

[NAME OF THE DOCUMENT] SPECIFICATION

[TITLE OF THE INVENTION] ELEVATOR WITH SAFE
POSITION SENSOR

[FIELD OF THE INVENTION]

5 [0001]

The present invention relates to an elevator of
which car performs upward and downward operation in a
hoistway, and in particular, is suitable for an elevator
that is provided with a safety position sensor for
10 detecting car position (landing detection), and a door
zone.

[BACKGROUND ART]

[0002]

In a conventional elevator, for example, a
15 photoelectric type position detection device is
disposed on a car, and a position of the car in a hoistway
is detected by detecting a plate to be detected disposed
corresponding to respective floors. And such position
detection device is utilized for detecting alignment
20 (landing detection) between the car floor and the
landing floor and a door zone (a door opening and closing
permitting region of a car door for a landing floor door)
for preventing door open running.

[0003]

25 In order to prevent an erroneous operation of a

photoelectric type landing detection switch (position
detection device), it is known to attach a landing
detection plate (plate to be detected) at a landing
floor door sill, and to provide an erroneous operation
5 preventing cover that intercepts light incidence other
than the light from the landing detection switch, as
disclosed in patent document 1.

[0004]

Further, in order to correctly detect the position
10 of a car and to facilitate installation of the position
detection device, it is known to attach a plurality of
plates discretely along the upward and downward running
direction at every activation point, to provide a
position detector that generates a signal representing
15 coupling with the plates in non-contact manner and to
code the respective activation points, as disclosed,
for example, in patent document 2.

[PRIOT ART DOCUMENT]

[PATENT DOCUMENT]

20 [0005]

[Patent Document 1] JP-A-2004-224529

[Patent Document 2] JP-A-5-338949

[SUMMARY OF THE INVENTION]

[TASKS TO BE SOLVED BY THE INVENTION]

25 [0006]

In the above conventional art, since what is disclosed in patent document 1 is designed simply to detect the door zone by the single sensor and only to prevent an erroneous operation due to external light, not only a failure of the position detection sensor itself cannot be detected but also it is difficult to operate the sensor in multifunction for detecting the door zone and for releveling by modifying a small step difference, and for overcoming such difficulty, it was inevitable to increase the numbers of sensors.

[0007]

Further, since what is disclosed in patent document 2 has the same problem as above, such as detection of a failure of the position detection sensor itself was difficult.

[0008]

An object of the present invention is to resolve the tasks of the conventional art, and, in particular, to improve safety and reliability of a position detection sensor by enabling detection of a door zone even when the position detection sensor itself fails. Further, another object of the present invention is to simplify the system construction even when multifunctioning, safety and reliability thereof are improved and to enhance redundancy of the entire system

including such as erroneous detection. Moreover, still another object of the present invention is to avoid such as failure and erroneous detection of the position detection sensor caused when ropes and the like get
5 caught on such as the sensor itself at the time of such as an earthquake.

[0009]

Further, the present invention intends to achieve at least one of the above objects.

10 [MEASURE FOR SOLVING THE TASKS]

[0010]

In order to achieve the above objects, an elevator with a safety position sensor according to the present invention that detects a door zone representing a region
15 of permitting passengers getting on and off when the position of a car reaches a hoistway position permitting doors of the car and of the landing floor to open or close comprises a first and a second position detection sensor that are provided at the side of the car, are
20 spaced apart by a predetermined distance (S) in the upward and downward running direction and are disposed so as to face the side of a landing floor, a plate to be detected that is provided at the side of the landing floor and is arranged so as to permit detection of the
25 door by the position detection sensors and a logical

operator that receives signals from the first and the second position sensor and outputs a result of logical operation of the inputted signals, wherein a logical OR output signal from the logical operator is treated
5 as a detection signal of the door zone.

[ADVANTAGES OF THE INVENTION]

[0011]

According to the present invention, since the logical OR output signal of the first and the second
10 position detection sensor that are provided being spaced apart by the predetermined distance (S) in the upward and downward running direction is used as the door zone detection signal, a failure detection as well as the door zone detection can be enabled even when one
15 of the position detection sensors fails.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0012]

Fig.1 is a block diagram showing an entirety of one embodiment of the present invention.

20 Fig.2 is a perspective view showing details of a sill portion at a landing floor according to the one embodiment.

Fig.3 is a plane view showing an arrangement of position detection sensors and a plate to be detected
25 according to the one embodiment.

Fig.4 is a table showing varying states of respective signals according to the one embodiment.

Fig.5 is a perspective view showing details of a sill portion at a landing floor according to another
5 embodiment of the present invention.

Fig.6 is a plane view showing an arrangement of position detection sensors and a plate to be detected according to the other embodiment.

Fig.7 is a table showing varying states of
10 respective signals according to the other embodiment.

Fig.8 is a perspective view showing details of a sill portion at a landing floor according to still another embodiment.

Fig.9 is a plane view showing an arrangement of
15 position detection sensors and a plate to be detected according to the still another embodiment.

[EMBODIMENTS FOR CARRYING OUT THE INVENTION]

[0013]

Herein below, the one embodiment of the present
20 invention will be explained in detail with reference to the drawings.

Fig.1 is an entire constitutional diagram showing the one embodiment, wherein numeral 102 represents a sill at the landing floor, and 115 represents a floor
25 face. In an elevator, a car 100 that moves across between

pluralities of floors in a hoistway constructed in a building is connected to a counter weight 111 via a rope 101. Movement of the car 100 is performed through driving a sheave 103 by a motor 105. A driving use power is supplied from a power converter 107 to the motor 105. Further, a pulse generator 106 such as an encoder is attached to the motor 105, a system controller 108 counts pulses generated through rotation of the motor 105, and calculates such as velocity of the drive motor 105, an equivalent position in the moving direction in the hoistway and moving distance of the car 100. At the car 100, a car side door 110 is provided that opens and closes under a condition when being coupled with a landing floor side door 109.

[0014]

At the side of the car 100, a first and a second position detection sensor 3 and 4 are disposed being spaced apart by a predetermined distance in the upward and downward running direction of the car 100, and the respective outputs thereof are connected to the system controller 108 via a logical operator (comparator) 5. Through detecting a plate to be detected 1 disposed at the landing floor sill 102 on the landing floor side corresponding to the photoelectric type position detection sensors 3 and 4, a position of the car in the

hoistway is detected. Thus, the floor face of the car 100 and the floor face of the landing floor are leveled (landing detection), and a door zone (a door opening and closing permitting region of a car side door 110 for a landing floor side door 109) is detected.

[0015]

Further, one of the functions of the position detection device constituted by the position detection sensors 3 and 4 includes a releveled function, thus, the elevator is caused to releveled the car floor face with the landing floor face while opening the doors so as to prevent passengers from stumbling against a step difference when a small step difference is caused between the car 100 and the floor face 115. Such a small step difference is usually caused frequently by an expansion and contraction of ropes due to car weight variation when many passengers get on or off at once, and the position detection device detects such small step difference.

[0016]

Any non-contact type detection sensor such as a photoelectric type, magnetic type (utilizing such as magnet and high frequency magnetic field) and electrostatic capacity type can be used for the position detection sensor, however, a reflection type

photoelectric detection sensor in which such as infrared rays are projected on a plate to be detected and the reflected rays are detected is desirable because there are no fears that ropes and the like may get caught
5 on such as the sensor itself or the plate to be detected
1 at the time of such as an earthquake as well as the directivity of the sensor is high that permits to detect the plate to be detected in high accuracy. However, because of the use of the infrared rays, there are fears
10 of erroneous detection due to such as disturbance rays primarily from sunlight, dusts and water drops.

[0017]

Particularly, when the position detection sensor for detecting the door zone makes an erroneous detection
15 or fails, it is possible such as that the car side door 110 is opened at a position not permitted of opening and closing of the door because of an erroneous recognition that the door is permitted of opening and closing depending on the failure mode, and that the door
20 is not opened and confines the passengers in the car even when the car is at a position permitting the door opening and closing because of an erroneous recognition that the door is not permitted of opening and closing.

[0018]

25 Fig.2 shows details of the landing floor sill

portion 102, and a toe guard 113 that protects toes or prevents a passenger from falling off in the hoistway and the plate to be detected 1 constituted of a metal body such as iron, a plastics and the like are attached
5 at the landing floor sill 102. And the position detection sensors 3 and 4 are attached on the car 100 corresponding to the plate to be detected 1. Outputs 3S and 4S from the position detection sensors 3 and 4 are input to the logical operator 5. The logical
10 operator 5 is a logical operation circuit and is constituted by such as a logic IC and an operating function of a microcomputer.

[0019]

The position detection sensors 3 and 4 are arranged
15 on a same axial line with respect to the running direction of the car 100 (in height direction), and the arrangement interval is determined so that a door zone output is obtained from an output signal 5S of the logical operator 5. In the elevator, the leveling
20 control of the car 100 with the landing floor (making the height of both floors same) is executed based on the final output signals 3S, 4S and 5S, and the door zone representing whether the car 100 is at a height position that permits to open and close the respective
25 doors safely is detected. Namely, the detection of the

door zone is performed according to the signal 5S representing the logical OR output of the signals 3S and 4S by the logical operator 5, and the releveling processing is executed with the signals 3S and 4S. More specifically, when setting the length of the plate to be detected 1 in upward and downward running direction to length L1 corresponding to the door zone, and when setting the interval S between the two position detection sensors 3 and 4 smaller than the length L1, the releveling function can be practiced with the difference component.

[0020]

Fig.3 shows an arrangement relationship of the position detection sensors 3 and 4 that are disposed being spaced apart by the predetermined distance (S) in the upward and downward running direction, in order to make the releveling function symmetric in upward and downward direction, the center line between the position detection sensors 3 and 4 in the upward and downward running direction under the landing condition of the car 100 is designed to be coincident with the center line of the plate to be detected 1, and the length L1 and a small step difference detection length M for performing the releveling function are determined in advance.

[0021]

The interval S between the position detection sensors 3 and 4 is determined so that the signal $5S$ representing the OR output of the signals $3S$ and $4S$ by the logical operator 5 in association with the running of the car 100 corresponds to the length $L1$. Namely, since $L1=S+2M$, the interval S is determined as $S=L1-2M$.

[0022]

Fig.4 shows varying states of respective signals until the car 100 lands to a floor where the plate to be detected 1 is attached, (a) through (c) in the drawing show states until the car lands, and (d) shows a state when the car 100 offsets for some cause after landing. In a case of (a) where the car is between floors, since the position detection sensors 3 and 4 detect nothing, the signals are in OFF state. Subsequently, when the car 100 reaches a target floor to be landed and assumes state (b), the position detection sensor 4 detects the plate 1 to be detected 1 and turns ON. Further, in the case of (b), the signal $5S$ determined by OR of $3S$ and $4S$ also becomes ON, and it is understood that the car comes to the door zone.

[0023]

Further, when the car 100 lands, the state moves to (c), all of the outputs for the respective signals

turn ON. Further, when the car 100 moves slightly upward from the state (c), and a small step difference is caused between the car 100 and the floor face 115, the state moves to (d). Under this state, the position detection
5 sensor 3 moves out from a range where the plate to be detected 1 is detectable, and with regard to the respective signal states in the logical operator 5, since the signal 3S assumes OFF, the signal 4S ON and the logical operation 01, it can be judged that the car
10 100 offsets upward although the same is in the door zone. Contrarily, when the car moves slightly downward, since the signal 3S assumes ON, the signal 4S OFF and the logical operation 10, it can be judged that the car 100 offsets downward.

15 [0024]

Further, after comparing information with regard to car running direction obtained from the pulse generator 106 that detects running direction of the car 100 and from the signals 3S and 4S, and when the
20 information does not coincide, the elevator is caused to stop.

[0025]

The state (d) where only the output of the position detection sensor 3 is OFF is caused when the car 100
25 was moved by a component M for the small step difference

detection length as shown in Fig.3. Accordingly, when the state where only the output of the position detection sensor 3 is OFF, the system controller 108 issues a command to move the car 100 by the component 5 M for the small step difference detection length, and a releveled control is performed.

[0026]

According to the above, only with the position detection sensors 3 and 4, the multifunctioning including both the door zone detection function and the releveled function is enabled. Further, even when one of the position detection sensors 3 and 4 fails and of which output is turned OFF, since the signal 5S remains ON, at least the door zone can be detected. Still further, by making use of a logical AND output signal of the signals from the position detection sensors 3 and 4, it can be judged which one is failed by the logical operator 5 and the system controller 108.

[0027]

In Fig.5 embodiment, a third position detection sensor 2 is added, and the embodiment includes the plate to be detected 1 attached at the landing floor sill 102, the position detection sensors 2, 3 and 4 attached to the car 100 so as to correspond to the plate and the logical operator 5 that compares the output signals 3S

and 4S from the position detection sensors 3 and 4. The plate to be detected 1 is configured in such a manner that the length in the running direction of the car 100 of the side where the position detection sensor 2 passes through is longer than the length of the side where the position detection sensors 3 and 4 pass through.

[0028]

The position detection sensor 2 is not on the same coaxial line as the position detection sensors 3 and 4 with respect to the running direction of the car 100, in that is arranged on a different row, and the position detection sensors 3 and 4 are arranged on the same axial line. The configuration of the plate to be detected 1 and the arrangement of the position detection sensors 2, 3 and 4 are determined so that the output signal 5S of the logical operator 5 and the output signal 2S of the position sensor 2 give a same signal, thereby, the detection function of door opening and closing permitting region is made redundant by the signals 2S and 5S. Accordingly, even when the position detection sensors themselves fail, the door zone detection function can be kept continuously, and a further high safety can be obtained with the provision of reserved backup.

25 [0029]

Fig.6 shows the configuration of the plate to be detected 1 and the arrangement of the position detection sensors 2, 3 and 4, and the length L_1 corresponding to the door opening and closing permitting region and a small step difference detection length M for performing the releveling function are determined in advance. The position of the position detection sensor 2 is determined at the center in up and down direction with respect to the position detection sensors 3 and 4, and the interval S between the position detection sensors 3 and 4 and the length y of the plate to be detected 1 are determined so that the signal $5S$ representing the OR output of the signals $3S$ and $4S$ by the logical operator 5 in association with the running of the car 100 corresponds to the length of the door zone.

[0030]

As shown in Fig.6, the plate to be detected 1 is configured in such a manner that the length y where the position detection sensors 3 and 4 pass is determined to be in center symmetric with respect to the length L corresponding to the door zone by the single position sensor where the position detection sensor 2 passes through, and, the length L is determined by adding a same component x to length y in up and down direction in that $L=2x+y$, and further, x is determined with

respect to the interval S between the position detection sensors 3 and 4 as $x=S/2$. Further, when the floor face of the car and the floor face of the landing floor coincide, since the position detection sensors 3 and 4 are located inside the plate to be detected 1 by the component M of the small step difference detection length from the edge portions of the plate to be detected 1, the length y is determined as $y=S+2M$.

[0031]

10 Accordingly, when solving the above equations in connection with S and y , $S=(L-2M)/2$, $y=(L+2M)/2$, Thereby, a configuration of the plate to be detected 1 can be obtained in which the OR signal 5S output from the logical operator 5 is the same as the signal 2S output
15 from the third position detection sensor 2.

[0032]

Fig.7 shows varying states of respective signals until the car 100 lands to a floor where the plate to be detected 1 is attached, (a) through (c) in the drawing
20 show states until the car lands, and (d) shows a state when the car 100 offsets for some cause after landing. In a case of (a) where the elevator car is between floors, since the position detection sensors 2, 3 and 4 detect nothing, all of the signals are in OFF state.
25 Subsequently, when the car 100 reaches a target floor

to be landed and assumes state (b), the position detection sensors 2 and 4 detect the plate to be detected 1 and turn ON. Further, in the case of (b), the signal 5S determined by OR output representing logical operation of 3S and 4S also becomes ON, and it is understood that the detection of the door zone is doubled and is performed under a condition of enhanced redundancy.

[0033]

10 Further, when the car 100 lands, the state moves to (c), all of the outputs for the respective signals turn ON. Further, when the elevator car moves slightly from the state of (c) because of expansion or contraction of the ropes due to getting on or off of
15 the passengers at once, and a small step difference is caused between the car 100 and the floor face 115, the state moves to (d), and the position detection sensor 3 moves out from a range where the plate to be detected 1 is detectable, while the signal 4S remains ON, and
20 according to the state (logical operation) of the signals 3S and 4S in the logical operator 5, it can be judged that the car 100 offsets upward although the same remains in the door zone. Contrarily, when the car moves slightly downward, since the signal 3S assumes ON and
25 the signal 4S OFF, it can be judged that the car 100

offsets downward.

[0034]

The state (d) where only the output of the position detection sensor 3 is OFF is caused when the car 100 was moved by a component M for the small step difference detection length as shown in Fig.3. Accordingly, when the state where only the output of the position detection sensor 3 is OFF, the system controller 108 issues a command to move the car 100 by the component M for the small step difference detection length, and a releveled control is performed.

[0035]

According to the above embodiment, since the configuration of the plate to be detected 1 and the intervals between the position detection sensors 2, 3 and 4 are determined so that the output signal 5S of the logical operator 5 and the output signal 2S of the position detection sensor 2 show a same output at all of the positions in the hoistway, a multifunctioning of both door zone detection function and releveled function is enabled at the same time, and redundancy of the entire system including erroneous detection and the like can be enhanced. Further, regardless of the enhancement of the redundancy merely through the arrangement of the position detection sensors and of

the detection plate portions in two rows in horizontal direction within the hoistway, they can be accommodated in compact and can be attached even in a limited narrow installation space.

5 [0036]

Fig.8 shows a modification of the configuration of the plate to be detected 1 and the arrangement of the position detection sensors 2, 3 and 4, which includes a plate to be detected 1 attached to the landing
10 floor sill 102, position detection sensors 2, 3 and 4 attached to the car corresponding thereto and a logic operator 5 that compares and performs logical operation of the outputs from the position detection sensors 2, 3 and 4.

15 [0037]

Like what has been shown in connection with Fig.5, the plate to be detected 1 is configured in such a manner that the length thereof in the running direction of the car 100 at the side where the position detection sensor
20 2 passes through is formed longer in comparison with the length at the side where the position detection sensors 3 and 4 pass through, however, the upper portion thereof are made flat so as not to exceed the landing floor sill 102, thereby, a possible danger that the
25 ropes and the like are caught on the upper portion of

the plate to be detected 1 at the time such as an earthquake.

[0038]

The position detection sensor 2 is not on the same
 5 coaxial line as the position detection sensors 3 and
 4 with respect to the running direction of the car 100, in
 that is arranged on a different row, and the position
 detection sensors 3 and 4 are arranged on the same axial
 line. The configuration of the plate to be detected 1
 10 and the arrangement of the position detection sensors
 2, 3 and 4 are determined so that the output signal 5S
 of the logical operator 5 and the output signal 2S of
 the position sensor 2 assume a same signal.

[0039]

15 Fig.9 shows a configuration of the plate to be
 detected 1 and another arrangement of the position
 detection sensors 2, 3 and 4, and the length L and the
 small step difference detection length M for performing
 the releveling function are determined in advance. The
 20 position of the position detection sensor 2 is at the
 same position in up and down direction as the position
 detection sensor 4, and the interval between the
 position detection sensors 3 and 4 and the length y of
 the plate to be detected 1 are determined in such a manner
 25 that the signal 5S representing the OR output of the

signals 3S and 4S in association with the running of the car 100 determined by the logical operator 5 determines the length corresponding to the door zone. Further, in comparison with the length L of the plate to be detected 1 where the position detection sensor 2 passes through, the length y of the plate to be detected 1 where the position detection sensors 3 and 4 pass through is shorter, and the difference thereof is determined as x. Namely, it is determined in the relationship of $L=x+y$ and $x=S$. Still further, when the floor face of the car and the floor face of the landing floor coincide, since the position detection sensors 3 and 4 are located inside the plate to be detected 1 by the component M of the small step difference detection length from the edge portions of the plate to be detected 1, the length y is determined as $y=S+2M$.

[0040]

The varying states of the respective signals until the car 100 reaches a floor where the plate to be detected 1 is attached are the same as those shown in Fig.7.

[0041]

According to the above, since the plate to be detected 1 configured so as not to exceed the landing floor sill 102 in comparison with that in Fig.5, such as failure and erroneous detection caused when the ropes

and the like are caught on the sensors themselves at the time such as an earthquake can be avoided.

[EXPLANATION OF REFERENCE NUMERALS]

[0042]

- | | | |
|----|---------|---|
| 5 | 1 | Plate to be detected, |
| | 2, 3, 4 | Position detecting sensor (2 third position detection sensor, 3 first position detection sensor, 4 second position detection sensor), |
| | 5 | Logic operator (comparator), |
| 10 | 100 | Car |
| | 102 | Landing floor sill |
| | 106 | Pulse generator |
| | 108 | System controller |
| | 109 | Landing floor side door |
| 15 | 110 | Car side door |
| | 115 | Floor face |

20

25

[NAME OF THE DOCUMENT] SCOPE OF CLAIMS

1. An elevator with a safety position sensor that detects a door zone representing a region of permitting passengers getting on and off when the position of a car reaches at a hoistway position permitting doors of the car and of a landing floor to open or close: comprising

a first and second position detection sensors that are provided at the side of the car, are spaced apart by a predetermined distance in the upward and downward running direction and are disposed so as to face the side of the landing floor,

a third position detection sensor that is provided on a different row as that for the first and second position detection sensors,

a place to be detected that is provided at the side of the landing floor and is arranged so as to permit detection of the door zone by the position detection sensors and

a logical operator that receives signals from the first and second position sensors and outputs a result of logical operation of the inputted signals, characterized in that

a logical OR output signal from the logical

operator is treated as a detection signal of the door zone and the plate to be detected is arranged so as to permit detection of the door zone by the third position detection sensor.

5 2. An elevator with a safety position sensor that detects a door zone representing a region of permitting passengers getting on and off when the position of a car reaches at a hoistway position permitting doors of the car and of a landing floor to open or close:
10 comprising

 a first and second position detection sensors that are provided at the side of the car, are spaced apart by a predetermined distance in the upward and downward running direction and are disposed so as to face the
15 side of the landing floor,

 a third position detection sensor that is provided on a different row as that for the first and second position detection sensors,

 a place to be detected that is provided at the side
20 of the landing floor and is arranged so as to permit detection of the door zone by the position detection sensors and

 a logical operator that receives signals from the first and second position sensors and outputs a result
25 of logical operation of the inputted signals,

characterized in that

a logical OR output signal from the logical operator is treated as a detection signal of the door zone, the length in the upward and downward running direction of the plate to be detected corresponding to the third position detecting sensor is determined as length L corresponding to the door zone by the single position sensor, interval S between the first and second position detection sensors is determined shorter than the length L1 corresponding to the door zone of the plate to be detected and a releveling function is performed by making use of the difference component thereof.

3. An elevator with a safety position sensor that detects a door zone representing a region of permitting passengers getting on and off when the position of a car reaches at a hoistway position permitting doors of the car and of a landing floor to open or close: comprising

a first and second position detection sensors that are provided at the side of the car, are spaced apart by a predetermined distance in the upward and downward running direction and are disposed so as to face the side of the landing floor,

a third position detection sensor that is provided on a different row as that for the first and second

position detection sensors,

a place to be detected that is provided at the side of the landing floor and is arranged so as to permit detection of the door zone by the position detection
5 sensors and

a logical operator that receives signals from the first and second position sensors and outputs a result of logical operation of the inputted signals, characterized in that

10 a logical OR output signal from the logical operator is treated as a detection signal of the door zone, the length in the upward and downward running direction of the plate to be detected corresponding to the third position detection sensor is determined as
15 length L corresponding to the door zoned by the single position sensor, the center line between the first and second position detection sensors and the center line of the plate to be detected in the upward and downward running direction coincide under a condition when the
20 car lands, and interval S between the first and second position detection sensors is determined as $L1-2M$ when assumed the length corresponding to the door zone of the plate to be detected as $L1$ and a small step difference detection length for performing releveling function as
25 M .

4. An elevator with a safety position sensor that detects a door zone representing a region of permitting passengers getting on and off when the position of a car reaches at a hoistway position permitting doors of the car and of a landing floor to open or close:
5 comprising

a first and second position detection sensors that are provided at the side of the car, are spaced apart by a predetermined distance in the upward and downward
10 running direction and are disposed so as to face the side of the landing floor,

a third position detection sensor that is provided on a different row as that for the first and second position detection sensors,

15 a place to be detected that is provided at the side of the landing floor and is arranged so as to permit detection of the door zone by the position detection sensors and

a logical operator that receives signals from the
20 first and second position sensors and outputs a result of logical operation of the inputted signals, characterized in that

a logical OR output signal from the logical operator is treated as a detection signal of the door
25 zone, the length in the upward and downward running

direction of the plate to be detected corresponding to the third position detection sensor is determined as length L corresponding to the door zone by the single position sensor, the length y of the plate to be detected
5 where the first and second position detection sensors pass through and the interval S between the first and second position detection sensors are determined as $y = (L + 2M) / 2$ and as $S = (L - 2M) / 2$ respectively, when assumed the length of the plate to be detected where the third
10 position detection sensor passes through as L and a small step difference detection length for performing releveled function as M .

5. An elevator with a safety position sensor that detects a door zone representing a region of permitting
15 passengers getting on and off when the position of a car reaches at a hoistway position permitting doors of the car and of a landing floor to open or close: comprising,

a first and second position detection sensors that
20 are provided at the side of the car, are spaced apart by a predetermined distance in the upward and downward running direction and are disposed so as to face the side of the landing floor,

a third position detection sensor that is provided
25 on a different row as that for the first and second

position detection sensors,

a place to be detected that is provided at the side of the landing floor and is arranged so as to permit detection of the door zone by the position detection
5 sensors and

a logical operator that receives signals from the first and second position sensors and outputs a result of logical operation of the inputted signals, characterized in that

10 a logical OR output signal from the logical operator is treated as a detection signal of the door zone, the length in the upward and downward running direction of the plate to be detected corresponding to the third position detection sensor is determined as
15 length L corresponding to the door zone by the single position sensor, the position of the third position sensor is determined same as that of the second position detection sensor with regard to the up and down direction, and the upper portion of the plate to be
20 detected is flattened.