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DESCRIPTION
ELECTRONIC SAFETY ELEVATOR

TECHNICAL FIELD

[0001]

The present invention relates to a safety system for elevators. More particularly,
5 the present invention is preferable for a highly-functional electronic safety system in which
mechanical safety devices are reduced using electronic safety devices.

BACKGROUND ART

[0002]

The conventional elevator is provided with a safety device including mechanical
10 safety switches, relay circuits and the like, which detects overrun of a car (limit switch), secures
an uppermost space (predetermined required clearance between the apex of car at the uppermost
floor and the ceiling of a shaft, checks that a maintenance person enters into a pit (pit switch),
and ascertains whether an access door is opened or closed (access door switch). In short, the
relay circuits receive outputs from the respective safety switches to thereby perform shutoff of
15 power supply and actuation of a brake in elevator operation.

[0003]

Concretely, it is known that in order to securely stop the elevator around the
lowermost floor in its maintenance work, provided are a limit switch which provides a stop
command for limiting descending of the car and a final limit switch at a lower location, whereby
20 when the car descends up to the position of the limit switch after passing through the lowermost
floor, the elevator is decelerated.

CITATION LIST

PATENT LITERATURE

[0004]

25 PATENT LITERATURE 1 JP2009-126639A

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005]

In the above-mentioned prior art, the elevator described in patent literature 1 uses mechanical safety switches, so that the constitutional components wear out and deteriorate with repeated use. As a result, there is a fear of causing an ON failure due to fixing of contact, short circuit or the like and cause an OFF failure due to shortage of contact and breaking of a wire.

5 Therefore, a maintenance person must check the system periodically. The checking work is greatly influenced by not only the technical power of a different maintenance person but also the maintenance system, so that the checking may result incompletely or in fail.

[0006]

10 In addition, the mechanical safety switch is usually constructed using a cam, which occupies a space within the shaft, causes restriction of the layout and hinders the transportation capability from being improved. Further, the mechanical safety device is difficult to make highly functional, so that the only deceleration at the position of the limit switch as disclosed in patent literature 1 is difficult to achieve sufficiently.

[0007]

15 An object of the present invention is to solve the problem of the above-mentioned prior art, realize highly-functional safety, reduce mechanical safety switches and reduce the objects to be maintained and checked to thereby improve the reliability.

[0008]

20 Another object of the present invention is to reduce mechanical safety devices to thereby increase the space available in the elevator shaft.

A further object of the present invention is to commonize the maintenance work without dependency to the technical power of the maintenance person and reduce the total cost involving the maintenance cost.

25 A still further object of the present invention is to allow self-diagnosis of the safety device and make investigation of causes at the occurrence of abnormality and replacement of the components at the maintenance work highly efficient.

The present invention contemplates to achieve at least either one of the above-mentioned objects.

SOLUTION TO PROBLEM

30 [0009]

In order to accomplish the above-mentioned objects the present invention provides an electronic safety elevator which detects the position of a car moving through a plurality of floors in the shaft, the elevator comprising a pulse generator which outputs pulses in

accordance with the amount of movement of said car, a position detector which detects that said car arrives at a predetermined position, and a safety controller which outputs a command corresponding to a pre-stored value when said pulses are counted after detection of the predetermined position and the counted value of the pulses reaches the pre-stored value.

5 ADVANTAGEOUS EFFECTS OF INVENTION

[0010]

According to the present invention, when the pulses are counted after detection of the predetermined position and the counted value of the pulses reaches the pre-stored value the command corresponding to a pre-stored value is outputted. As a result, the mechanical safety
10 switch provided in the shaft can be recognized by replacing with electronic position, and the function of the safety device can be executed. Accordingly, highly functional safety can be realized and the objects to be maintained and checked can be decreased, thereby enhancing the reliability.

BRIEF DESCRIPTION OF DRAWINGS

15 [0011]

[FIG. 1] Fig. 1 is a whole construction diagram showing one embodiment of the present invention.

[FIG. 2] Fig. 2 is a diagram for explaining the output of a position detecting sensor in the one embodiment..

20 [FIG. 3] Fig. 3 is a block diagram showing a safety controller in the one embodiment.

[FIG. 4] Fig. 4 is an operation diagram showing the relation in number of pulses between a car position and the position detector in the one embodiment (where the car is below the lowermost floor).

[FIG. 5] Fig. 5 is an operation diagram showing the relation in number of pulses between a
25 car position and the position detector in the one embodiment (where the car is above the lowermost floor).

[FIG. 6] Fig. 6 is an operation diagram showing the relation in number of pulses between a car position and the position detector in the one embodiment (where when returned from power outage the car is between the lowermost floor and the uppermost floor).

30 [FIG. 7] Fig. 7 is an operation diagram showing the relation in number of pulses between the car position and the position detector in the one embodiment (where when returned from power outage the car is below the lowermost floor).

[FIG. 8] Fig. 8 is a whole construction diagram showing another embodiment of the present invention.

[FIG. 9] Fig. 9 is a block diagram showing a safety controller in the other embodiment.

[FIG. 10] Fig. 10 is an operation diagram showing the relation in number of pulses between
5 the car position and the position detector in the other embodiment (where when returned from power outage the car is below the lowermost floor).

DESCRIPTION OF EMBODIMENTS

[0012]

Description of one embodiment will be made in detail with reference to the
10 drawings in the following.

A safety system is constituted by an electronic system which mainly comprises a safety controller independently of conventional elevator systems. The safety controller combines input information of a plurality of safety switches to thereby judge the safety condition of the elevator. Thus, since software is applicable, the safety controller can realize highly
15 functional safety than using the conventional relay circuit.

The safety controller performs the safety function using software, which safety function has conventionally been implemented using mechanical safety switches. Therefore, mechanical safety switches may be cut in the invention. Because of reduction of the safety switches themselves the objects to be maintained and checked decrease, and the space available
20 in the shaft is possible to increase.

If the safety controller is constituted to self-diagnose each safety switch, maintenance work without dependency to the maintenance person's level of technical skill, that is, standardization and commonization of the maintenance will be made possible, enhancing the quality of work and the reliability.

25 The safety controller stores an operation history of safety switch in a memory or the like, whereby investigation of the cause at the occurrence of abnormality and replacement of components at the maintenance can be performed with high efficiency.

[0013]

Fig. 1 is a whole construction diagram showing an elevator of one embodiment, in
30 which a car 20 moves through a plurality of floor s within a shaft constructed in a building, and is connected to a weight 22 via a rope 21. The movement of car 20 is made by a motor 9, and the motor 9 is supplied with electric power for driving by a power converter provided in an elevator controller 3. An encoder as a pulse generator is equipped to the motor 9 and the

elevator controller 3 counts pulses generated by the rotation of the motor 9. The elevator controller 3 calculates the speed of motor 9, the position and the movement distance of car 20 along the direction of car movement and the like based on the count value of pulses to make a match between the car and the hatch.

5 [0014]

The car 20 is equipped with a car (cage) door which opens and closes in engagement with a hoistway door 23 and a position detecting sensor 27. A position detector is comprised of the position detecting sensor 27 and plates 50-54 to be detected as predetermined positions which are provided at a terminating floor, floors of intermediate floors and a floor side
10 of the terminal portion, and identifies that the car 20 has arrived at the predetermined position. The position detecting sensor 27 detects a region (door zone) within which opening and closing of the hoistway door and the car door are permissible.

[0015]

The plate 51 to be detected at the lowermost floor, the plate 53 to be detected at
15 the uppermost floor and the plate 52 to be detected at the intermediate floor are fixed to the respective floor surfaces. The plate 51 to be detected at the lowermost floor and the plate 53 to be detected at the uppermost floor have plate shapes different from that of the plate 52 to be detected at the intermediate floor, and the lowermost floor and the uppermost floor are made to be identifiable. At the terminal portions of the lowermost floor and the terminal portion of the
20 uppermost floor the plates 50, 54 to be detected are provided which are capable of identifying the terminals.

[0016]

A governor 7 is wound with a governor rope connected with car 20 and rotates with movement of the car 20 to follow, and a governor encoder 8 equipped to the governor 7
25 detects the amount of revolution of the governor. Therefore, the governor encoder 8 generates pulses in accordance with the movement amount of the car 20. The outputs of the position detecting sensor 27 and the governor encoder 8 are inputted to the safety controller 2.

[0017]

The safety controller 2 is independent from the elevator controller 3, and outputs
30 a power supply shutoff command or a braking command to stop the car 20 when the car reaches a predetermined position and thereafter is placed at another predetermined position. Conventionally, as mechanical switches a first limit switch position 24, a second limit switch position 25 and a third limit switch position 26 are provided. These positions are pre-stored and commands corresponding to the stored values are stored in the safety controller 2.

[0018]

In place of using the first limit switch position 24, the second limit switch position 25 and the third limit switch position 26, the safety controller 2 detects positions corresponding to those positions based on information from the position detecting sensor 27 and the governor
5 encoder 8. The safety controller 2 outputs a signal 40 deciding the current car position to the elevator controller 3 if the current position of car 20 is in a defined condition. The safety controller 2 further outputs a position signal 41 indicating the current position of car 20 to the elevator controller 3.

[0019]

10 Incidentally, in order to output the number of pulses in accordance with the movement amount of car 20, the governor encoder 8 may be replaced with an encoder equipped to the motor 9 or an encoder equipped to a guide roller of car 20, so that the governor rope may be dispensed with and the occupied space in the shaft may be reduced.

[0020]

15 Fig. 2 shows output patterns based on the position detecting sensor 27 required for detection of the terminating floor (on the car side) and shapes of the respective plates to be detected (on the floor side: 50, 51, 52, 53, 54). The position detecting sensor 27 is a three-axis sensor including a set of three sensors (sensor A, sensor B and sensor C). The plates to be
20 detected are shaped so that either output of the sensors may be made OFF at the uppermost floor and the lowermost floor as terminating floors and the intermediate floor to thereby identify the terminating floor. In the uppermost floor terminal portion above the uppermost floor and the lowermost floor terminal portion below the lowermost floor the plates to be detected are shaped so that all sensor outputs may be made ON. The Figure shows that when any sensor of the
25 position detecting sensor 27 opposes to a color painted portion of the plate to be detected the sensor output turns ON to be "1". At the uppermost floor, sensor A, sensor B and sensor C output "1, 0, 1". The output at the intermediate floor is "1, 1, 0", and the output at the lowermost floor is "0, 1, 1". The size of plates to be detected in the vertical direction in the Figure corresponds to the length of the door zone. At the uppermost floor terminal portion and the lowermost floor terminal portion, the sensor A, sensor B and sensor C output "1, 1, 1", and
30 therefore, the size in the vertical direction corresponds to the same length as the region in which the conventional final limit switch functions. When the safety controller 2 detects a combination of "1, 1, 1", power supply shutoff and brake operation are carried out as does the conventional final limit switch.

[0021]

The terminating floor may be identified as follows. A bar code is applied to only the terminating floor, and the applied bar code is read using a bar code reader provided to the car. Alternatively, a sensor capable of detecting a gap length against the plate to be detected may be used, where the gap length is made different between the intermediate floor and the terminating floor. The more the number of sensors increases the more floors can be identified, respectively.

5 [0022]

Fig. 3 shows a block diagram regarding the function implemented by the safety controller. Basic operation of the respective blocks will be described as follows.

A pulse counting unit 60 receives an input from the governor encoder 8, counts pulses corresponding to the movement amount of car 20, and outputs the counted value to a car position detecting unit 64. A floor position identifying unit 61 receives the output of position detecting sensor 27, identifies the current position of car 20 by an output pattern as shown in Fig. 2, and outputs identification information of the car position.

10 [0023]

The car position detecting unit 64, based on the counted pulse value and identification information of the car position, outputs information of the current position of car 20 to a car position data 62 and a switch function executing unit 66. The car position data 62 stores the current position information as a history or log. The present data is preferably stored on mainly a RAM. In a floor position data 63 data such as the distances between the respective floors and the distances between a buffer and the respective floors are stored, which the maintenance person pre-stores based on building design information. The present data are established on a ROM or a flash memory. When highly frequently updated the data may be established on RAM.

15 20 [0024]

The car position detecting unit 64 refers to the car position data 62, and stops the output of a car position deciding signal 40 when the car position information has not been stored (has not been memorized). The car position detecting unit 64 arithmetically operates the distance between floors every operation of the elevator, refers to the floor position data 63, and, for example, if the floor position data is different from the stored distance between the respective floors, outputs such a fact to the elevator controller.

25 30 [0025]

In a switch position data 65 data corresponding to the positions in the shaft of electronic switches and the like are memorized and stored. These data are stored by maintenance person's inputting based on design information of the building or previously

inputting when manufacturing the safety controller. These data are stored mainly on ROM or flash memory.

[0026]

A switch function executing unit 66 outputs a command for executing the function of the corresponding relevant switch when the current position of the car matches with the stored switch position data. For example, if the function of the relevant switch is a limit switch power shutoff or brake actuation is executed to stop or decelerate the car. The switch function executing unit 66 transmits information of the actuated switch function to the car controller 3.

[0027]

Fig. 4 shows transitions of states of from detection of car at the lowermost floor to arrival at the positions corresponding to a first limit switch 24 and a second limit switch 25 by three steps (a) to (c). In the Figure, the first floor 1F is assumed as a reference floor. The number of pulses of the governor encoder for the descending direction of car in the shaft is assumed minus.

[0028]

The first limit switch is required for limiting the moving direction of the car. In its function, when the car reaches the position corresponding to the first limit switch only brake actuation is carried out and the car is permitted to move only in the ascending direction. The second limit switch is called "a final limit switch". In its function, brake actuation and power shutoff are performed in order to prevent the car from colliding with a buffer 30 when car reaches the second limit switch position.

[0029]

The safety controller 2 pre-stores the distances of from the plate 28 to be detected at the lowermost floor up to the first limit switch 24 and the second limit switch 25 (L1 and L1+L2, respectively) as data corresponding to the number of pulses outputted by the governor encoder 8 (L1 is -800 and L1+L2 is -1200 in Fig. 4).

[0030]

The actual lengths of L1 and L2 vary depending upon various factors such as the conditions of building, the rating speed of car, the height of car. But, in the case of mechanical first limit switch 24 and second limit switch 25, when once set lengths are necessary to change the rearrangement and adjustment will be indispensable, resulting in difficult work. However, in the present embodiment, pre-stored switch position data 65 may be provided in the safety controller as an initial setting. Therefore, the pre-stored value may be changed even in the

restructure or reform. The maintenance person may input the pre-stored data directly to the safety controller through a data terminal. Alternatively, the pre-stored data may be inputted previously as an initial setting of the safety controller at the delivery. As a result, maintenance work such as data checking as well as arrangement work will be easy to do, so that the total cost
5 can be reduced.

[0031]

Column (a) in Fig. 4 indicates the state in which the position detecting sensor 27 has detected the plate 28 to be detected at the lowermost floor. In this state, the safety controller 2 discriminates that the car has reached the lowermost floor based on the detection
10 output of the lowermost floor from the position detecting sensor 27 (for example, "0, 1, 1"), and initializes the current position Lx of car 20 to zero.

[0032]

In the state of column (b), when the car passes through the plate 28 to be detected at the lowermost floor the safety controller 2 starts counting of pulses outputted from the
15 governor encoder 8 and calculates the relative distance from the plate 28 to be detected at the lowermost floor.

[0033]

In the state of column (c), the car 20 has arrived at the position corresponding to the first limit switch. At this time, the safety controller 2 compares the current position Lx of
20 car with the position L1 corresponding to the first limit switch and judges that both positions are coincident, so that a command for power shutoff is outputted to stop the elevator car 20. Incidentally, though Fig. 3 shows the case of the lowermost floor, the like matter will be made in the case of the uppermost floor as well.

[0034]

25 Fig. 5 shows the case where a virtual limit switch is between the lowermost floor and the intermediate floor, and shows transitions of states of from detection of car at the lowermost floor up to arrival at the position corresponding to the third limit switch 26 by three steps (a) to (c).

[0035]

30 The function using the third limit switch is required for securing the uppermost space of elevator shaft when the maintenance person enters below a pit to work therein, and also is required for a terminating floor forced deceleration device for shortening the length of buffer
30 by early applying the brake in accordance with the position and the speed of car 20.

[0036]

The safety controller 2 pre-stores the distance (L3) of from the plate 28 to be detected at the lowermost floor 28 to the third limit switch 26 as data (L3 is 700 in Fig. 5) corresponding to the number of pulses outputted by the governor encoder 8.

[0037]

5 Column (a) indicates the state in which the position detecting sensor 27 has detected the plate 28 to be detected at the lowermost floor. By the detected output of the lowermost floor from the position detecting sensor 27 (for example, "0, 1, 1") the safety controller 2 discriminates that the car has arrived at the lowermost floor, and initializes the current position Lx to zero.

10 [0038]

In column (b), in response to when car 20 ascends to cause the position detecting sensor 27 to pass through the plate 28 to be detected at the lowermost floor, the safety controller 2 starts counting of pulses outputted from the governor encoder 8 and calculates the relative distance from the plate 28 to be detected at the lowermost floor.

15 [0039]

In the state of column (c), the car 20 has arrived at the position corresponding to the third limit switch. At this time, the safety controller 2 compares the current position Lx of car 20 with the position L3 corresponding to the third limit switch and detects that both positions are coincident, so that the function of the third limit switch is carried out.

20 [0040]

Incidentally, though Fig. 5 shows the case of the lowermost floor, the like matter will be applied to the case of the uppermost floor as well. By providing a plurality of virtual limit switches between the lowermost floor and the intermediate floor, a more sophisticated functionality can be realized.

25 [0041]

Figs. 6 and 7 show operations when returned from power outage or a long-term unavailable state, and when returned from emergency stop.

Fig. 6 shows the case where the car 20 is in the intermediate floor. Column (a) indicates the state in which a floor N of a reference position is unknown. At a power outage, when the elevator is returned to operate from a long-term operation stop state the safety controller 2 is impossible to hold data of the safety controller 2, so that the reliability of position information of the floor N as the reference position and the current position Lx for car 20 is lowered. In order to hold the data of the safety controller 2, a backup battery may be provided to the controller 2 or the data themselves may be held in a flash memory. However, when the

power supply for the overall elevator system is shut off there is a possibility that the car 20 may move during the operation stop, bringing a fear of causing a relative difference between the actual position of car 20 within the shaft and the position information of the reference position floor N and the current position Lx.

5 [0042]

Likewise, in the case of emergency stop a strong braking force is exerted to car 20 and therefore, a slip is caused between the governor rope and the governor pulley. As a result, a difference between the actual position of car 20 within the shaft and the current position Lx may occur.

10 [0043]

In the foregoing cases, the safety controller 2 turns OFF a car position deciding signal 40 outputted to elevator controller 3 to signal to the elevator controller 3 that the current position of car 20 has not been decidable by the safety controller 2.

[0044]

15 When the elevator controller 3 detects that the car position deciding signal 40 is in OFF state, the operation speed of car 20 is limited to start the descending operation slowly as shown in Fig. 6(b). At this time, the safety controller 2 also monitors the operation speed of car, and when speed abnormality occurs, power shutoff and brake actuation will be performed to thereby stop the car.

20 [0045]

Next, when the car arrives at the lowermost floor as shown in Fig. 6(c) and the safety controller 2 detects the arrival at the lowermost floor through the position detecting sensor 27, the safety controller 2 turns the car position deciding signal 40 ON, and initializes the current position Lx of car 20 to zero. Accordingly, the elevator controller 3 can restart the operation at the normal time.

25 [0046]

Fig. 7 shows the case where car 20 is below the terminating floor. In column (a), the safety controller 2 turns OFF the position signal outputted to the elevator controller 3 (current position deciding signal) because of the car current position being unknown to signal that the current position of car 20 is undeterminable by the safety controller 2. When the elevator controller 3 detects that the position signal 40 has been turned OFF, the operation speed of car 20 is limited and the descending operation starts slowly. At this time, the safety controller 2 monitors the operation speed of car as well, and when speed abnormality occurs, power shutoff and brake actuation will be carried out to stop the car.

[0047]

Next, when the car arrives at the lowermost floor terminal portion as shown in Fig. 7(b), and the safety controller 3 detects the arrival at the lowermost floor terminal portion through the position detecting sensor 27, the safety controller 2 effects power shutoff and brake
5 actuation to stop the car. Subsequently, the car 20 is elevated, and when the safety controller 3 detects that the car has arrived at the lowermost floor through the position detecting sensor 27, the safety controller 2 turns the car position deciding signal 40 ON and initializes the current position Lx of car 20 to zero.

[0048]

10 According to the foregoing, by providing the position detecting sensor 27 capable of detecting a door zone and identifying the terminating floor, the governor encoder 8 serving as a pulse generator for generating pulses in accordance with the movement amount of car, the safety controller 2 receiving inputs from the position detecting sensor 27 and the pulse generator, deciding the current position by the safety controller 2, and outputting the car position deciding
15 signal 40 to the elevator controller 3, it can be made to replace the safety system which has been conventionally mechanical, with electronic positions based on the safety controller, and identify the electronic positions to thereby implement the function of the safety system. Accordingly, the mechanical switches can be dispensed with, making it possible to improve the maintenance and effectively utilize the space of horizontal area in the shaft.

20 [0049]

Fig. 8 is the overall construction diagram showing an elevator according to another embodiment, in which a range sensor 70 is provided in the lower portion of a car, and plates 50, 54 to be detected at the lowermost floor terminal portion and at the uppermost floor terminal portion are not provided. The range sensor 70 may be capable of measuring the
25 distance La indicated in Fig. 8.

[0050]

Fig. 9 shows a block diagram of the function implemented by the safety controller 2, in which a terminating floor position measuring unit 67 is additionally added which outputs distance information provided by the range sensor 70 to the car position detecting unit 64.

30 [0051]

Fig. 10 shows the case where electronic switches are disposed below the terminating floor, in which the switches disposed below the terminating floor are made electronic (substituted for mechanical switches) based on information of the height from the shaft floor measured by the range sensor 70.

[0052]

Description will be made of the case where the car 20 lying below the terminating floor returns in operation from power outage and long-term inoperative state. When the car is below the terminating floor the range sensor 70 is in the detectable range and the distance is measurable in range, so that it will be possible to detect the position of the car from the shaft floor of car 20. When return to the normal operation, prompt return becomes possible without effecting the operation for detecting the reference position.

[0053]

According to the foregoing, by additionally adding the range sensor capable of measuring the region below the terminating floor it is possible to make electronic a plurality of switches disposed below the terminating floor even when returned from power outage or long-term inoperative state, thus making it possible to contribute to space saving and improve the operation speed when returned.

REFERENCE SIGNS LIST

[0054]

2 safety controller

3 elevator controller

7 governor

8 governor encoder (pulse generator)

9 motor

20 car

22 weight

27 position detecting sensor (position detector)

50 (lowermost floor terminal portion), 51 (lowermost floor), 52 (intermediate floor), 53 (uppermost floor), 54 (uppermost floor terminal portion) plate to be detected

CLAIMS

[CLAIM 1] An electronic safety elevator for detecting the position of a car moving through a plurality of floors in a shaft, comprising

a pulse generator which outputs pulses in accordance with the amount of movement of said car,

a position detector which detects that said car arrives at a predetermined position, and

a safety controller which counts said pulses after said predetermined position is detected, and outputs a command corresponding to a pre-stored value when the counted value reaches the pre-stored value.

[CLAIM 2] An electronic safety elevator as defined in claim 1, wherein said position detector detects that said car arrives at said floor, and said pulses are counted after said floor is detected.

[CLAIM 3] An electronic safety elevator as defined in claim 1, wherein said pulses are counted after said car arrives at a terminating floor, and said car is decelerated or stopped when the counted value reaches the pre-stored value.

[CLAIM 4] An electronic safety elevator as defined in claim 1, wherein said position detector comprises a position sensor provided in said car, and a plate to be detected which is fixed on the floor side of said terminating floor.

[CLAIM 5] An electronic safety elevator as defined in claim 1, wherein said position detector comprises a position sensor provided in said car, and plates to be detected which are fixed to the respective floors and have lengths corresponding to door zones.

[CLAIM 6] An electronic safety elevator as defined in claim 1, wherein
said position detector identifies the position of floor by a position detecting sensor provided in said car and plates to be detected which are fixed to the respective floors, and
said safety controller comprises a car position detecting unit for detecting the current position of said car based on said pulse counted value and information of said identified position of floor, a switch position data in which data according to positions within said shaft are stored, and a switch function executing unit responsive to a match between the current position of said car and said switch position data for outputting a command corresponding to data according to the positions within the shaft.

[CLAIM 7] An electronic safety elevator as defined in claim 1, wherein said pre-stored value corresponds to positions corresponding to a first limit switch and a second limit switch after detection of a terminating floor by said car.

[CLAIM 8] An electronic safety elevator as defined in claim 1, wherein said pre-stored value

is made changeable.

[CLAIM 9] An electronic safety elevator as defined in claim 1, wherein when returned from power outage or a long-term inoperative state or when returned from emergency stop, the counted value is initialized by said safety controller when said car is made to descend and the terminating floor is detected.

[CLAIM 10] An electronic safety elevator as defined in claim 1, wherein information of the current position of said car is stored based on said counted value.

[CLAIM 11] An electronic safety elevator as defined in claim 1, wherein a car position data storing the current position of said car based on said counted value is provided, and the counted value is initialized by said safety controller when the car position information is not stored or when said car is made to descend and the terminating floor is detected.