby incorporated in its entirety by reference. This elevator system presents but one suitable configuration which, when modified as shown in Figs. 3-7, is useful for practicing the present invention. Fig. 2 shows an alternative group control arrangement as described in the '381 patent to Bittar which can also be modified to practice the present invention. As shown in Fig. 1, an elevator group control function may be distributed to separate data processors, such as microprocessors, on a per elevator car basis. These microprocessors, referred to herein as operational control subsystems (OCSS) 101, are coupled together with a two-way ring communication bus 102,103. For the illustrated system of Fig. 1, the elevator group consists of eight elevator cars (CAR 1-CAR 8) and, hence, includes eight OCSS 101 units. Each OCSS includes a CPU, I/O ports and volatile (RAM), and nonvolatile (ROM, EEPROM, etc.) memories, all interconnected by suitable buses not shown; see Fig. 1A.

For a given installation, a building may have more than one group of elevator cars. Furthermore, each group may include from one to some maximum specified number of elevator cars, typically a maximum of eight cars.

As shown in Fig. 3, the elevator system of Fig. 1 has been modified to include two logically separated four-car groups, the group reconfiguration software, remote transmitter 10 and a display 25, as all hereafter described.

Group 1 (cars 1-4) and Group 2 (cars 5-8) are logically separated into groups by any appropriate software which forms part of or may be separate from, for example, the group reconfiguration software suitably stored in each nonvolatile memory of each OCSS; see Fig. 5.

In Fig. 3, hall buttons, for initiating elevator hall calls, and lights are connected with remote stations 104 and remote serial communication links 105 to each OCSS 101 via a switch-over module (SOM) 106. Elevator car buttons, lights, and switches are coupled through similar remote stations 107 and serial links 108 to the OCSS 101. Elevator car specific hall features, such as car direction and position indicators, are coupled through remote stations 109 and a remote serial link 110 to the OCSS 101.

It should be realized that each elevator car and associated OCSS 101 has a similar arrangement of indicators, switches, communication links and the like, as just described, associated therewith. For the sake of simplicity, only those associated with CAR 3 are shown in Fig. 3.

Car load measurement is periodically read by a door control subsystem (DCSS) 111, which is a component of the car controller system. The load measurement is sent to a motion control subsystem (MCSS) 112, which is also a component of the car controller system. The load measurement in turn is sent to the OCSS 101. DCSS 111 and MCSS 112 are preferably embodied within microprocessor systems for controlling the car door operation and the car motion, under the control of the OCSS 101. The MCSS 112 also works in conjunction with a drive and brake subsystem (DBSS) 112A.

A car dispatching function is executed by the OCSS 101, in conjunction, for example, with an advanced dispatcher subsystem (ADSS) 113, which communicates with each OCSS 101 through an information control subsystem (ICSS) 114. By example, the measured car load is converted into boarding and deboarding passenger counts by the MCSS 112 and sent to the OCSS 101. The OCSS 101 subsequently transmits this data over the communication buses 102, 103 to the ADSS 113, via the ICSS 114. Also, by example, data from a hardware sensor (not shown) mounted on the car's door frame may sense boarding traffic, and this sensed information is provided to the car's OCSS 101.

As such, it can be seen that the ICSS 114 functions as a communication bus interface for the ADSS 113, which in turn influences high level elevator car control functions and parameters.

The ADSS 113 may also collect data on individual car and group demands throughout the day to arrive at a historical record of traffic demands for different time

intervals for each day of the week. The ADSS 113 may also compare a predicted demand to an actual demand so as to adjust elevator car dispatching sequences to obtain an optimum level of group and individual car performance.

Various aspects of this ADSS functionality are described in commonly assigned U.S. Patent No. 5,024,295, issued January 19, 1991, entitled "Relative System Response Elevator Dispatcher System using Artificial Intelligence to Vary Bonuses and Penalties" to K. Thangavelu, the disclosure of which is incorporated herein in its entirety by reference.

According to the present invention as shown in Figs. 3-7, a wireless transmitter 10 having suitable hardware and/or software for generating unique signals, encoding such signals and transmitting such signals via, for example, radio frequency (rf) carrier, communicates with a receiver 20 located in a hall button fixture at an elevator floor landing. See Figs. 4 and 5. The rf transmitter-receiver arrangement is of any conventional type. Those used in some commercially available (Genie, Sears or Stanley brand) garage door opener arrangements are useable. Arrangements found in hand-held radio telephones are also useable. See, e.g., U.S. Patent Nos: 5,371,783; 5,359,375 and 5,358,238, which are all incorporated in their entireties by reference. Of course, optical or sonic receivers - transmitters can, alternatively, be used. Pressing the # key a first time, for example, causes the unit 10 to transmit a unique and encoded elevator group reconfiguration (EGR) command signal. See Fig. 5. After the unit 10 transmits the EGR signal to the receiver 20 located in the hall button fixture at the same landing, the receiver suitably receives and decodes the signal in any conventional fashion. The receiver, for example, re-encodes the signal for transmission to the appropriate portion of the controller such as OCSS which is in an electronically communicative relationship with other operational control subsystems within a group in any well-known manner. See, for example, the previously incorporated U.S. Patent 5,202,540.

According to one aspect of the present invention, communication with an OCSS in another group is accomplished through the lines 102, 103 and conventional communication techniques which may include optional hardware/software interfaces. Further descriptions of such techniques are unnecessary for understanding and practicing the present invention. Those skilled in the art can readily implement such techniques in

communications/control software which permits results of commands introduced through, e.g., the OCSS for car 1 to be communicated and executed at a proper time by all appropriate OCSS's in all groups. Each unique signal commands correspondingly unique function(s) in the elevator group reconfiguration (EGR) software. The EGR software includes instructions for fetching, displaying and modifying group configuration data (e.g., car and group ID numbers) stored in conventional dispatcher software such as that taught in the '381 patent to Bittar. The communication/control software is separate from or may be part of the EGR software and is stored in each OCSS memory. The communication/control software controls communication to and from each group reconfiguration (EGR) software (Fig. 6, 7) stored in each OCSS of each group. See U.S. Patent 5,202,540.

Each OCSS includes either hardware or software decode logic (e.g., OCSS RSL decode logic) which detects all incoming signals, but recognizes or passes only EGR command signals. Upon receiving the EGR command signal, the EGR software responds or performs according to the EGR routine of the present invention as shown in, for example, Figs. 6 and 7. Figs. 6 and 7 include a third four-car group, i.e., Group 3. That routine interacts with the group control/identification portions of well-known dispatching software such as the RSR routines disclosed in U.S. Patent 4,363,381, previously incorporated by reference. The EGR routine causes such group ID portion of the software to add or delete particular cars to or from selected group(s). Also, the screen information of (e.g., screens 1-5) is stored and, responsive to suitable signals, modified and outputted to a display 25 (Fig. 5) as explained in Fig. 6 and Fig. 7. Upon receiving a final command signal to end a reconfiguration session, the EGR software queues the group reconfiguration request and automatically communicates such request for queuing by all controllers of all groups. In view of the instant disclosure, those skilled in the art will readily be able to code the routines of Figs. 6,7 for interaction with known dispatching software stored in same/different elevator group(s), and otherwise to implement the present invention.

While there has been shown and described what is at present considered preferred embodiments of the present invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit and scope of the present invention which shall be limited only by the appended claims.

What is claimed is:

1. An elevator control system, comprising:
an elevator car;
a controller associated with said car, said a controller including an electronic processor connected to a memory, a dispatching routine for controlling dispatching of said car stored within said memory, an elevator group reconfiguration (EGR) routine stored within said memory, said EGR routine including instructions for detecting at least one EGR command signal, and for processing said EGR command signal, said instructions for processing said EGR command signal including instructions for removing said dispatching routine from controlling said car;
a portable transmitter for generating and transmitting said EGR command signal, and
a receiver for receiving said EGR signal, said receiver being coupled to said controller.
2. A control system as claimed in claim 1, wherein said transmitter includes circuits for encoding said EGR command signal.
3. An elevator control system as claimed in claim 1, wherein said transmitter is a radio frequency transmitter.
4. An elevator control system as claimed in claim 1, wherein said transmitter includes means for generating and transmitting a plurality of unique EGR command signals.
5. An elevator control system as claimed in claim 1, further comprising a hall call fixture coupled to said controller, said receiver being connected to said fixture.



6. An elevator control system as claimed in claim 1, further comprising a car operating panel coupled to said controller, said receiver being connected to said panel.

