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ELEVATOR SYSTEM WITH CRIME PREVENTION FUNCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an elevator system with a crime prevention function in the elevator having anti-crime windows or an in-cage monitor for displaying the situation on each elevator hall.

2. Description of the Related Art

In recent years, elevators have been designed with an improved security function to prevent the intrusion of a suspicious person. JP-A-60-77082 and JP-A-6-255922, for example, propose a design for trapping a suspicious person in an elevator cage.

The conventional techniques described above, though capable of trapping a suspicious intruder in an elevator cage, are still insufficient to protect good elevator passengers from a suspicious person who has intruded into a building.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an elevator system equipped with a crime prevention function capable of protecting the elevator passengers from any suspicious person who has intruded into a building.

The idea of preventing crimes by trapping an

intruder in an elevator cage cannot produce an expected effect unless the intruder uses an elevator. In the case where an intruder stays on an elevator hall awaiting an elevator user, the elevator user has no means to protect himself. In an elevator system equipped with an anti-crime window (viewport) between the elevator cage and an elevator hall, an elevator user in a cage can recognize a dangerous situation on a given elevator hall, for example, in the case where a suspicious person awaits on a destination floor. Nevertheless, the fact that the elevator door opens automatically upon arrival at the particular floor in response to a call exposes the elevator passenger to danger unavoidably.

According to one aspect of the invention, there is provided an elevator system with a crime prevention function, comprising means for enabling a passenger in an elevator cage with the door thereof closed to recognize the situation on a given elevator hall where the cage is expected to stop, such as a crime prevention window (viewport) formed in both an elevator cage and on each floor or a monitor for displaying the elevator hall situation on an in-cage display unit, and means for preventing the elevator door from automatically opening upon arrival at the particular floor in response to a predetermined operation performed in the elevator cage.

As a result, the elevator passenger can

prevent the elevator door from automatically opening at his/her own discretion and thus can avoid the danger.

According to another aspect of the invention, there is provided an elevator system with a crime
5 prevention function, wherein an elevator door is prevented from automatically opening by operating a door close button in the cage whenever the elevator cage is located within a door zone.

In this way, a passenger who has sensed
10 danger, through an anti-crime window, etc., from the situation of an elevator hall where the cage is soon to stop can prevent the automatic door from opening and thus secure his/her safety by the very natural operation of depressing a door close button.

15 According to still another aspect of the invention, there is provided an elevator system with a crime prevention function, wherein the means for preventing the automatic door from opening is so configured as to operate only in the case where an
20 elevator controller is set in crime prevention mode.

As a result, the automatic elevator door can be prevented from opening only during the night time or when otherwise required, thereby preventing the elevator operation from being unduly hampered.

25 According to yet another aspect of the invention, there is provided an elevator system with a crime prevention function, wherein the means for preventing the automatic elevator door from opening is

deactivated quickly by operating a door open button in the cage.

In this way, the elevator door can be opened again as desired by a passenger, and the normal
5 operation can be restored quickly whenever an operation is erroneous or the dangerous situation of an elevator hall is overcome.

The above and other objects, features and advantages will be made apparent by the detailed
10 description taken in conjunction with the accompanying drawings described below.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing a general configuration of an elevator system with a crime
15 prevention function according to an embodiment of the invention.

Fig. 2 is a block diagram showing the control functions of an elevator system with a crime prevention function according to an embodiment of the invention.

20 Fig. 3 is a flowchart of the process for preventing the automatic door from opening in an elevator system with a crime prevention function according to an embodiment of the invention.

DESCRIPTION OF THE EMBODIMENTS

25 An embodiment of the present invention will be described below with reference to the accompanying

drawings.

Fig. 1 is a diagram showing a general configuration of an elevator system with a crime prevention function according to an embodiment of the invention. An elevator cage 1 serves a plurality of floors. A counterweight 2 arranged in opposed relation to the elevator cage 1 is driven to move up and down by a hoisting motor 3. The rotation of the motor 3 is input to an elevator control board 5 as a pulse signal generated by a rotary encoder 4 thereby to calculate the cage position and the running speed. The control board 5 is configured of a MPU, a ROM, a RAM and an I/O unit, and also has a microcomputer (CPU) 6 built therein as a central processing unit. The program in the microcomputer 5 includes a plurality of control function modules required for various elevator operations.

The cage 1 has mounted thereon an on-cage control board 7 also including a microcomputer as a main component element. The on-cage control board 7 controls a communication equipment for transmitting and receiving signals to and from the elevator control board 5, an I/O unit, a position indicator 8 in the cage and the open/close operation of a cage door 9. The signal output from the elevator control board 5 is input to an in-cage operation board 10 through the on-cage control board 7. The in-cage operation board 10 has arranged thereon a cage call button 12 for allowing

an in-cage passenger 11 to register a destination floor, a door open button 13 and a door close button 14. Further, a load detector 15 for detecting the load of the passenger 11 in the cage is arranged under the
5 cage floor. The detection signal from the load detector 15 is transmitted to the elevator control board 5 through the on-cage control board 7.

On the other hand, a hall call button 16 and a cage position indicator 17 are arranged on the
10 elevator hall of each floor. The signal output from the hall call button 16 is adapted to be input to the microcomputer (CPU) 6 in the elevator control board 5, and a cage position signal is output to the cage position indicator 17 on the elevator floor from the
15 microcomputer (CPU) 6 in the control board 5. The internal situation of the cage 1 that has arrived at the elevator hall can be checked by a prospective passenger 21 waiting on the hall from an anti-crime window (viewport) 19 of the hall door 18 through an
20 anti-crime window (viewport) 20 of the cage door 9. In similar fashion, the passenger 11 in the elevator cage can check the situation of the hall through the anti-crime windows 20, 19.

First, the operation of this embodiment will
25 be explained briefly. The passenger 11 in the cage 1 depresses the door close button 14 in the case where he/she decides that the person 21 waiting on the hall is a suspicious person. Thus, the elevator door is

prevented from automatically opening, and the door of the elevator cage 1 remains closed upon arrival at the particular floor. The door is not automatically opened and remains closed in the absence of another call. In 5 the case where the passenger 11 in the cage depresses a call button 12 for a different floor as a destination, therefore, the cage 1 is driven toward the particular different floor. As a result, the passenger 11 in the cage 1, whenever he/she senses danger, can reject the 10 access to a particular elevator hall.

Even in the case where the automatic door open operation is prevented and the door of the cage 1 remains closed, however, the passenger 11 in the cage can quickly open the door by depressing a door open 15 button 13 whenever he/she feels safe.

Also, upon lapse of a predetermined time length while the door is closed without depressing the cage call button 12 for another floor, the normal control is restored and the door is opened.

20 The operation described above is implemented by the embodiment shown in Figs. 2 and 3.

Fig. 2 is a block diagram showing the control function of an elevator system with a crime prevention function according to an embodiment of the invention 25 for explaining the elevator control functions related to the invention. A basic elevator operation control unit 22 accomplishes a control function based on the program stored in the ROM of the CPU 6 in the elevator

control board 5 shown in Fig. 1. The basic operation control unit 22 is configured to start the program for each task by time division, say, for every 40 ms.

During this predetermined period of time, the timer
5 count processing, the input/output processing, the determination of various operation modes, the operation control, the speed control and the trouble-shooting processing are executed.

First, upon operation of the hall call button
10 16 on an elevator hall, a hall call response processing unit 23 is activated to operate the elevator to serve the call. As a prerequisite for this operation, the present position of the cage 1 is kept monitored by a cage position calculation processing unit 24. In the
15 case where the cage call button 12 in the cage 1 is depressed, on the other hand, a cage call response processing unit 25 is activated. Further, a door open/close processing unit 26 is activated in such a manner that when the cage 1 arrives at a given floor,
20 the door is opened automatically in response to the arrival at the floor and closed automatically upon lapse of a predetermined time, or the door is opened or closed in accordance with the operation of the door open button or the door close button 14, respectively,
25 in the cage 1.

Next, a control function related to this embodiment is an automatic door open prevention processing unit 28 for preventing the door from opening

automatically as a function of an elevator controller
27 with a crime prevention function. The processing
unit 28 includes a counting timer 29 and a change-over
switch 30 arranged on the operation board. The anti-
5 crime operation is set to a time zone such as night
time by an external timer 29. Also, the change-over
switch 30 arranged on the operation board 10 is used to
activate or deactivate the anti-crime operation
manually. These operations make it possible to
10 activate or deactivate the automatic door open
prevention processing unit 28.

Fig. 3 is a flowchart of the automatic door
opening prevention processing for an elevator system
with the crime prevention function according to an
15 embodiment of the invention.

The prospective passenger 21 waiting on the
hall operates the hall call button 16, and upon arrival
of the elevator cage 1 in response to the call, the
doors 9 and 18 open automatically. The waiting
20 prospective passenger 21 enters the cage 1 and becomes
an in-cage passenger 11. Upon depression of one of the
cage call buttons 12, the elevator cage is driven
toward the destination floor designated by the
depressed button. In the case where a hall call is
25 generated from the destination floor or any other
floor, the elevator cage 1 stops at the nearer one of
the destination floor and the calling floor in response
to the call generated from the nearer floor. In the

process, assume that the in-cage passenger 11 harbors a fear against a waiting prospective passenger 21 seen through the anti-crime windows 20, 19 or visually checked by the in-cage monitor.

5 Also assume that night has already come and the elevator system (elevator controller) is operating in crime prevention mode set by the external timer 29 or the change-over switch 30 arranged on the operation board 10.

10 Again assume that the in-cage passenger 11 who has harbored fear wants to avoid meeting the suspicious person 21 and has depressed the door close button. First, in step 301, it is determined whether the elevator system is in crime prevention mode or not.

15 In the case where the system is operating in crime prevention mode, it is determined in step 302 whether the cage 1 is located in a door zone or not. In the case where the cage 1 is in a door zone, it is determined in step 303 whether the door close button 14

20 has been depressed or not. Since the door close button 14 is assumed to have been depressed, the process proceeds to step 304 for preventing the door from opening automatically. The automatic door open preventing operation leads to a standby mode in which

25 the door of the cage 1 remains closed and the elevator is ready to serve any other call which may be generated. In the case where any other call is generated or the passenger 11 depresses the cage call

button 12 for any other destination floor to escape from the fear, the cage 1 is driven toward the particular floor. In this way, the in-cage passenger 11 can escape to a different floor without opening the door at the original destination floor where he/she harbors fear to stop. In the case where a suspicious person is seen on another floor, too, the same procedure of operation is repeated.

In standby mode set in step 304 with the door remaining closed, it is determined in step 305 whether the door open button 13 has been operated or not. Unless the door open button 13 is operated, it is determined in step 306 whether a predetermined time length has passed or not, and upon lapse of the predetermined time length, the door open processing is executed in step 307. In the case where the passenger 11 decides that his/her safety is secured, on the other hand, depression of the door open button 13 causes the process to proceed to step 307 based on the determination in step 305, thereby executing the door open processing at any time.

In the case where it is determined in step 301 that the elevator system is not operating in crime prevention mode or it is determined in step 302 that the cage 1 is not located in a door zone, the depression of the door close button 14 does not work so that an erroneous depression of the door close button 14 may not unduly prevent the door from being opened

automatically.

The configuration in the embodiment described above is summarized as follows. First, the elevator system includes the anti-crime windows 19, 20 or the
5 elevator hall monitor in the cage 1 as a means for enabling the passenger 11 in the cage with the door closed to recognize the situation on the elevator hall of a given floor where the cage 1 is scheduled to stop. Also, the elevator system includes the change-over
10 switch 30 adapted to be switched by the external timer 29 set to a predetermined time zone or manually through the in-cage operation board 10 as a means for setting the elevator controller (control board) 5 to crime prevention mode. The elevator system also includes
15 means for determining that the elevator controller 5 is in crime prevention mode (step 301) and the cage 1 is located in a door zone (step 302). Once these conditions are met, the automatic door opening operation is prevented (step 304) by another means upon arrival at a
20 given floor in response to the depression of the door close button 14 in the cage 1. Nevertheless, the elevator system further includes means to cancel the automatic door opening prevention function and open the door (step 307) in response to the operation of the
25 door open button 13 in the cage 1 (step 305) or the lapse of a predetermined time length (step 306).

According to this embodiment, in the case where the in-cage passenger visually confirms a

suspicious person on an elevator hall, he/she can prevent the elevator from automatically opening and thus can avoid a possible danger. Also, the passenger can escape safely to another floor and by repeating
5 this escape process, can contact a security office rapidly using an in-cage interphone while staying within the now safe cage. Also, the operation in crime prevention mode is made possible by a combination of the basic elevator switches including the door
10 open/close buttons and the cage call button, the switches on the operation board and the external timer. Thus, the configuration is very simple and can be realized at a low cost.

This invention provides an elevator system
15 with a crime prevention function which is capable of protecting an elevator user from a suspicious person who has intruded into a building.

It should be further understood by those skilled in the art that although the foregoing
20 description has been made on embodiments of the invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

CLAIMS:

1. An elevator system with a crime prevention function, comprising:

means for enabling a passenger in an elevator cage with the door thereof closed to recognize the situation of an elevator hall of a floor where said elevator cage is scheduled to stop; and

means for preventing the door of said elevator cage from being automatically opened on arrival at said floor in response to a predetermined operation in said cage.

2. An elevator system with a crime prevention function according to Claim 1,

wherein said means for enabling the passenger to recognize the situation of an elevator hall includes a viewport formed in each of said cage door and said elevator hall door.

3. An elevator system with a crime prevention function according to Claim 1,

wherein said means for enabling the passenger to recognize the situation of an elevator hall includes a camera arranged on the elevator hall of each floor and a monitor arranged in said cage for displaying the situation of said elevator hall based on the operation of said camera.

4. An elevator system with a crime prevention function, comprising:

means for enabling a passenger in an elevator

cage with the door thereof closed to recognize the situation of an elevator hall of a floor where said elevator cage is scheduled to stop; and

means for preventing the door of said elevator cage from being automatically opened on arrival at said floor in response to the depression of a door close button in said cage located within a door zone.

5. An elevator system with a crime prevention function according to any one of Claims 1 to 4, further comprising means for setting an elevator controller to crime prevention mode, wherein said means for preventing the door from being automatically opened is adapted to operate as long as said elevator controller is set to crime prevention mode.

6. An elevator system with a crime prevention function according to Claim 5, wherein said means for setting said elevator controller to crime prevention mode includes means for setting said elevator controller to crime prevention mode in a predetermined time zone.

7. An elevator system with a crime prevention function according to any one of Claims 1 to 6, further comprising means for canceling said automatic door opening prevention function and opening the door in response to the operation of a door open button in said cage.

8. An elevator system with a crime prevention

function according to any one of Claims 1 to 7, further comprising means for canceling said automatic door opening prevention function and opening said door upon lapse of a predetermined time length with said door prevented from being automatically opened.

9. An elevator system with a crime prevention function, comprising:

means for enabling a passenger in an elevator cage with the door thereof closed to recognize the situation of an elevator hall of a floor where said elevator cage is scheduled to stop;

means for setting an elevator controller to crime prevention mode;

means for preventing said door from being automatically opened upon arrival of said cage at a given floor in response to the depression of a door close button in said cage located in a door zone with said controller set in crime prevention mode; and

means for canceling said automatic door opening prevention function in response to selected one of the operation of a door open button in said cage and the lapse of a predetermined time length.